Duke Energy®

RONALD A. JONES
Sr Vice President
Nuclear Development

Duke Energy
EC09D/ 526 South Church Street
Charlotte, NC 28201-1006

Mailing Address:
P.O. Box 1006 – EC09D
Charlotte, NC 28201-1006

704-382-8149
704-607-8683 cell
Ron.Jones@duke-energy.com

July 8, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC (Duke Energy)
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Responses to Request for Additional Information
Ltr# WLG2011.07-04

References: Letter from Sarah Lopas (NRC) to Bryan Dolan (Duke Energy), *Request for Additional Information Regarding the Supplement to the Environmental Report for the William States Lee III Nuclear Station Units 1 and 2, Combined License Application*, dated September 14, 2010 (ML102371173)

Letter from Sarah Lopas (NRC) to Bryan Dolan (Duke Energy), *Request for Additional Information Regarding the Supplement to the Environmental Report for the William States Lee III Nuclear Station, Units 1 and 2,* Combined License Application, dated June 22, 2010 (ML101370398)

Letter from J.M. Muir (NRC) to B.J. Dolan (Duke Energy), *Request for Additional Information Regarding the Environmental Review* of the *Combined License Application for William States Lee Nuclear Station Units 1 and 2,* dated August 21, 2008 (ML082200509)

Letter from L.M. Tello (NRC) to B.J. Dolan (Duke Energy), *Request for Additional Information Regarding the Environmental Review of Combined License Application for William States Lee Nuclear Station Units 1 and 2,* dated January 21, 2009 (ML083120589)

This letter provides supplemental information to Duke Energy's responses to the Nuclear Regulatory Commission's request for additional information (RAI) included in the referenced letters.

RAI 206, Alternatives
RAI 216, Alternatives

D093
NRO

RAI 128, Alternatives
RAIs 48, 114 and 123, Alternatives

The supplemental responses to these NRC information requests are addressed in the enclosures, which also identify associated changes to the Combined License Application for the Lee Nuclear Station, when appropriate.

If you have any questions or need any additional information, please contact Peter S. Hastings, Nuclear Plant Development Licensing Manager, at 980-373-7820.

John S. Thrasher
for
Ronald A. Jones
Sr Vice President
Nuclear Development

Enclosures:

1) RAI 206 Supplement, Alternatives
2) RAI 216 Supplement, Alternatives
3) RAI 128 Supplement, Alternatives
4) RAIs 48, 114 and 123 Supplement, Alternatives

xc (w/o enclosures):

Loren Plisco, Deputy Regional Administrator, Region II
Allen Fetter, Branch Chief, DSER

xc (w/ enclosures):

Sarah Lopas, Project Manager, DSER
Brian Hughes, Senior Project Manager, DNRL
Terri Miley, PNNL
Lance Vail, PNNL

AFFIDAVIT OF JOHN S. THRASHER

John S. Thrasher, being duly sworn, states that he is Engineering Manager, Nuclear Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

John S. Thrasher

John S. Thrasher

Subscribed and sworn to me on July 8, 2011

Vickie M Prenatt

Notary Public

My commission expires: May 11, 2016

SEAL

VICKIE M PRENATT
Notary Public, North Carolina
Mecklenburg County
My Commission Expires
May 11, 2016

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter Dated: September 14, 2010

Reference NRC RAI Number: ER RAI 206 Supplement, Alternatives

NRC RAI:

Provide justification of the sizes and locations of cooling pond reservoirs at the Lee site and the alternative sites. Details should include: (l) calculations showing actual numbers and all the steps taken to come up with the final reservoir size estimates for the four sites (Lee, Perkins, Keowee, and Middleton Shoals). The analysis should also include a clear description justifying why 20 percent of the mean annual daily flow (MADF) in the Yadkin River was used as opposed to contacting the relevant water permitting agency for the drawdown limit; (2) area/volume tables and elevation/volume tables for the alternative site reservoirs; and (3) references that support the 20-ft depth being representative of the upper portion of the thermocline in the Piedmont region (if specific references are unavailable, explain how a 20-ft thermocline depth was derived).

NRC June 2 and 3, 2011 Audit - Request for Supplemental Information:

During the June 2 and 3, 2011 NRC audit, the NRC Staff requested that Duke Energy provide the following supplemental information:

- Present the water balance model/results for the most recent 10 year period of flow data for the Broad River (2001 through 2010)
- Present the water balance model/results based on the hypothetical condition that the seasonal flow release limits in the Federal Energy Regulatory Commission (FERC) license for the Ninety-Nine Islands Dam would apply as constraints on Lee Nuclear Station withdrawals (bounding evaluation)

Duke Energy Response:

Duke Energy is supplementing the previous response to this RAI based on the request for supplemental information identified above.

Several parameters associated with the water balance model used to determine the volume of supplemental water required to support operations of Lee Nuclear Station through significant droughts (sizing of Make-Up Pond C) were recently updated. First, the daily evaporation rates for Make-Up Ponds A, B and C were updated to consider average pan evaporation values from Clemson, South Carolina from July 1948 through 2010. Updated evaporation data tables are provided in the supplemental response to ER RAI 216 (Enclosure 2 to this letter). In addition, the design margin applied to account for uncertainty in the length/severity of future droughts was reduced slightly from the 25% margin applied in the initial sizing of Make-Up Pond C to a margin of 20 days of consumptive water storage so that a consistent margin was applied to each of the energy alternatives evaluated (nuclear with wet cooling towers, nuclear with hybrid cooling towers and natural gas combined cycle with wet cooling towers).

Because the Proportional Flow Limitation (5% mean annual flow) in regulations implementing Section 316(b) of the Federal Water Pollution Control Act (CWA) is susceptible to differing interpretations, Duke Energy has evaluated two values using the water balance model. First, a Proportional Flow Limitation (5% mean annual flow) of 125 cfs was applied in the water balance model, derived from the full period of record (1926 through 2010) for the Broad River at the Gaffney Station (No. 02153500). Second, a Proportional Flow Limitation (5% mean annual flow) of 98 cfs was applied in the water balance model, derived from the most recent 10 years (2001 through 2010) for the Broad River at the Gaffney Station. In comparing these two cases (98 cfs versus 125 cfs), very little difference is seen in the volume of supplemental water required to support operations of Lee Nuclear Station through significant droughts as reflected in the water balance model results summarized below.

The minimum flow release requirement of 483 cfs from the Ninety-Nine Islands Dam per its FERC License is described in more detail below. The majority of the water balance model evaluations that were performed apply this minimum flow release requirement. The seasonal flow release requirements from the Ninety-Nine Islands Dam per its FERC license are also described below. A hypothetical bounding evaluation of the water balance model, postulating constraints based on these seasonal flow release requirements, would result in a significant increase in the volume of supplemental water required to support operations of Lee Nuclear Station through significant droughts (results summarized below). Rather than postulating a larger Make-Up Pond C to support this increase in volume of required supplemental water, the volume and depth of the water layer preserved to protect the thermocline is reduced for the purposes of this evaluation. Duke Energy believes that reducing this water layer would result in less overall environmental impacts than increasing the size of Make-Up Pond C.

Different scenarios or cases of the water balance model were evaluated considering different energy alternatives, proportional flow limitations (125 cfs and 98 cfs) and flow release constraints for the Ninety-Nine Islands Dam (483 cfs and seasonal). Several sensitivity evaluations were also performed to justify the margins applied in sizing of Make-Up Pond C. The results of these different cases are presented in ER RAI supplemental responses as summarized below.

Description	**Case(s)**	**ER RAI Supplemental Response (Enclosure to Ltr. WLG2011.07-04)**
Energy Alternatives		
Nuclear with wet cooling towers	1 through 3	206 (Enclosure 1)
Nuclear with hybrid cooling towers	4 through 6	128 (Enclosure 3)
Natural gas combined cycle	7 through 9	48/114/123 (Enclosure 4)
Sensitivity Evaluations		
Combined worst evaporation	10	206 (Enclosure 1)
Synthetic drought	11 through 12	206 (Enclosure 1)

Data input tables and results are provided in the supplemental response to ER RAI 216 (ER RAI 216 Supplement, Enclosure 2 to this letter).

Make-Up Pond C Sizing Based on 5% of Mean Annual Flow of 125 cfs (Case 1)

Water balance model results based on a 5% mean annual flow of 125 cfs considering the entire 85-year period of record (1926-2010) are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 1. An 18-ft layer is preserved to protect the thermocline while maintaining the full pond elevation of Make-Up Pond C at 650 ft msl (a 20-ft layer was used in the initial sizing of Make-Up Pond C). This layer will be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (significant droughts)	9,874 ac-ft	
• 20 days usable storage as margin (worse future droughts)	2,500 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	12,251 ac-ft	632 ft
• Volume and depth to protect thermocline	9,502 ac-ft	18 ft
• Full pond volume and elevation	22,023 ac-ft	650 ft

Additional details for Case 1 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Make-Up Pond C Sizing Based on 5% of Mean Annual Flow of 98 cfs (Case 2)

Water balance model results based on a 5% mean annual flow of 98 cfs considering the most recent 10 years (2001-2010) are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 2. A 17-ft layer is preserved to protect the thermocline while maintaining the full pond elevation of Make-Up Pond C at 650 ft msl. This layer will be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (significant droughts)	10,270 ac-ft	
• 20 days usable storage as margin (worse future droughts)	2,500 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	12,917 ac-ft	633 ft
• Volume and depth to protect thermocline	9,106 ac-ft	17 ft
• Full pond volume and elevation	22,023 ac-ft	650 ft

Additional details for Case 2 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Sensitivity of Make-Up Pond C Sizing to Proportional Flow Limitation

A usable volume of 9,874 ac-ft is required in Make-Up Pond C to support station operations considering a Proportional Flow Limitation of 125 cfs based on the full period of record (1926-2010) as identified in Case 1. A usable volume of 10,270 ac-ft is required considering a Proportional Flow Limitation of 98 cfs based on the most recent 10 years as the period of record (2001-2010) as identified in Case 2. A negligible difference of only 396 ac-ft (volume of consumptive water required to support approximately three days of station operations) results, with application of a Proportional Flow Limitation of 98 cfs yielding a slightly larger volume of supplemental water being required to support station operations.

Seasonal Flow Release Limits in FERC License from Ninety-Nine Islands Dam

During the June 2 and 3, 2011 audit, the NRC Staff requested that Duke Energy perform a bounding analysis and provide water balance model results with the withdrawal threshold from the Ninety-Nine Islands Reservoir based on the hypothetical condition that the seasonal flow release limits in the FERC license from Ninety-Nine Islands Dam would apply as constraints on Lee withdrawals. This bounding evaluation has been performed and the results are presented below as Case 3. Importantly, Duke Energy's FERC license for Ninety-Nine Islands Hydroelectric Station supports the water balance model evaluations for Cases 1 and 2 above, which consider maintaining a minimum flow of 483 cfs in the Broad River as the threshold flow to support withdrawals of makeup water from the Ninety-Nine Islands Reservoir (to support operations of Lee Nuclear Station and to support refill of Make-Up Ponds B and C [drought contingency ponds]). This perspective is also supported by South Carolina Water Withdrawal Law. Additional information on the FERC operating license for the Ninety-Nine Islands Hydroelectric Station is provided below.

The FERC operating license for Ninety-Nine Islands Hydroelectric Station includes seasonal limits on reservoir levels to one foot below full impoundment (511 feet above msl) from March through May, and two feet below full impoundment from June through February. This allows for a short-term potential of zero outflow (excluding a measured 53 cfs due to dam leakage) to occur, immediately followed by the required minimum flow release (Reference 2). Minimum flow requirements below the dam are 966 cfs (January through April); 725 cfs (May, June and December); and 483 cfs (July through November), when flow is available. If the above referenced flows cannot be maintained during December through June without dropping below the reservoir level restrictions described above, then at least 483 cfs is required to be released. If there is insufficient water to maintain at least 483 cfs of continuous flow release, the operating license provides that one hydroelectric unit can be operated at its minimum hydraulic output for that portion of every hour that is necessary to release the approximate accumulated inflow; inflow can be released at the trash gate, or the inflow can be spilled. Collectively, these limits are referred to as the "low flow protocol". Pursuant to South Carolina Water Withdrawal Law, only the lowest minimum flow identified above (i.e., 483 cfs) constrains withdrawals by Lee Nuclear Station. See South Carolina Water Withdrawal Law § 49-4-150(A)(4) (stating in part that water withdrawal from a licensed flow control impoundment are based on the lowest minimum flow specified in the license for that impoundment).

Make-Up Pond C Sizing Based on Ninety-Nine Islands Dam Seasonal Flow Release Constraints (Case 3)

Water balance model results based on the bounding evaluation of hypothetical constraints associated with Ninety-Nine Islands Dam seasonal flow release limits are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 3. A significant increase in usable volume to support station operations would be required under this scenario, resulting in only an

11-ft layer being preserved to protect the thermocline with a full pond elevation of 650 ft msl. This layer should be sufficient to avoid disruption of the natural thermal stratification or turnover pattern; however, there are increased risks of not protecting the thermocline for Case 3 as compared to Cases 1 and 2.

• Usable volume to support station operations (significant droughts)	12,928 ac-ft	
• 20 days usable storage as margin (worse future droughts)	2,500 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	15,575 ac-ft	639 ft
• Volume and depth to protect thermocline	6,448 ac-ft	11 ft
• Full pond volume and elevation	22,023 ac-ft	650 ft

Additional details for Case 3 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter). Daily results for Case 3 (Table 19) are also provided in the supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Justification of Margins (Usable Volume and Depth of Layer to Protect Thermocline)

During the June 2 and 3, 2011 audit, the NRC Staff asked whether the water balance model considered worst-case evaporation. To fully address this question, Duke Energy conducted a sensitivity evaluation based on the worst-case combined evaporation. The worst evaporation for each month of the year considering the full period of record of Clemson Pan Evaporation data from 07/01/1948 to 12/31/2010 were combined to create a conservative worst-case evaporation. The water balance model using this conservative worst-case evaporation was run as Case 10 and results are presented below.

Margin was added to the required usable storage when originally sizing Make-Up Pond C owing to uncertainty of the length/severity of future droughts. During the June 2 and 3, 2011 audit, the NRC Staff asked about the basis for the margin and if preserving the upper 20-ft layer of Make-Up Pond C to protect the thermocline provided additional margin. To address these questions, Duke Energy conducted two sensitivity evaluations using a synthetic drought to validate that the margins applied in sizing Make-Up Pond C are both prudent and reasonable. The synthetic drought used in these sensitivity evaluations considers 2002 flow data from January through mid-September and 2007 flow data for mid-September through December. (The last 3-½ months of 2002 included significant rainfall, which reduced the drought impact, while 2007 had little rainfall during this time resulting in extending the drought.) Cases 2 and 3 of the water balance model were re-run using the synthetic drought (with no margin added since worse-case drought being evaluated) and results are presented below as Cases 11 and 12 respectively.

Make-Up Pond C Sizing Based on Combined Worst Evaporation and Seasonal Flow Release Constraints (Case 10)

The sensitivity analysis consisting of water balance model results based on the combined hypothetical cases of worst-case evaporation and seasonal flow release constraints associated with the Ninety-Nine Islands Dam FERC license is summarized below. This Make-Up Pond C sizing evaluation is designated as Case 10 (same as Case 3 with combined worst evaporation). As compared to Case 3, a small additional increase in usable volume to support station operations is realized from Case 10, resulting in only a 10-ft layer being preserved to protect the thermocline with a full pond elevation of 650 ft msl. This layer should be sufficient to avoid disruption of the natural thermal stratification or turnover pattern; however, there are increased risks of not protecting the thermocline for Case 10 as compared to Cases 1 and 2

• Usable volume to support station operations (significant droughts)	13,434 ac-ft	
• 20 days usable storage as margin (worse future droughts)	2,500 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	16,081 ac-ft	640 ft
• Volume and depth to protect thermocline	5,942 ac-ft	10 ft
• Full pond volume and elevation	22,023 ac-ft	650 ft

Additional details for Case 10 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Make-Up Pond C Sizing Based on Synthetic Drought and Minimum Flow Release Limit in FERC License from Ninety-Nine Islands Dam (Case 11)

The sensitivity analysis consisting of water balance model results based on the hypothetical synthetic drought and minimum flow release limit associated with the Ninety-Nine Islands Dam FERC license is summarized below. This Make-Up Pond C sizing evaluation is designated as Case 11. A large increase in usable volume to support station operations results in only an 8-ft layer being preserved to protect the thermocline with a full pond elevation of 650 ft msl. This layer should be sufficient to avoid disruption of the natural thermal stratification or turnover pattern; however, there are increased risks of not protecting the thermocline for Case 11 as compared to Cases 1 and 2

• Usable volume to support station operations (synthetic drought)	17,013 ac-ft	
• 0 days usable storage as margin (worse-case drought evaluated)	0 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	17,160 ac-ft	642 ft
• Volume and depth to protect thermocline	4,863 ac-ft	8 ft
• Full pond volume and elevation	22,023 ac-ft	650 ft

Additional details for Case 11 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Make-Up Pond C Sizing Based on Synthetic Drought and Seasonal Flow Release Constraints (Case 12)

The sensitivity analysis consisting of water balance model results based on the combined hypothetical cases of synthetic drought and seasonal flow release constraints associated with the Ninety-Nine Islands Dam FERC license is summarized below. This Make-Up Pond C sizing evaluation is designated as Case 12. A significant increase in usable volume to support station operations is realized from Case 12 which results in only a 1-ft layer being preserved to protect the thermocline with a full pond elevation of 650 ft msl. This layer would not be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (synthetic drought)	21,216 ac-ft	
• 0 days usable storage as margin (worse-case drought evaluated)	0 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	21,363 ac-ft	649 ft
• Volume and depth to protect thermocline	660 ac-ft	1 ft
• Full pond volume and elevation	22,023 ac-ft	650 ft

Additional details for Case 12 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Margins Justified (Usable Volume and Depth of Layer to Protect the Thermocline)

The worst-case evaporation results (Case 10) reflect that approximately 500 ac-ft of additional supplemental water storage would be required in Make-Up Pond C to support station operations as compared with considering average evaporation results (Case 3). This change in assumed evaporation alone would erode the margin in usable storage of Make-Up Pond C by 20% (approximately four days of storage out of the 20 days of storage added as margin).

Synthetic drought evaluations (Cases 11 and 12) consider zero days of margin in usable storage in Make-Up Pond C because a hypothetical worse-case drought is being evaluated in both cases. The results from these cases reflect a large (Case 11) and significant (Case 12) increase in the usable storage volume required to support station operations through the worse-case drought and a shallow (Case 11) to insufficient (Case 12) layer being preserved to protect the thermocline through the worse-case drought.

The margins applied by Duke Energy in sizing the usable storage and in preserving a layer of water to protect the thermocline in Make-Up Pond C are both prudent and reasonable in light of water balance model results for sensitivity evaluations considering worst-case evaporation (Case 10) and considering a synthetic drought (Cases 11 and 12).

There are no other changes to the information provided in Reference 1 as a result of this update.

References:

1. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2010.10-04, dated October 14, 2010 (ML103360419)

2. U.S. Federal Energy Regulatory Commission (FERC), 1996, Order Issuing New License, Project No. 2331-002, June 17, 1996

Associated Revision to the Lee Nuclear Station Combined License Application:

None

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter Dated: September 14, 2010

Reference NRC RAI Number: ER RAI 216 Supplement, Alternatives

NRC RAI:

Provide the following information that will be cited in the response to RAI 128 (to be received by NRC in October 2010):

1. Table of stage-volume and stage-area data used to model Ponds Band C;
2. Water balance model results including daily stage, volume, surface area, inflow and outflow for Ponds A, B, and C;
3. Broad River daily flows used as input and the computed daily discharge from Ninety-Nine Islands Dam;
4. Daily evaporation rates for each pond; and
5. Any assumptions such as sources and sinks of water, and other initial and boundary conditions for these ponds or the Ninety-Nine Islands Reservoir.

The requested information is to be repeated for any alternative cooling scenario evaluated.

NRC June 2 and 3, 2011 Audit - Request for Supplemental Information:

During the June 2 and 3, 2011 NRC audit, the NRC Staff requested that Duke Energy provide the following supplemental information:

- Present the water balance model/results for the most recent 10 year period of flow data for the Broad River (2001 through 2010)
- Present the water balance model/results based on the hypothetical condition that the seasonal flow release limits in the Federal Energy Regulatory Commission (FERC) license for the Ninety-Nine Islands Dam would apply as constraints on Lee Nuclear Station withdrawals (bounding evaluation)

Duke Energy Response:

Duke Energy is supplementing the previous response to this RAI based on the request for supplemental information identified above.

Because the Proportional Flow Limitation (5% mean annual flow) in regulations implementing Section 316(b) of the Federal Water Pollution Control Act (CWA) is susceptible to differing interpretations, Duke Energy has evaluated two values using the water balance model. First, a Proportional Flow Limitation (5% mean annual flow) of 125 cfs was applied in the water balance model, derived from the full period of record (1926 through 2010) for the Broad River at the Gaffney Station (No. 02153500). Second, a Proportional Flow Limitation (5% mean annual flow) of 98 cfs was applied in the water balance model, derived from the most recent 10 years (2001 through 2010) for the Broad River at the Gaffney Station. These Proportional Flow Limitation values are shown in Table 2 of Attachment 216S-01. In comparing these two cases

(98 cfs versus 125 cfs), very little difference is seen in the volume of supplemental water required to support operations of Lee Nuclear Station through significant droughts as reflected in the water balance model results for different cases/scenarios summarized in Table 16 of Attachment 216S-01.

Daily evaporation rates for Make-Up Ponds A, B and C used in the water balance model were updated to consider pan evaporation values from Clemson, South Carolina from July 1948 through 2010 (refer to Tables 6, 6a, 6b, 7, 8 and 9 in Attachment 216S-01).

The NRC Staff requested that Duke Energy perform a bounding evaluation of the water balance model considering hypothetical constraints associated with the seasonal flow release requirements from the Ninety-Nine Islands Dam per its FERC License. Inputs to the water balance model and results from this bounding evaluation are presented in Tables 17, 18 and 19 of Attachment 216S-01.

Attachment 216S-01 provides several tables that have been updated from Duke Energy's response to ER RAI 216 (Reference 1) and several new tables. These tables provide updated and new water balance model inputs and output results as summarized in the paragraphs below.

Table 2 provides an updated summary of water balance model inputs.

Table 6 provides updated daily evaporation rates for the Make-Up Ponds considering pan evaporation values from Clemson, South Carolina from July 1948 through 2010.

Table 6a provides daily evaporation rates for the Make-Up Ponds considering worst case monthly pan evaporation values from Clemson, South Carolina from July 1948 through 2010.

Table 6b provides monthly pan evaporation values from Clemson, South Carolina from July 1948 through 2010.

Table 7 provides updated daily evaporation for Make-Up Pond A assuming full pond elevation 547 ft msl.

Table 8 provides updated daily evaporation for Make-Up Pond B assuming full pond elevation 570 ft msl.

Table 9 provides updated daily evaporation for Make-Up Pond C assuming full pond elevation 650 ft msl.

Table 13 which provides water balance model results for a heat dissipation system evaluation using 100% wet cooling towers during the year 2002 was not updated due to negligible changes in the updated water balance model results. The updated water balance model results (refer to Case 1 on Table 16 for inputs and outputs) reflect that 9,874 ac-ft of additional supplemental water would be required to support station operations versus 9,847 ac-ft shown in Table 13 of Duke Energy's initial response to ER RAI 216 (Reference 1). This difference is less than one percent and is considered negligible.

Table 14 which provides water balance model results using the hybrid cooling system year-round during the year 2002 for the maximum "water savings" evaluation was not updated due to negligible changes in the updated water balance model results. The updated water balance model results (refer to Case 4 on Table 16 for inputs and outputs) reflect that 2,804 ac-ft of additional supplemental water would be required to support station operations versus 2,778 ac-ft shown in Duke Energy's initial response to ER RAI 128 (Reference 1). This difference is less than one percent and is considered negligible.

Table 16 provides a summary of inputs and outputs on Make-Up Pond C sizing for different scenarios (cases).

Table 17 provides Broad River monthly threshold flows used in the water balance model to support all consumptive withdrawals from the Broad River considering hypothetical constraints associated with FERC seasonal flow release limits from the Ninety-Nine Islands Dam.

Table 18 provides Broad River monthly threshold flows used in the water balance model to support maximum refill operations considering hypothetical constraints associated with FERC seasonal flow release limits from the Ninety-Nine Islands Dam.

Table 19 provides water balance model results for a heat dissipation system evaluation using 100% wet cooling towers considering hypothetical constraints associated with FERC seasonal flow release limits from the Ninety-Nine Islands Dam during the year 2002 including daily stage, volume, surface area, inflow and outflow for Make-Up Ponds A, B, and C. Table 19 also includes the Broad River daily flows used as input, and the Broad River flow at the Ninety-Nine Islands Dam. Table 19 provides input and output details for Case 3 shown on Table 16.

There are no other changes to the information provided in Reference 1 as a result of this update.

References:

1. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2010.10-09, dated October 29, 2010 (ML103070311)

2. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2011.06-04, dated June 23, 2011 (ML11179A079)

3. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and*

2, *Response to Request for Additional Information*, Ltr# WLG2010.12-01, dated December 17, 2010 (ML103550032)

4. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information*, Ltr# WLG2011.01-03, dated January 26, 2011 (ML110310017)

Associated Revision to the Lee Nuclear Station Combined License Application:

None

Attachment:

Attachment 216S-01	Table 2	Updated Summary of Water Balance Model Inputs
	Table 6	Updated Daily Evaporation Rates for the Make-Up Ponds
	Table 6a	Daily Evaporation Rates for the Make-Up Ponds Using Worst Case Pan Evaporation Combination
	Table 6b	Monthly Pan Evaporation Values from Clemson, South Carolina from July 1948 through 2010.
	Table 7	Updated Daily Evaporation for Make-Up Pond A Assuming Full Pond Elevation
	Table 8	Updated Daily Evaporation for Make-Up Pond B Assuming Full Pond Elevation
	Table 9	Updated Daily Evaporation for Make-Up Pond C Assuming Full Pond Elevation
	Table 16	Make-Up Pond C Sizing for Different Scenarios (Cases)
	Table 17	Broad River Monthly Threshold Flows in Water Balance Model to Support All Consumptive Withdrawal from the Broad River Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from the Ninety-Nine Islands Dam
	Table 18	Broad River Monthly Threshold Flows in Water Balance Model to Support Maximum Refill Operations Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from the Ninety-Nine Islands Dam
	Table 19	Water Balance Model Results Using 100% Wet Cooling Towers for Year 2002 Considering Hypothetical Constraints

Associated with FERC Seasonal Flow Release Limits from the Ninety-Nine Islands Dam

Attachment 216S-01

Table 2 Summary of Water Model Inputs

Water Withdrawals and Consumptive Use	Range (Winter–Summer) Based on Monthly Evaporation Rates		
Lee Nuclear Station Consumptive Water Use	51–63 cfs		
Intake Screen Wash + Cooling Tower Blowdown	4.5 cfs + 18.5 cfs = 23 cfs		
Maximum Make-Up Pond Refill Rates (varies based on fish spawning period)	40-47 cfs (Mar–Jun); 239-251 cfs (Jan–Feb and Jul–Dec)		
Mean Annual Daily Flow (MADF) 1926-2010 (85 years)	2,497 cfs (5% = 125 cfs)		
Mean Annual Daily Flow (MADF) 2001-2010 (most recent 10 years)	1,956 cfs (5% = 98 cfs)		
Broad River Pumping Capacity (125 cfs based on 5% MADF)	125-325 cfs		
Natural Evaporation Losses from Make-up Ponds	**Range (Winter–Summer) Based on Monthly Evaporation Rates and Full Pond Elevations**		
Make-Up Pond A	0.11–0.43 cfs		
Make-Up Pond B	0.26–1.04 cfs		
Make-Up Pond C	1.05–4.24 cfs		
Broad River Bypass Flow Requirements			
Ninety-Nine Islands Minimum Continuous Flow (Established by FERC in 1996)	483 cfs		
Future Water Demands (Estimated for Year 2060)	60 cfs		
Pond Stage/Area/Volume Information	**Make-Up Pond A**	**Make-Up Pond B**	**Make-Up Pond C**
Full Pond Elevation	547 ft msl	570 ft msl	650 ft msl
Full Pond Surface Area	62 ac	152 ac	618 ac
Full Pond Volume	1,425 ac-ft	3,991 ac-ft	22,023 ac-ft
Pond Elevation at Maximum Drawdown For Drought Needs	No Drawdown	540 ft msl	605 ft msl
Pond Area at Maximum Drawdown For Drought Needs	No Drawdown	63 ac	201 ac
Minimum Pond Volume (Dead Storage)	No Drawdown	835 ac-ft	4,530 ac-ft
Usable Pond Volume For Drought Contingency (30 ft drawdown on Make-Up Pond B and 45 ft drawdown on Make-Up Pond C)	0 ac-ft	3,156 ac-ft	17,493 ac-ft

Table 6 Daily Evaporation Rates for the Ponds

Month	Month	Daily Evap [ft/day]
January	1	0.00351
February	2	0.00512
March	3	0.00777
April	4	0.01081
May	5	0.01217
June	6	0.0135
July	7	0.01361
August	8	0.01245
September	9	0.00965
October	10	0.00708
November	11	0.00478
December	12	0.00337

Table 6a Daily Evaporation Rates for the Ponds Using Worst Case Pan Evaporation Combination

Month	Month	Daily Evap [ft/day]
January	1	0.0048
February	2	0.00656
March	3	0.01047
April	4	0.01434
May	5	0.01548
June	6	0.02096
July	7	0.01755
August	8	0.01786
September	9	0.01432
October	10	0.00981
November	11	0.00696
December	12	0.00447

Table 6b - Monthly Pan Evaporation Values from Clemson, South Carolina from July 1948 through 2010

Station: CLEMSON UNIV
State: SC
ID: 381770
Latitude: 34.66 degrees
Longitude: -82.82 degrees
Elevation: 824 feet
Station period of record: 07/01/1948-12/31/2010

CLIMOD product: Monthly Time Series
Creation time: 06/13/2011 08:28 EDT
Element: Evaporation
Units: inch

Analysis: Sum
Max allowable missing days: 3
Lowest acceptable quality of data: Raw data
Column delimiter: tab

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1948	z	z	z	z	z	z	5.81	5.16a	3.84	3.17	f	1.25c	g
1949	e	d	3.74	f	6.29	5.77	5.46c	4.92b	3.75c	d	2.40a	d	e
1950	d	d	3.97	5.16c	6.15	d	d	4.97	4.04b	3.70a	e	f	f
1951	1.75	h	3.80c	5.46b	7.47	6.44a	7.06	6.27a	4.16b	3.48b	1.82c	l	47.71b
1952	d	2.77a	f	5.11b	6.3	6.82c	z	z	z	z	z	w	h
1953	f	d	d	6.23a	6.72b	6.41	7.1	6.06c	d	3.67c	2.57a	k	e
1954	j	e	i	5.47	6.21b	7.12a	7.89	7.18a	6.62	5.07	f	f	e
1955	e	f	d	5.72b	6.01b	6.34	6.69a	6.02b	4.36	3.92a	2.83	1.48a	43.37c
1956	1.79c	d	3.92b	d	6.17a	8.11	6.79a	6.14	d	3.11	2.07c	1.91c	40.01c
1957	1.77a	2.26b	3.46a	5.09a	5.37b	5.07c	6.02c	7.21a	4.15c	2.71b	1.83c	f	44.94a
1958	h	l	g	5.31a	6.02	6.8	6.30a	d	5.27a	3.43c	3.04	g	e
1959	e	f	4.06c	5.96b	d	6.91a	6.57b	7.05a	4.22b	f	2.4	f	e
1960	k	g	h	5.81b	7.02a	6.51	6.14b	6.01	4.64a	d	2.32	s	e
1961	t	h	4.10a	5.62a	5.77	6.35b	7.11	i	z	z	i	d	g
1962	1.62b	d	3.88b	5.29b	7.79	6.19a	7.26	7.4	z	3.95b	2.87b	e	46.25c
1963	d	2.63a	4.86c	6.30b	6.83	5.57c	6.31a	6.84	4.82a	4.27a	2.26c	q	50.69b
1964	k	e	4.31c	f	6.68a	7.58a	e	5.65c	5.43	3.26a	2.75a	h	e
1965	1.89b	j	4.06b	5.33b	7.47	5.57c	6.27a	7.04	5.03	3.86b	2.37a	1.75	50.64a
1966	e	g	4.56a	4.52b	4.9	7.04	6.99	5.89a	4.78a	3.27a	2.03a	1.61b	45.59b
1967	2.01b	g	4.59	5.92b	d	6.14b	6.12a	5.25c	4.91	3.93	2.53	1.22	42.62b
1968	f	2.96	5.07	5.27	6.77	6.94	7.24	7.7	4.74	3.30a	1.81a	1.85	53.65a
1969	1.28	1.9	4.34	5.15a	6.56	7.53	8.29	6.94	4.62	3.72	2.47	1.69	54.49
1970	m	2.75b	3.72	5.3	6.83a	7.13	8.2	6.6	5.41	3.36	2.19	1.8	53.29a
1971	1.46	2.55	3.47	i	6.05a	5.77	6.05	5.95	4.92	3.98	2.55	1.94	44.69a
1972	1.83	2.4	3.93	5.52	5.42	6.85	6.95	7.13	6.63	3.87	z	1.79	52.32a
1973	1.71c	2.45	3.08	4.49	6.04	5.91	6.83	5.84	5.12a	3.54	2.09	h	47.10a
1974	1.14a	1.38a	3.04	4.27	5.37	6.09	6.95	4.93	4.11	3.68	2.23	1.58	44.77
1975	1.79c	2.19b	g	5.21	5.57	7.17	6.48	5.69	3.88	3.15	2.71	n	43.84b
1976	n	h	3.25	5.99	5.27	6.36	7.01a	6.17	3.68	2.76b	d	s	d
1977	x	q	3.26b	5.22	6.17	6.29	8.1	7.31	4.16a	3.27a	2.24	s	46.02c
1978	z	z	z	4.26	3.69b	6.07a	5.57	4.65	3.78a	3.90b	3.27	w	d
1979	z	z	4.25	5.36	5.58	5.87	5.73	7.54	z	4.33	d	w	e
1980	h	t	d	5.81	6.14	6.97	8.58	7.65	5.05	3.29a	d	q	e
1981	t	l	4.86a	6.03	6.57	7.71	7.2	6.12	5.79	4.72	2.31a	l	51.31c
1982	r	g	3.94	4.81	6.96	6.24	7.12	5.82a	4.39	3.16	2.38c	l	44.82c
1983	q	f	g	4.66	6.64	6.39	7.8	7.34	4.78a	3.76a	e	j	e
1984	z	i	i	4.28	6.51a	6.45b	5.67c	5.37	5.38	4.31	h	h	e
1985	1.91a	h	4.46	5.97	6.14	7.58	5.65b	5.58	5.63	3.95b	1.58	h	48.45b
1986	e	2.18	3.94	6.29	6.28	7.8	8.74	5.91	4.07	3.51b	1.48b	g	50.20b
1987	d	1.78b	3.09b	5.01	5.91	6.38	7.33	7.08	4.56	4.24	2.69a	1.48c	49.55a
1988	z	l	3.81	5.43	6.32a	7.83	6.35	6.55	4.02c	3.33	2.46	z	46.10c
1989	1.69	2.06c	3.14b	4.72	5.88	5.19b	5.05c	5.04c	4.34	3.29	d	z	40.40b
1990	d	2.53	3.35a	5.14a	5.95	6.87	7.15	5.75b	4.51	2.94a	2.72	z	46.91b
1991	1.11c	2.33	3.41a	4.16	4.55	5.20a	5.64a	4.72a	4.44	3.64	2.09	1.8	43.09
1992	f	2.52	3.43	4.64	5.18	5.17	7.05	4.82b	3.83a	2.83b	d	1.28a	40.75b
1993	1.37c	2.08	3.00c	5	4.99	6.31	8.29	6.04a	4.56a	3.29a	1.89b	1.64b	48.46
1994	j	g	4.21	5.00b	5.91	6.02	5.49a	4.67c	4	2.67	2.36c	1.59a	41.92b
1995	1.67b	f	3.66a	5.45	6	5.91	6.74	5.20a	3.81	3.43	1.86a	m	43.73b
1996	k	d	d	5.02	6.71	6.42	7	4.73	5.21	4.03a	3.19a	2.03c	44.34c
1997	j	2.05b	5.41	7.17	8	6.46	7.48b	7.3	5.46	3.81b	1.93b	1.43	56.50a
1998	e	2.33	4.14	4.53a	6.58	8.14	8.11	8.08	6.05	4.05	2.11	1.85	55.97a
1999	1.85	2.16	4.29	6.11	7.14	6.75	7.3	9.23	7.16	3.49	2.88	2.31	60.67
2000	2.03	2.92	4.77	5.2	7.96	8.9	9.07	7.22	4.61a	4.69	2.23	d	59.60a
2001	2.03	2.55	4.64a	6.06a	7.39	6.20b	7.43	6.99a	4.87	4.53	3.48	2.3	58.47
2002	1.85c	3.06	3.95	5.82	6.82	8.6	8.58	8.95	4.58	4.05a	2.08c	2.31	60.65
2003	2.48	2.41a	3.71a	4.56	5.36a	6.57a	7.19a	6.63	6.09	3.62	3.1	1.75	53.47
2004	d	1.90b	4.95	6.42	6.7	6.46	e	6.33a	4.86b	3.21a	2.14	2.01	44.98b
2005	2.17	z	4.49a	5.61	6.56	u	z	i	g	3.96	i	i	g
2006	2.18	2.26	5.12	6.6	g	h	8.51	7.02	4.37	3.62	2.01	2.02	43.71b
2007	2.25	2.99	4.85a	6.18	7.74	8.19	6.8	8.97	6.13	4.31	3.36	1.79a	63.56
2008	2.13	2.87	4.21	5.19	7.28	10.48	8.28	8.28	5.24	3.91	2.69	1.48	62.04
2009	2.14	2.76	3.38	5.91	5.72	8.04	8.14	7.72	4.47	2.52	2.16	1.56	54.52
2010	z	2.06a	3.75	6.48	6.59	8.42	8.73	6.89	6.77	4.44	2.29	m	56.42b
Max value	***2.48***	***3.06***	***5.41***	***7.17***	***8***	***10.48***	***9.07***	***9.23***	***7.16***	***5.07***	***3.48***	***2.31***	***63.56***
Min value	***1.11***	***1.38***	***3***	***4.16***	***3.69***	***5.07***	***5.05***	***4.65***	***3.68***	***2.52***	***1.48***	***1.22***	***43.09***
Mean	***1.81***	***2.39***	***4.01***	***5.41***	***6.29***	***6.75***	***7.03***	***6.43***	***4.82***	***3.66***	***2.39***	***1.74***	***54.93***
Median	***1.83***	***2.4***	***3.95***	***5.32***	***6.28***	***6.46***	***7.03***	***6.27***	***4.63***	***3.66***	***2.32***	***1.75***	***54.52***
# years	***27***	***31***	***50***	***58***	***59***	***59***	***58***	***59***	***56***	***58***	***49***	***29***	***11***

FLAGS:
a = 1, b = 2, c = 3, ..., or z = 26 or more missing days in a month or missing months in a year.
A = Accumulation over more than one day, S = Subsequent

NOTES:
- Long-term means based on columns. Thus, the sum (or average) of the monthly values may not equal the annual value.
- Requested start time is earlier than beginning of record.

Table 7

Daily Evaporation for Make-Up Pond A Assuming Full Pond Elevation (Elev. 547 ft and Surface Area 62 ac.)

Month	Month	Daily Evap [ft/day]	Pond A Surface Area [ac]	Pond A Evap. [ac-ft/day]	Pond A Evap. [cfs]
January	1	0.00351	62	0.22	0.11
February	2	0.00512	62	0.32	0.16
March	3	0.00777	62	0.48	0.24
April	4	0.01081	62	0.67	0.34
May	5	0.01217	62	0.75	0.38
June	6	0.0135	62	0.84	0.42
July	7	0.01361	62	0.84	0.43
August	8	0.01245	62	0.77	0.39
September	9	0.00965	62	0.60	0.30
October	10	0.00708	62	0.44	0.22
November	11	0.00478	62	0.30	0.15
December	12	0.00337	62	0.21	0.11

Table 8
Daily Evaporation for Make-Up Pond B Assuming Full Pond Elevation (Elev. 570 ft and Surface Area 152 ac.)

Month	Month	Daily Evap [ft/day]	Pond B Surface Area [ac]	Pond B Evap. [ac-ft/day]	Pond B Evap. [cfs]
January	1	0.00351	152	0.53	0.27
February	2	0.00512	152	0.78	0.39
March	3	0.00777	152	1.18	0.60
April	4	0.01081	152	1.64	0.83
May	5	0.01217	152	1.85	0.93
June	6	0.0135	152	2.05	1.03
July	7	0.01361	152	2.07	1.04
August	8	0.01245	152	1.89	0.95
September	9	0.00965	152	1.47	0.74
October	10	0.00708	152	1.08	0.54
November	11	0.00478	152	0.73	0.37
December	12	0.00337	152	0.51	0.26

Table 9
Daily Evaporation for Make-Up Pond C Assuming Full Pond Elevation (Elev. 650 ft and Surface Area 618 ac.)

Month	Month	Daily Evap [ft/day]	Pond C Surface Area [ac]	Pond C Evap. [ac-ft/day]	Pond C Evap. [cfs]
January	1	0.00351	618	2.17	1.09
February	2	0.00512	618	3.16	1.59
March	3	0.00777	618	4.80	2.42
April	4	0.01081	618	6.68	3.37
May	5	0.01217	618	7.52	3.79
June	6	0.0135	618	8.34	4.21
July	7	0.01361	618	8.41	4.24
August	8	0.01245	618	7.69	3.88
September	9	0.00965	618	5.96	3.01
October	10	0.00708	618	4.38	2.21
November	11	0.00478	618	2.95	1.49
December	12	0.00337	618	2.08	1.05

Table 16 - Make-Up Pond C Sizing for Different Scenarios

Case	Generation Type	MADF Record	MADF (cfs)	5% of MADF (cfs)	Drought Considered	Consumptive Use Year	Pan Evaporation	Dry Cooling Degradation Considered	Cooling Type	Non-Spawn Additional Refill (cfs)	99 Islands FERC Flow Requirements(s) (cfs)	Pond B Maximum Drawdown (ft)	Pond C Maximum Drawdown (ft)	Volume Used in Pond C (ac-ft)	20 Days of Additional Margin (ac-ft)	Dead Storage Below Intake Inlet (ac-ft)	Volume of Pond C Without 316 b Considerations (ac-ft)	Pond Elev Without Additional Storage for 316 b Considerations (ft)	Additional Pond Depth Available for 316 b Considerations (ft)	Full Pond Elevation with 316 b Considerations (ft)	Volume of Pond C Available for 316 b Considerations (ft)	Total Volume of Pond C With 316 b Considerations (ac-ft)
1	Nuclear	1926-2010	2497	125	Historic	2002	New Avg	n/a	Wet	200	483	30	45	9874	2500	147	12521	632	18	650	9502	22023
2	Nuclear	2001-2010	1956	98	Historic	2002	New Avg	n/a	Wet	200	483	30	45	10270	2500	147	12917	633	17	650	9106	22023
3	Nuclear	2001-2010	1956	98	Historic	2002	New Avg	n/a	Wet	200	966/725/483	30	45	12928	2500	147	15575	639	11	650	6448	22023
4	Nuclear/Hybrid	1926-2010	2497	125	Historic	2002	New Avg	25 percent	Hybrid	0	483	30	30	2804	2500	147	5451	610	20	630	6439	11890
5	Nuclear/Hybrid	2001-2010	1956	98	Historic	2002	New Avg	25 percent	Hybrid	0	483	30	30	2927	2500	147	5574	610	20	630	6316	11890
6	Nuclear/Hybrid	2001-2010	1956	98	Historic	2002	New Avg	25 percent	Hybrid	0	966/725/483	30	30	3443	2500	147	6090	612	18	630	5800	11890
7	Combined Cycle	1926-2010	2497	125	Historic	2002	New Avg	n/a	Wet	200	483	30	30	3277	1200	147	4624	606	20	626	5737	10361
8	Combined Cycle	2001-2010	1956	98	Historic	2002	New Avg	n/a	Wet	200	483	30	30	3380	1200	147	4727	606	20	626	5634	10361
9	Combined Cycle	2001-2010	1956	98	Historic	2002	New Avg	n/a	Wet	200	966/725/483	30	30	4279	1200	147	5626	610	16	626	4735	10361

Sensitivity Runs

Case	Generation Type	MADF Record	MADF (cfs)	5% of MADF (cfs)	Drought Considered	Consumptive Use Year	Pan Evaporation	Dry Cooling Degradation Considered	Cooling Type	Non-Spawn Additional Refill (cfs)	99 Islands FERC Flow Requirements(s) (cfs)	Pond B Maximum Drawdown (ft)	Pond C Maximum Drawdown (ft)	Volume Used in Pond C (ac-ft)	20 Days of Additional Margin (ac-ft)	Dead Storage Below Intake Inlet (ac-ft)	Volume of Pond C Without 316 b Considerations (ac-ft)	Pond Elev Without Additional Storage for 316 b Considerations (ft)	Additional Pond Depth Available for 316 b Considerations (ft)	Full Pond Elevation with 316 b Considerations (ft)	Volume of Pond C Available for 316 b Considerations (ft)	Total Volume of Pond C With 316 b Considerations (ac-ft)
10	Nuclear	2001-2010	1956	98	Historic	2002	Comb Worst	n/a	Wet	200	966/725/483	30	45	13434	2500	147	16081	640	10	650	5942	22023
* 11	Nuclear	2001-2010	1956	98	Synthetic	2002/2007	New Avg	n/a	Wet	200	483	30	45	17013	0	147	17160	642	8	650	4863	22023
* 12	Nuclear	2001-2010	1956	98	Synthetic	2002/2007	New Avg	n/a	Wet	200	966/725/483	30	76	21216	0	147	21363	649	1	650	660	22023

Days of Pond C useage are not necessarily consecutive.
Hybrid cooling was used exclusively all year round ("Water Savings" mode with dry cooling towers operating year round).
Synthetic drought used 2002 river flows through mid-September and then used river flow data from 2007 from mid-September to December 31.
New Avg includes pan evaporation from July 1948 to 2010 at Clemson.
Combined Worst Evaporation - The worst evaporation for each month of the year considering the full period of record of Clemson Pan Evaporation from 7/1/1948 to 12/31/2010 was combined together for a very conservative worst case to determine the additional storage that would be used in Pond C.

* Since Cases 11 and 12 evaluate a synthetic drought, no margin is applied in sizing Pond C.

Table 17 Broad River Monthly Threshold Flows in Water Model to Support All Consumptive Withdrawal from the Broad River Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits (not considering pond evaporation) from the Ninety-Nine Islands Dam

Month	Broad River Minimum Low Flow cfs	Total Plant Consumptive 2 Units cfs	Future Water Demand cfs	Water Model Broad River Threshold Flows cfs
Jan	966	50.9	60	1076.9
Feb	966	52.1	60	1078.1
Mar	966	55.2	60	1081.2
Apr	966	58.2	60	1084.2
May	725	60.1	60	845.1
Jun	725	61.9	60	846.9
Jul	483	63.0	60	606.0
Aug	483	62.3	60	605.3
Sep	483	60.4	60	603.4
Oct	483	57.4	60	600.4
Nov	483	54.6	60	597.6
Dec	725	51.9	60	836.9

Table 18 Broad River Monthly Threshold Flows in Water Model to Support Maximum Refill Operations Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

Month	Broad River Minimum Low Flow cfs	Total Plant Consumptive 2 Units cfs	Maximum Refill Rate for Make-Up Ponds cfs	Future Water Demand cfs	Water Model Broad River Threshold Flows cfs
Jan	966	50.9	224.1	60	1301
Feb	966	52.1	222.9	60	1301
Mar	966	55.2	219.8	60	1301
Apr	966	58.2	216.8	60	1301
May	725	60.1	214.9	60	1060
Jun	725	61.9	213.1	60	1060
Jul	483	63.0	212.0	60	818
Aug	483	62.3	212.7	60	818
Sep	483	60.4	214.6	60	818
Oct	483	57.4	217.6	60	818
Nov	483	54.6	220.4	60	818
Dec	725	51.9	223.1	60	1060

Table 19

Water Model Results Using 100% Wet Cooling Towers for Year 2002 Based on 98 cfs and Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

Date	2002 Broad River flow At Lee Nuclear Site (cfs)	2002 Broad River Flow At Lee Nuclear Site Less 60 cfs For Future Upstream Demand (cfs)	Lee Nuclear Plant Withdrawal From Broad River (cfs)	Lee Nuclear Plant Discharge To Broad River (cfs)	2002 Broad River Flow At Ninety Nine Islands Dam (cfs)	Pond A						Pond B						Pond C					
						Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)
1/1/2002	771.57	711.57	23.00	23	711.57	547	1425	62	0.11	69.40	69.51	568.61	3,784.90	145.83	0.26	51.01	0.00	649.98	22,017.12	618.39	1.09	0.00	0.00
1/2/2002	690.71	630.71	23.00	23	630.71	547	1425	62	0.11	69.40	69.51	567.9	3,683.18	143.73	0.26	51.01	0.00	649.98	22,014.95	618.39	1.09	0.00	0.00
1/3/2002	593.69	533.69	23.00	23	533.69	547	1425	62	0.11	69.40	69.51	567.19	3,581.46	141.60	0.25	51.01	0.00	649.98	22,012.78	618.39	1.09	0.00	0.00
1/4/2002	929.81	869.81	23.00	23	869.81	547	1425	62	0.11	69.40	69.51	566.47	3,479.75	139.74	0.25	51.01	0.00	649.97	22,010.61	618.28	1.09	0.00	0.00
1/5/2002	874.36	814.36	23.00	23	814.36	547	1425	62	0.11	69.40	69.51	565.73	3,378.05	137.62	0.25	51.01	0.00	649.97	22,008.45	618.28	1.09	0.00	0.00
1/6/2002	906.71	846.71	23.00	23	846.71	547	1425	62	0.11	69.40	69.51	564.99	3,276.35	135.25	0.24	51.01	0.00	649.97	22,006.28	618.28	1.09	0.00	0.00
1/7/2002	1037.22	977.22	34.22	23	966.00	547	1425	62	0.11	69.40	69.51	564.4	3,196.93	133.33	0.24	39.79	0.00	649.96	22,004.11	618.18	1.09	0.00	0.00
1/8/2002	1305.19	1245.19	298.00	23	970.19	547	1425	62	0.11	293.39	293.50	567.61	3,640.85	142.88	0.24	0.00	223.99	649.96	22,001.95	618.18	1.09	0.00	0.00
1/9/2002	1073.03	1013.03	70.03	23	966.00	547	1425	62	0.11	69.40	69.51	567.55	3,632.45	142.69	0.25	3.98	0.00	649.96	21,999.78	618.18	1.09	0.00	0.00
1/10/2002	982.94	922.94	23.00	23	922.94	547	1425	62	0.11	69.40	69.51	566.83	3,530.74	140.69	0.25	51.01	0.00	649.95	21,997.61	618.07	1.09	0.00	0.00
1/11/2002	1099.60	1039.60	96.60	23	966.00	547	1425	62	0.11	91.99	92.10	567.14	3,575.05	141.48	0.25	0.00	22.58	649.95	21,995.45	618.07	1.09	0.00	0.00
1/12/2002	1076.50	1016.50	73.50	23	966.00	547	1425	62	0.11	69.40	69.51	567.13	3,573.52	141.45	0.25	0.52	0.00	649.95	21,993.28	618.07	1.09	0.00	0.00
1/13/2002	930.96	870.96	23.00	23	870.96	547	1425	62	0.11	69.40	69.51	566.41	3,471.81	139.57	0.25	51.01	0.00	649.94	21,991.11	617.97	1.09	0.00	0.00
1/14/2002	780.81	720.81	23.00	23	720.81	547	1425	62	0.11	69.40	69.51	565.68	3,370.11	137.47	0.25	51.01	0.00	649.94	21,988.95	617.97	1.09	0.00	0.00
1/15/2002	671.08	611.08	23.00	23	611.08	547	1425	62	0.11	69.40	69.51	564.93	3,268.42	135.05	0.24	51.01	0.00	649.94	21,986.78	617.97	1.09	0.00	0.00
1/16/2002	743.84	683.84	23.00	23	683.84	547	1425	62	0.11	69.40	69.51	564.17	3,166.73	132.57	0.24	51.01	0.00	649.93	21,984.61	617.86	1.09	0.00	0.00
1/17/2002	845.49	785.49	23.00	23	785.49	547	1425	62	0.11	69.40	69.51	563.4	3,065.05	129.88	0.23	51.01	0.00	649.93	21,982.45	617.86	1.09	0.00	0.00
1/18/2002	835.09	775.09	23.00	23	775.09	547	1425	62	0.11	69.40	69.51	562.6	2,963.38	127.07	0.23	51.01	0.00	649.93	21,980.28	617.86	1.09	0.00	0.00
1/19/2002	1201.24	1141.24	198.24	23	966.00	547	1425	62	0.11	193.63	193.74	564.49	3,209.40	133.63	0.22	0.00	124.23	649.92	21,978.12	617.75	1.09	0.00	0.00
1/20/2002	1813.41	1753.41	298.00	23	1478.41	547	1425	62	0.11	293.39	293.50	567.69	3,653.32	143.13	0.24	0.00	223.99	649.92	21,975.95	617.75	1.09	0.00	0.00
1/21/2002	1443.80	1383.80	268.14	23	1138.66	547	1425	62	0.11	263.53	263.64	569.99	3,990.45	151.33	0.25	0.00	170.18	649.99	22,021.29	618.50	1.09	0.00	23.95
1/22/2002	1894.26	1834.26	75.31	23	1781.95	547	1425	62	0.11	70.70	70.81	569.99	3,990.33	151.33	0.27	0.00	0.21	649.99	22,021.29	618.50	1.09	0.00	1.09
1/23/2002	2760.54	2700.54	75.38	23	2648.17	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
1/24/2002	3811.63	3751.63	75.38	23	3699.25	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
1/25/2002	3615.27	3555.27	75.38	23	3502.90	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
1/26/2002	3222.56	3162.56	75.38	23	3110.18	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
1/27/2002	1801.86	1741.86	75.38	23	1689.49	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
1/28/2002	1674.81	1614.81	75.38	23	1562.43	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
1/29/2002	1905.81	1845.81	75.38	23	1793.44	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
1/30/2002	1570.85	1510.85	75.38	23	1458.48	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
1/31/2002	1547.75	1487.75	75.38	23	1435.38	547	1425	62	0.11	70.77	70.88	569.99	3,990.33	151.33	0.27	0.00	0.27	649.99	22,021.29	618.50	1.09	0.00	1.09
2/1/2002	1397.60	1337.60	76.64	23	1283.96	547	1425	62	0.16	71.97	72.14	569.99	3,990.08	151.33	0.39	0.00	0.27	649.99	22,020.29	618.50	1.60	0.00	1.09
2/2/2002	1305.19	1245.19	77.27	23	1190.93	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/3/2002	971.39	911.39	23.00	23	911.39	547	1425	62	0.16	70.61	70.78	569.29	3,885.59	148.04	0.39	52.28	0.00	649.98	22,017.12	618.39	1.60	0.00	0.00
2/4/2002	890.53	830.53	23.00	23	830.53	547	1425	62	0.16	70.61	70.78	568.58	3,781.11	145.73	0.38	52.28	0.00	649.98	22,013.96	618.39	1.60	0.00	0.00
2/5/2002	939.05	879.05	23.00	23	879.05	547	1425	62	0.16	70.61	70.78	567.86	3,676.64	143.62	0.38	52.28	0.00	649.97	22,010.79	618.28	1.60	0.00	0.00
2/6/2002	1178.14	1118.14	175.14	23	966.00	547	1425	62	0.16	170.47	170.64	569.21	3,874.02	147.76	0.37	0.00	99.86	649.97	22,007.63	618.28	1.60	0.00	0.00
2/7/2002	1593.95	1533.95	142.16	23	1414.79	547	1425	62	0.16	137.49	137.66	569.99	3,990.13	151.33	0.38	0.00	58.90	649.99	22,020.29	618.50	1.60	0.00	7.98
2/8/2002	2529.53	2469.53	77.24	23	2415.29	547	1425	62	0.16	72.57	72.74	569.99	3,990.08	151.33	0.39	0.00	0.37	649.99	22,020.29	618.50	1.60	0.00	1.60
2/9/2002	1998.22	1938.22	77.27	23	1883.95	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/10/2002	1547.75	1487.75	77.27	23	1433.49	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/11/2002	1201.24	1141.24	77.27	23	1086.97	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/12/2002	1501.55	1441.55	77.27	23	1387.28	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/13/2002	1397.60	1337.60	77.27	23	1283.33	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/14/2002	1443.80	1383.80	77.27	23	1329.53	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/15/2002	1270.54	1210.54	77.27	23	1156.28	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/16/2002	1224.34	1164.34	77.27	23	1110.08	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60
2/17/2002	1081.12	1021.12	77.27	23	966.85	547	1425	62	0.16	72.60	72.77	569.99	3,990.08	151.33	0.39	0.00	0.39	649.99	22,020.29	618.50	1.60	0.00	1.60

Table 19

Water Model Results Using 100% Wet Cooling Towers for Year 2002 Based on 98 cfs and Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

						Pond A						Pond B						Pond C					
Date	2002 Broad River flow At Lee Nuclear Site (cfs)	2002 Broad River Flow At Lee Nuclear Site Less 60 cfs For Future Upstream Demand (cfs)	Lee Nuclear Plant Withdrawal From Broad River (cfs)	Lee Nuclear Plant Discharge To Broad River (cfs)	2002 Broad River Flow At Ninety Nine Islands Dam (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)
2/18/2002	927.50	867.50	23.00	23	867.50	547	1425	62	0.16	70.61	70.78	569.29	3,885.59	148.04	0.39	52.28	0.00	649.98	22,017.12	618.39	1.60	0.00	0.00
2/19/2002	1045.31	985.31	42.31	23	966.00	547	1425	62	0.16	70.61	70.78	568.84	3,819.42	146.56	0.38	32.97	0.00	649.98	22,013.96	618.39	1.60	0.00	0.00
2/20/2002	1051.09	991.09	48.09	23	966.00	547	1425	62	0.16	70.61	70.78	568.47	3,764.71	145.38	0.38	27.19	0.00	649.97	22,010.79	618.28	1.60	0.00	0.00
2/21/2002	1166.59	1106.59	163.59	23	966.00	547	1425	62	0.16	158.92	159.09	569.65	3,939.18	149.39	0.38	0.00	88.31	649.97	22,007.63	618.28	1.60	0.00	0.00
2/22/2002	1155.04	1095.04	109.31	23	1008.73	547	1425	62	0.16	104.64	104.81	569.99	3,990.11	151.33	0.39	0.00	26.06	649.99	22,020.29	618.50	1.60	0.00	7.98
2/23/2002	1201.24	1141.24	77.25	23	1086.99	547	1425	62	0.16	72.58	72.75	569.99	3,990.08	151.33	0.39	0.00	0.38	649.99	22,020.29	618.50	1.60	0.00	1.60
2/24/2002	746.16	686.16	23.00	23	686.16	547	1425	62	0.16	70.61	70.78	569.29	3,885.59	148.04	0.39	52.28	0.00	649.98	22,017.12	618.39	1.60	0.00 -	0.00
2/25/2002	808.53	748.53	23.00	23	748.53	547	1425	62	0.16	70.61	70.78	568.58	3,781.11	145.73	0.38	52.28	0.00	649.98	22,013.96	618.39	1.60	0.00	0.00
2/26/2002	1029.14	969.14	26.14	23	966.00	547	1425	62	0.16	70.61	70.78	567.9	3,682.87	143.73	0.38	49.14	0.00	649.97	22,010.79	618.28	1.60	0.00	0.00
2/27/2002	1054.55	994.55	51.55	23	966.00	547	1425	62	0.16	70.61	70.78	567.57	3,635.05	142.76	0.37	23.73	0.00	649.97	22,007.63	618.28	1.60	0.00	0.00
2/28/2002	882.45	822.45	23.00	23	822.45	547	1425	62	0.16	70.61	70.78	566.83	3,530.60	140.69	0.37	52.28	0.00	649.96	22,004.47	618.18	1.60	0.00	0.00
3/1/2002	952.91	892.91	23.00	23	892.91	547	1425	62	0.24	73.73	73.97	566.03	3,419.45	138.51	0.55	55.47	0.00	649.96	21,999.66	618.18	2.42	0.00	0.00
3/2/2002	1282.09	1222.09	98.00	23	1147.09	547	1425	62	0.24	93.26	93.50	566.3	3,457.12	139.27	0.54	0.00	19.53	649.95	21,994.86	618.07	2.42	0.00	0.00
3/3/2002	1409.15	1349.15	98.00	23	1274.15	547	1425	62	0.24	93.26	93.50	566.57	3,494.78	140.01	0.55	0.00	19.53	649.94	21,990.06	617.97	2.42	0.00	0.00
3/4/2002	1478.45	1418.45	98.00	23	1343.45	547	1425	62	0.24	93.26	93.50	566.84	3,532.44	140.71	0.55	0.00	19.53	649.93	21,985.26	617.86	2.42	0.00	0.00
3/5/2002	1732.56	1672.56	98.00	23	1597.56	547	1425	62	0.24	93.26	93.50	567.11	3,570.09	141.40	0.55	0.00	19.53	649.93	21,980.46	617.86	2.42	0.00	0.00
3/6/2002	1443.80	1383.80	98.00	23	1308.80	547	1425	62	0.24	93.26	93.50	567.38	3,607.73	142.14	0.55	0.00	19.53	649.92	21,975.66	617.75	2.42	0.00	0.00
3/7/2002	1328.29	1268.29	98.00	23	1193.29	547	1425	62	0.24	93.26	93.50	567.64	3,645.37	142.97	0.56	0.00	19.53	649.91	21,970.86	617.65	2.42	0.00	0.00
3/8/2002	1374.50	1314.50	98.00	23	1239.50	547	1425	62	0.24	93.26	93.50	567.9	3,683.00	143.73	0.56	0.00	19.53	649.9	21,966.06	617.54	2.42	0.00	0.00
3/9/2002	1270.54	1210.54	98.00	23	1135.54	547	1425	62	0.24	93.26	93.50	568.16	3,720.63	144.49	0.56	0.00	19.53	649.89	21,961.27	617.44	2.42	0.00	0.00
3/10/2002	1039.53	979.53	36.53	23	966.00	547	1425	62	0.24	73.73	73.97	567.58	3,636.30	142.79	0.57	41.94	0.00	649.89	21,956.47	617.44	2.42	0.00	0.00
3/11/2002	833.94	773.94	23.00	23	773.94	547	1425	62	0.24	73.73	73.97	566.79	3,525.14	140.58	0.56	55.47	0.00	649.88	21,951.67	617.33	2.42	0.00	0.00
3/12/2002	978.32	918.32	23.00	23	918.32	547	1425	62	0.24	73.73	73.97	565.99	3,413.99	138.39	0.55	55.47	0.00	649.87	21,946.88	617.22	2.42	0.00	0.00
3/13/2002	2621.94	2561.94	98.00	23	2486.94	547	1425	62	0.24	93.26	93.50	566.27	3,451.66	139.19	0.54	0.00	19.53	649.86	21,942.08	617.12	2.42	0.00	0.00
3/14/2002	2298.53	2238.53	98.00	23	2163.53	547	1425	62	0.24	93.26	93.50	566.54	3,489.32	139.92	0.55	0.00	19.53	649.86	21,937.29	617.12	2.42	0.00	0.00
3/15/2002	1975.12	1915.12	98.00	23	1840.12	547	1425	62	0.24	93.26	93.50	566.8	3,526.98	140.61	0.55	0.00	19.53	649.85	21,932.49	617.01	2.42	0.00	0.00
3/16/2002	1801.86	1741.86	98.00	23	1666.86	547	1425	62	0.24	93.26	93.50	567.07	3,564.63	141.30	0.55	0.00	19.53	649.84	21,927.70	616.91	2.42	0.00	0.00
3/17/2002	1478.45	1418.45	98.00	23	1343.45	547	1425	62	0.24	93.26	93.50	567.34	3,602.28	142.02	0.55	0.00	19.53	649.83	21,922.91	616.80	2.42	0.00	0.00
3/18/2002	1940.47	1880.47	98.00	23	1805.47	547	1425	62	0.24	93.26	93.50	567.6	3,639.92	142.85	0.56	0.00	19.53	649.82	21,918.12	616.70	2.42	0.00	0.00
3/19/2002	2437.13	2377.13	98.00	23	2302.13	547	1425	62	0.24	93.26	93.50	567.86	3,677.55	143.62	0.56	0.00	19.53	649.82	21,913.33	616.70	2.42	0.00	0.00
3/20/2002	1894.26	1834.26	98.00	23	1759.26	547	1425	62	0.24	93.26	93.50	568.12	3,715.18	144.38	0.56	0.00	19.53	649.81	21,908.54	616.59	2.42	0.00	0.00
3/21/2002	1882.71	1822.71	98.00	23	1747.71	547	1425	62	0.24	93.26	93.50	568.38	3,752.80	145.11	0.57	0.00	19.53	649.8	21,903.75	616.49	2.41	0.00	0.00
3/22/2002	1917.36	1857.36	98.00	23	1782.36	547	1425	62	0.24	93.26	93.50	568.64	3,790.42	145.93	0.57	0.00	19.53	649.79	21,898.96	616.38	2.41	0.00	0.00
3/23/2002	1790.31	1730.31	98.00	23	1655.31	547	1425	62	0.24	93.26	93.50	568.9	3,828.03	146.75	0.57	0.00	19.53	649.79	21,894.17	616.38	2.41	0.00	0.00
3/24/2002	1201.24	1141.24	98.00	23	1066.24	547	1425	62	0.24	93.26	93.50	569.16	3,865.63	147.59	0.57	0.00	19.53	649.78	21,889.38	616.28	2.41	0.00	0.00
3/25/2002	1224.34	1164.34	98.00	23	1089.34	547	1425	62	0.24	93.26	93.50	569.41	3,903.23	148.47	0.58	0.00	19.53	649.77	21,884.59	616.17	2.41	0.00	0.00
3/26/2002	1490.00	1430.00	98.00	23	1355.00	547	1425	62	0.24	93.26	93.50	569.66	3,940.82	149.43	0.58	0.00	19.53	649.76	21,879.81	616.06	2.41	0.00	0.00
3/27/2002	1570.85	1510.85	98.00	23	1435.85	547	1425	62	0.24	93.26	93.50	569.91	3,978.40	150.67	0.59	0.00	19.53	649.75	21,875.02	615.96	2.41	0.00	0.00
3/28/2002	1524.65	1464.65	98.00	23	1389.65	547	1425	62	0.24	93.26	93.50	569.99	3,989.69	151.33	0.59	0.00	6.28	649.79	21,896.52	616.38	2.41	0.00	13.25
3/29/2002	1628.60	1568.60	98.00	23	1493.60	547	1425	62	0.24	93.26	93.50	569.99	3,989.68	151.33	0.59	0.00	0.59	649.84	21,929.31	616.91	2.41	0.00	18.94
3/30/2002	1755.66	1695.66	98.00	23	1620.66	547	1425	62	0.24	93.26	93.50	569.99	3,989.68	151.33	0.59	0.00	0.59	649.9	21,962.08	617.54	2.42	0.00	18.94
3/31/2002	1247.44	1187.44	98.00	23	1112.44	547	1425	62	0.24	93.26	93.50	569.99	3,989.68	151.33	0.59	0.00	0.59	649.95	21,994.85	618.07	2.42	0.00	18.94
4/1/2002	1443.80	1383.80	96.54	23	1310.26	547	1425	62	0.34	91.70	92.04	569.98	3,989.22	151.16	0.83	0.00	0.59	649.98	22,016.77	618.39	3.37	0.00	14.42
4/2/2002	1559.30	1499.30	85.72	23	1436.58	547	1425	62	0.34	80.88	81.22	569.98	3,989.22	151.16	0.82	0.00	0.82	649.98	22,016.77	618.39	3.37	0.00	3.37
4/3/2002	1478.45	1418.45	85.72	23	1355.73	547	1425	62	0.34	80.88	81.22	569.98	3,989.22	151.16	0.82	0.00	0.82	649.98	22,016.77	618.39	3.37	0.00	3.37
4/4/2002	1362.95	1302.95	85.72	23	1240.22	547	1425	62	0.34	80.88	81.22	569.98	3,989.22	151.16	0.82	0.00	0.82	649.98	22,016.77	618.39	3.37	0.00	3.37
4/5/2002	1455.35	1395.35	85.72	23	1332.63	547	1425	62	0.34	80.88	81.22	569.98	3,989.22	151.16	0.82	0.00	0.82	649.98	22,016.77	618.39	3.37	0.00	3.37
4/6/2002	1270.54	1210.54	85.72	23	1147.82	547	1425	62	0.34	80.88	81.22	569.98	3,989.22	151.16	0.82	0.00	0.82	649.98	22,016.77	618.39	3.37	0.00	3.37

Table 19

Water Model Results Using 100% Wet Cooling Towers for Year 2002 Based on 98 cfs and Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

Date	2002 Broad River flow At Lee Nuclear Site (cfs)	2002 Broad River Flow At Lee Nuclear Site Less 60 cfs For Future Upstream Demand (cfs)	Lee Nuclear Plant Withdrawal From Broad River (cfs)	Lee Nuclear Plant Discharge To Broad River (cfs)	2002 Broad River Flow At Ninety Nine Islands Dam (cfs)	Pond A						Pond B						Pond C					
						Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)
4/7/2002	1017.59	957.59	23.00	23	957.59	547	1425	62	0.34	76.69	77.03	569.2	3,871.47	147.73	0.82	58.53	0.00	649.97	22,010.08	618.28	3.37	0.00	0.00
4/8/2002	986.40	926.40	23.00	23	926.40	547	1425	62	0.34	76.69	77.03	568.39	3,753.75	145.14	0.81	58.53	0.00	649.96	22,003.39	618.18	3.37	0.00	0.00
4/9/2002	1351.40	1291.40	98.00	23	1216.40	547	1425	62	0.34	93.16	93.50	568.61	3,784.86	145.83	0.79	0.00	16.47	649.95	21,996.71	618.07	3.37	0.00	0.00
4/10/2002	1282.09	1222.09	98.00	23	1147.09	547	1425	62	0.34	93.16	93.50	568.82	3,815.97	146.49	0.80	0.00	16.47	649.94	21,990.03	617.97	3.37	0.00	0.00
4/11/2002	1432.25	1372.25	98.00	23	1297.25	547	1425	62	0.34	93.16	93.50	569.03	3,847.06	147.16	0.80	0.00	16.47	649.93	21,983.34	617.86	3.37	0.00	0.00
4/12/2002	1478.45	1418.45	98.00	23	1343.45	547	1425	62	0.34	93.16	93.50	569.24	3,878.15	147.86	0.80	0.00	16.47	649.92	21,976.66	617.75	3.37	0.00	0.00
4/13/2002	1778.76	1718.76	98.00	23	1643.76	547	1425	62	0.34	93.16	93.50	569.45	3,909.23	148.61	0.81	0.00	16.47	649.91	21,969.98	617.65	3.37	0.00	0.00
4/14/2002	1131.94	1071.94	98.00	23	996.94	547	1425	62	0.34	93.16	93.50	569.66	3,940.30	149.43	0.81	0.00	16.47	649.9	21,963.30	617.54	3.37	0.00	0.00
4/15/2002	1082.27	1022.27	79.27	23	966.00	547	1425	62	0.34	76.69	77.03	569.62	3,934.21	149.27	0.81	2.26	0.00	649.89	21,956.62	617.44	3.37	0.00	0.00
4/16/2002	1432.25	1372.25	98.00	23	1297.25	547	1425	62	0.34	93.16	93.50	569.83	3,965.28	150.24	0.81	0.00	16.47	649.88	21,949.95	617.33	3.37	0.00	0.00
4/17/2002	1316.74	1256.74	98.00	23	1181.74	547	1425	62	0.34	93.16	93.50	569.98	3,989.24	151.16	0.82	0.00	12.90	649.88	21,950.37	617.33	3.37	0.00	3.58
4/18/2002	1386.05	1326.05	98.00	23	1251.05	547	1425	62	0.34	93.16	93.50	569.98	3,989.22	151.16	0.82	0.00	0.82	649.92	21,974.75	617.75	3.37	0.00	15.66
4/19/2002	1570.85	1510.85	98.00	23	1435.85	547	1425	62	0.34	93.16	93.50	569.98	3,989.22	151.16	0.82	0.00	0.82	649.96	21,999.12	618.18	3.37	0.00	15.65
4/20/2002	1443.80	1383.80	94.62	23	1312.18	547	1425	62	0.34	89.78	90.12	569.98	3,989.22	151.16	0.82	0.00	0.82	649.98	22,016.77	618.39	3.37	0.00	12.27
4/21/2002	989.87	929.87	23.00	23	929.87	547	1425	62	0.34	76.69	77.03	569.2	3,871.47	147.73	0.82	58.53	0.00	649.97	22,010.08	618.28	3.37	0.00	0.00
4/22/2002	902.09	842.09	23.00	23	842.09	547	1425	62	0.34	76.69	77.03	568.39	3,753.75	145.14	0.81	58.53	0.00	649.96	22,003.40	618.18	3.37	0.00	0.00
4/23/2002	1030.29	970.29	27.29	23	966.00	547	1425	62	0.34	76.69	77.03	567.63	3,644.58	142.94	0.79	54.23	0.00	649.95	21,996.71	618.07	3.37	0.00	0.00
4/24/2002	1235.89	1175.89	98.00	23	1100.89	547	1425	62	0.34	93.16	93.50	567.85	3,675.72	143.59	0.78	0.00	16.47	649.94	21,990.03	617.97	3.37	0.00	0.00
4/25/2002	1002.57	942.57	23.00	23	942.57	547	1425	62	0.34	76.69	77.03	567.02	3,558.04	141.17	0.78	58.53	0.00	649.93	21,983.35	617.86	3.37	0.00	0.00
4/26/2002	1559.30	1499.30	98.00	23	1424.30	547	1425	62	0.34	93.16	93.50	567.24	3,589.20	141.73	0.77	0.00	16.47	649.92	21,976.66	617.75	3.37	0.00	0.00
4/27/2002	1443.80	1383.80	98.00	23	1308.80	547	1425	62	0.34	93.16	93.50	567.46	3,620.35	142.39	0.77	0.00	16.47	649.91	21,969.98	617.65	3.37	0.00	0.00
4/28/2002	784.27	724.27	23.00	23	724.27	547	1425	62	0.34	76.69	77.03	566.63	3,502.69	140.16	0.78	58.53	0.00	649.9	21,963.31	617.54	3.37	0.00	0.00
4/29/2002	739.22	679.22	23.00	23	679.22	547	1425	62	0.34	76.69	77.03	565.78	3,385.05	137.77	0.76	58.53	0.00	649.89	21,956.63	617.44	3.37	0.00	0.00
4/30/2002	675.70	615.70	23.00	23	615.70	547	1425	62	0.34	76.69	77.03	564.92	3,267.44	135.02	0.75	58.53	0.00	649.88	21,949.95	617.33	3.37	0.00	0.00
5/1/2002	822.39	762.39	60.39	23	725.00	547	1425	62	0.38	78.61	78.98	564.57	3,219.99	133.89	0.83	23.09	0.00	649.86	21,942.44	617.12	3.79	0.00	0.00
5/2/2002	1152.73	1092.73	98.00	23	1017.73	547	1425	62	0.38	93.13	93.50	564.77	3,247.17	134.53	0.82	0.00	14.52	649.85	21,934.93	617.01	3.79	0.00	0.00
5/3/2002	1055.71	995.71	98.00	23	920.71	547	1425	62	0.38	93.13	93.50	564.97	3,274.35	135.18	0.83	0.00	14.52	649.84	21,927.42	616.91	3.79	0.00	0.00
5/4/2002	1801.86	1741.86	98.00	23	1666.86	547	1425	62	0.38	93.13	93.50	565.17	3,301.51	135.92	0.83	0.00	14.52	649.83	21,919.91	616.80	3.79	0.00	0.00
5/5/2002	1096.13	1036.13	98.00	23	961.13	547	1425	62	0.38	93.13	93.50	565.37	3,328.67	136.53	0.83	0.00	14.52	649.82	21,912.40	616.70	3.78	0.00	0.00
5/6/2002	1118.08	1058.08	98.00	23	983.08	547	1425	62	0.38	93.13	93.50	565.57	3,355.82	137.14	0.84	0.00	14.52	649.8	21,904.90	616.49	3.78	0.00	0.00
5/7/2002	1063.79	1003.79	98.00	23	928.79	547	1425	62	0.38	93.13	93.50	565.77	3,382.97	137.74	0.84	0.00	14.52	649.79	21,897.40	616.38	3.78	0.00	0.00
5/8/2002	1305.19	1245.19	98.00	23	1170.19	547	1425	62	0.38	93.13	93.50	565.97	3,410.10	138.33	0.85	0.00	14.52	649.78	21,889.90	616.28	3.78	0.00	0.00
5/9/2002	1305.19	1245.19	98.00	23	1170.19	547	1425	62	0.38	93.13	93.50	566.16	3,437.23	138.88	0.85	0.00	14.52	649.77	21,882.40	616.17	3.78	0.00	0.00
5/10/2002	1178.14	1118.14	98.00	23	1043.14	547	1425	62	0.38	93.13	93.50	566.36	3,464.36	139.44	0.85	0.00	14.52	649.75	21,874.90	615.96	3.78	0.00	0.00
5/11/2002	894.00	834.00	98.00	23	759.00	547	1425	62	0.38	93.13	93.50	566.55	3,491.47	139.95	0.86	0.00	14.52	649.74	21,867.40	615.85	3.78	0.00	0.00
5/12/2002	1066.10	1006.10	98.00	23	931.10	547	1425	62	0.38	93.13	93.50	566.74	3,518.58	140.45	0.86	0.00	14.52	649.73	21,859.91	615.74	3.78	0.00	0.00
5/13/2002	780.81	720.81	23.00	23	720.81	547	1425	62	0.38	78.61	78.98	565.87	3,396.89	138.04	0.86	60.48	0.00	649.72	21,852.41	615.64	3.78	0.00	0.00
5/14/2002	1055.71	995.71	98.00	23	920.71	547	1425	62	0.38	93.13	93.50	566.07	3,424.02	138.62	0.85	0.00	14.52	649.71	21,844.92	615.53	3.78	0.00	0.00
5/15/2002	1513.10	1453.10	98.00	23	1378.10	547	1425	62	0.38	93.13	93.50	566.26	3,451.14	139.16	0.85	0.00	14.52	649.69	21,837.43	615.32	3.78	0.00	0.00
5/16/2002	1104.22	1044.22	98.00	23	969.22	547	1425	62	0.38	93.13	93.50	566.46	3,478.26	139.71	0.85	0.00	14.52	649.68	21,829.94	615.21	3.78	0.00	0.00
5/17/2002	1101.91	1041.91	98.00	23	966.91	547	1425	62	0.38	93.13	93.50	566.65	3,505.38	140.22	0.86	0.00	14.52	649.67	21,822.46	615.10	3.77	0.00	0.00
5/18/2002	1022.21	962.21	98.00	23	887.21	547	1425	62	0.38	93.13	93.50	566.84	3,532.48	140.71	0.86	0.00	14.52	649.66	21,814.97	615.00	3.77	0.00	0.00
5/19/2002	731.14	671.14	23.00	23	671.14	547	1425	62	0.38	78.61	78.98	565.97	3,410.78	138.33	0.86	60.48	0.00	649.64	21,807.49	614.78	3.77	0.00	0.00
5/20/2002	831.63	771.63	69.63	23	725.00	547	1425	62	0.38	78.61	78.98	565.76	3,381.62	137.71	0.85	13.85	0.00	649.63	21,800.00	614.67	3.77	0.00	0.00
5/21/2002	468.95	408.95	23.00	23	408.95	547	1425	62	0.38	78.61	78.98	564.87	3,259.96	134.85	0.84	60.48	0.00	649.62	21,792.52	614.57	3.77	0.00	0.00
5/22/2002	613.33	553.33	23.00	23	553.33	547	1425	62	0.38	78.61	78.98	563.96	3,138.33	131.85	0.83	60.48	0.00	649.61	21,785.05	614.46	3.77	0.00	0.00
5/23/2002	806.22	746.22	44.22	23	725.00	547	1425	62	0.38	78.61	78.98	563.35	3,058.83	129.70	0.81	39.26	0.00	649.6	21,777.57	614.35	3.77	0.00	0.00
5/24/2002	729.98	669.98	23.00	23	669.98	547	1425	62	0.38	78.61	78.98	562.4	2,937.27	126.38	0.80	60.48	0.00	649.58	21,770.09	614.14	3.77	0.00	0.00

Table 19

Water Model Results Using 100% Wet Cooling Towers for Year 2002 Based on 98 cfs and Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

Date	2002 Broad River flow At Lee Nuclear Site (cfs)	2002 Broad River Flow At Lee Nuclear Site Less 60 cfs For Future Upstream Demand (cfs)	Lee Nuclear Plant Withdrawal From Broad River (cfs)	Lee Nuclear Plant Discharge To Broad River (cfs)	2002 Broad River Flow At Ninety Nine Islands Dam (cfs)	Pond A Pond Elev. (ft)	Pond A Pond Vol. (ac-ft)	Pond A Pond Surface Area (ac)	Pond A Pond Evap. (cfs)	Pond A Flow Pumped Out of Pond (cfs)	Pond A Flow Pumped In To Pond (cfs)	Pond B Pond Elev. (ft)	Pond B Pond Vol. (ac-ft)	Pond B Pond Surface Area (ac)	Pond B Pond Evap. (cfs)	Pond B Flow Pumped Out of Pond (cfs)	Pond B Flow Pumped In To (cfs)	Pond C Pond Elev. (ft)	Pond C Pond Vol. (ac-ft)	Pond C Pond Surface Area (ac)	Pond C Pond Evap. (cfs)	Pond C Flow Pumped Out of Pond (cfs)	Pond C Flow Pumped In To Pond (cfs)
5/25/2002	802.75	742.75	40.75	23	725.00	547	1425	62	0.38	78.61	78.98	561.71	2,850.96	124.03	0.78	42.73	0.00	649.57	21,762.62	614.03	3.77	0.00	0.00
5/26/2002	732.29	672.29	23.00	23	672.29	547	1425	62	0.38	78.61	78.98	560.72	2,729.47	120.74	0.76	60.48	0.00	649.56	21,755.14	613.92	3.77	0.00	0.00
5/27/2002	569.43	509.43	23.00	23	509.43	547	1425	62	0.38	78.61	78.98	559.7	2,608.01	117.57	0.74	60.48	0.00	649.55	21,747.67	613.81	3.77	0.00	0.00
5/28/2002	462.02	402.02	23.00	23	402.02	547	1425	62	0.38	78.61	78.98	558.65	2,486.59	114.63	0.72	60.48	0.00	649.54	21,740.20	613.70	3.77	0.00	0.00
5/29/2002	693.02	633.02	23.00	23	633.02	547	1425	62	0.38	78.61	78.98	557.58	2,365.21	111.57	0.70	60.48	0.00	649.52	21,732.74	613.49	3.77	0.00	0.00
5/30/2002	792.36	732.36	30.36	23	725.00	547	1425	62	0.38	78.61	78.98	556.61	2,258.46	108.85	0.68	53.12	0.00	649.51	21,725.27	613.38	3.76	0.00	0.00
5/31/2002	701.11	641.11	23.00	23	641.11	547	1425	62	0.38	78.61	78.98	555.48	2,137.15	105.68	0.67	60.48	0.00	649.5	21,717.81	613.27	3.76	0.00	0.00
6/1/2002	854.73	794.73	92.73	23	725.00	547	1425	62	0.42	87.81	88.23	555.6	2,150.35	106.01	0.72	0.00	7.37	649.49	21,709.52	613.16	4.18	0.00	0.00
6/2/2002	766.95	706.95	23.00	23	706.95	547	1425	62	0.42	80.44	80.86	554.4	2,025.20	102.61	0.72	62.36	0.00	649.47	21,701.24	612.95	4.17	0.00	0.00
6/3/2002	562.50	502.50	23.00	23	502.50	547	1425	62	0.42	80.44	80.86	553.17	1,900.10	99.39	0.70	62.36	0.00	649.46	21,692.97	612.84	4.17	0.00	0.00
6/4/2002	300.31	240.31	23.00	23	240.31	547	1425	62	0.42	80.44	80.86	551.89	1,775.05	96.01	0.68	62.36	0.00	649.44	21,684.69	612.62	4.17	0.00	0.00
6/5/2002	907.86	847.86	98.00	23	772.86	547	1425	62	0.42	93.08	93.50	552.13	1,798.84	96.66	0.65	0.00	12.64	649.43	21,676.42	612.51	4.17	0.00	0.00
6/6/2002	865.12	805.12	98.00	23	730.12	547	1425	62	0.42	93.08	93.50	552.38	1,822.62	97.33	0.66	0.00	12.64	649.42	21,668.15	612.40	4.17	0.00	0.00
6/7/2002	734.60	674.60	23.00	23	674.60	547	1425	62	0.42	80.44	80.86	551.07	1,697.59	93.83	0.66	62.36	0.00	649.4	21,659.88	612.19	4.17	0.00	0.00
6/8/2002	1077.65	1017.65	98.00	23	942.65	547	1425	62	0.42	93.08	93.50	551.32	1,721.41	94.48	0.64	0.00	12.64	649.39	21,651.61	612.08	4.17	0.00	0.00
6/9/2002	895.16	835.16	98.00	23	760.16	547	1425	62	0.42	93.08	93.50	551.57	1,745.22	95.12	0.64	0.00	12.64	649.38	21,643.34	611.97	4.17	0.00	0.00
6/10/2002	704.57	644.57	23.00	23	644.57	547	1425	62	0.42	80.44	80.86	550.23	1,620.22	91.53	0.65	62.36	0.00	649.36	21,635.08	611.75	4.17	0.00	0.00
6/11/2002	515.15	455.15	23.00	23	455.15	547	1425	62	0.42	80.44	80.86	548.84	1,495.27	87.09	0.62	62.36	0.00	649.35	21,626.82	611.64	4.16	0.00	0.00
6/12/2002	549.80	489.80	23.00	23	489.80	547	1425	62	0.42	80.44	80.86	547.37	1,370.38	82.75	0.59	62.36	0.00	649.34	21,618.56	611.53	4.16	0.00	0.00
6/13/2002	457.40	397.40	23.00	23	397.40	547	1425	62	0.42	80.44	80.86	545.81	1,245.55	78.13	0.56	62.36	0.00	649.32	21,610.30	611.32	4.16	0.00	0.00
6/14/2002	548.64	488.64	23.00	23	488.64	547	1425	62	0.42	80.44	80.86	544.17	1,120.78	73.71	0.53	62.36	0.00	649.31	21,602.04	611.21	4.16	0.00	0.00
6/15/2002	347.67	287.67	23.00	23	287.67	547	1425	62	0.42	80.44	80.86	542.43	996.07	69.22	0.50	62.36	0.00	649.3	21,593.79	611.10	4.16	0.00	0.00
6/16/2002	392.71	332.71	23.00	23	332.71	547	1425	62	0.42	80.44	80.86	540.56	871.42	64.39	0.47	62.36	0.00	649.28	21,585.54	610.88	4.16	0.00	0.00
6/17/2002	529.01	469.01	23.00	23	469.01	547	1425	62	0.42	80.43	80.85	540	835.45	62.89	0.44	18.13	0.00	649.13	21,489.59	609.23	4.16	44.22	0.00
6/18/2002	315.33	255.33	23.00	23	255.33	547	1425	62	0.42	80.44	80.86	539.98	834.60	62.84	0.43	0.00	0.00	648.91	21,357.68	606.80	4.15	62.36	0.00
6/19/2002	330.34	270.34	23.00	23	270.34	547	1425	62	0.42	80.44	80.86	539.97	833.75	62.81	0.43	0.00	0.00	648.69	21,225.80	604.40	4.13	62.36	0.00
6/20/2002	339.58	279.58	23.00	23	279.58	547	1425	62	0.42	80.44	80.86	539.95	832.90	62.76	0.43	0.00	0.00	648.47	21,093.95	601.99	4.11	62.36	0.00
6/21/2002	331.50	271.50	23.00	23	271.50	547	1425	62	0.42	80.44	80.86	539.94	832.06	62.73	0.43	0.00	0.00	648.25	20,962.14	599.55	4.10	62.36	0.00
6/22/2002	323.41	263.41	23.00	23	263.41	547	1425	62	0.42	80.44	80.86	539.93	831.21	62.71	0.43	0.00	0.00	648.03	20,830.36	597.06	4.08	62.36	0.00
6/23/2002	328.03	268.03	23.00	23	268.03	547	1425	62	0.42	80.44	80.86	539.91	830.36	62.65	0.43	0.00	0.00	647.81	20,698.62	594.54	4.06	62.36	0.00
6/24/2002	319.95	259.95	23.00	23	259.95	547	1425	62	0.42	80.44	80.86	539.9	829.52	62.63	0.43	0.00	0.00	647.59	20,566.90	592.00	4.05	62.36	0.00
6/25/2002	319.95	259.95	23.00	23	259.95	547	1425	62	0.42	80.44	80.86	539.89	828.67	62.60	0.43	0.00	0.00	647.37	20,435.23	589.45	4.03	62.36	0.00
6/26/2002	315.33	255.33	23.00	23	255.33	547	1425	62	0.42	80.44	80.86	539.87	827.82	62.55	0.43	0.00	0.00	647.14	20,303.58	586.81	4.01	62.36	0.00
6/27/2002	315.33	255.33	23.00	23	255.33	547	1425	62	0.42	80.44	80.86	539.86	826.98	62.52	0.43	0.00	0.00	646.92	20,171.98	584.30	4.00	62.36	0.00
6/28/2002	361.53	301.53	23.00	23	301.53	547	1425	62	0.42	80.44	80.86	539.85	826.14	62.50	0.43	0.00	0.00	646.69	20,040.40	581.70	3.98	62.36	0.00
6/29/2002	710.35	650.35	23.00	23	650.35	547	1425	62	0.42	80.44	80.86	539.83	825.29	62.44	0.43	0.00	0.00	646.47	19,908.87	579.16	3.96	62.36	0.00
6/30/2002	791.20	731.20	29.20	23	725.00	547	1425	62	0.42	80.44	80.86	539.82	824.45	62.42	0.43	0.00	0.00	646.26	19,789.66	576.76	3.94	56.16	0.00
7/1/2002	390.40	330.40	23.00	23	330.40	547	1425	62	0.42	81.49	81.90	539.81	823.60	62.39	0.43	0.00	0.00	646.03	19,656.07	574.14	3.96	63.40	0.00
7/2/2002	398.49	338.49	23.00	23	338.49	547	1425	62	0.42	81.49	81.90	539.79	822.75	62.34	0.43	0.00	0.00	645.79	19,522.51	571.39	3.94	63.40	0.00
7/3/2002	382.32	322.32	23.00	23	322.32	547	1425	62	0.42	81.49	81.90	539.78	821.90	62.31	0.43	0.00	0.00	645.56	19,388.99	568.78	3.92	63.40	0.00
7/4/2002	464.33	404.33	23.00	23	404.33	547	1425	62	0.42	81.49	81.90	539.76	821.05	62.26	0.43	0.00	0.00	645.32	19,255.50	566.06	3.90	63.40	0.00
7/5/2002	502.44	442.44	23.00	23	442.44	547	1425	62	0.42	81.49	81.90	539.75	820.21	62.23	0.43	0.00	0.00	645.09	19,122.06	563.45	3.88	63.40	0.00
7/6/2002	473.57	413.57	23.00	23	413.57	547	1425	62	0.42	81.49	81.90	539.74	819.36	62.20	0.43	0.00	0.00	644.85	18,988.64	560.69	3.87	63.40	0.00
7/7/2002	436.60	376.60	23.00	23	376.60	547	1425	62	0.42	81.49	81.90	539.72	818.51	62.15	0.43	0.00	0.00	644.61	18,855.27	557.89	3.85	63.40	0.00
7/8/2002	378.85	318.85	23.00	23	318.85	547	1425	62	0.42	81.49	81.90	539.71	817.67	62.12	0.43	0.00	0.00	644.37	18,721.93	555.11	3.83	63.40	0.00
7/9/2002	340.74	280.74	23.00	23	280.74	547	1425	62	0.42	81.49	81.90	539.7	816.82	62.10	0.43	0.00	0.00	644.13	18,588.63	552.33	3.81	63.40	0.00
7/10/2002	314.17	254.17	23.00	23	254.17	547	1425	62	0.42	81.49	81.90	539.68	815.98	62.04	0.43	0.00	0.00	643.89	18,455.37	549.51	3.79	63.40	0.00
7/11/2002	296.84	236.84	23.00	23	236.84	547	1425	62	0.42	81.49	81.90	539.67	815.13	62.02	0.43	0.00	0.00	643.65	18,322.15	546.76	3.77	63.40	0.00

Table 19

Water Model Results Using 100% Wet Cooling Towers for Year 2002 Based on 98 cfs and Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

Date	2002 Broad River flow At Lee Nuclear Site (cfs)	2002 Broad River Flow At Lee Nuclear Site Less 60 cfs For Future Upstream Demand (cfs)	Lee Nuclear Plant Withdrawal From Broad River (cfs)	Lee Nuclear Plant Discharge To Broad River (cfs)	2002 Broad River Flow At Ninety Nine Islands Dam (cfs)	Pond A						Pond B						Pond C					
						Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)
7/12/2002	294.53	234.53	23.00	23	234.53	547	1425	62	0.42	81.49	81.90	539.66	814.29	61.99	0.43	0.00	0.00	643.4	18,188.96	543.92	3.75	63.40	0.00
7/13/2002	322.26	262.26	23.00	23	262.26	547	1425	62	0.42	81.49	81.90	539.64	813.45	61.93	0.43	0.00	0.00	643.16	18,055.81	541.19	3.73	63.40	0.00
7/14/2002	363.84	303.84	23.00	23	303.84	547	1425	62	0.42	81.49	81.90	539.63	812.60	61.91	0.42	0.00	0.00	642.91	17,922.70	538.33	3.71	63.40	0.00
7/15/2002	317.64	257.64	23.00	23	257.64	547	1425	62	0.42	81.49	81.90	539.62	811.76	61.88	0.42	0.00	0.00	642.66	17,789.63	535.42	3.69	63.40	0.00
7/16/2002	389.25	329.25	23.00	23	329.25	547	1425	62	0.42	81.49	81.90	539.6	810.92	61.82	0.42	0.00	0.00	642.41	17,656.60	532.46	3.67	63.40	0.00
7/17/2002	435.45	375.45	23.00	23	375.45	547	1425	62	0.42	81.49	81.90	539.59	810.08	61.80	0.42	0.00	0.00	642.16	17,523.61	529.49	3.65	63.40	0.00
7/18/2002	427.36	367.36	23.00	23	367.36	547	1425	62	0.42	81.49	81.90	539.57	809.24	61.74	0.42	0.00	0.00	641.91	17,390.66	526.56	3.63	63.40	0.00
7/19/2002	351.13	291.13	23.00	23	291.13	547	1425	62	0.42	81.49	81.90	539.56	808.40	61.71	0.42	0.00	0.00	641.66	17,257.75	523.70	3.61	63.40	0.00
7/20/2002	316.48	256.48	23.00	23	256.48	547	1425	62	0.42	81.49	81.90	539.55	807.56	61.69	0.42	0.00	0.00	641.41	17,124.88	520.89	3.59	63.40	0.00
7/21/2002	303.78	243.78	23.00	23	243.78	547	1425	62	0.42	81.49	81.90	539.53	806.72	61.63	0.42	0.00	0.00	641.15	16,992.04	517.97	3.57	63.40	0.00
7/22/2002	294.53	234.53	23.00	23	234.53	547	1425	62	0.42	81.49	81.90	539.52	805.88	61.60	0.42	0.00	0.00	640.89	16,859.25	515.01	3.55	63.40	0.00
7/23/2002	282.98	222.98	23.00	23	222.98	547	1425	62	0.42	81.49	81.90	539.51	805.04	61.58	0.42	0.00	0.00	640.63	16,726.50	512.05	3.53	63.40	0.00
7/24/2002	279.52	219.52	23.00	23	219.52	547	1425	62	0.42	81.49	81.90	539.49	804.20	61.52	0.42	0.00	0.00	640.37	16,593.78	509.02	3.51	63.40	0.00
7/25/2002	294.53	234.53	23.00	23	234.53	547	1425	62	0.42	81.49	81.90	539.48	803.37	61.50	0.42	0.00	0.00	640.11	16,461.11	505.91	3.49	63.40	0.00
7/26/2002	317.64	257.64	23.00	23	257.64	547	1425	62	0.42	81.49	81.90	539.47	802.53	61.47	0.42	0.00	0.00	639.85	16,328.48	502.84	3.47	63.40	0.00
7/27/2002	337.27	277.27	23.00	23	277.27	547	1425	62	0.42	81.49	81.90	539.45	801.69	61.41	0.42	0.00	0.00	639.59	16,195.89	499.75	3.45	63.40	0.00
7/28/2002	354.60	294.60	23.00	23	294.60	547	1425	62	0.42	81.49	81.90	539.44	800.86	61.39	0.42	0.00	0.00	639.32	16,063.35	496.58	3.43	63.40	0.00
7/29/2002	339.58	279.58	23.00	23	279.58	547	1425	62	0.42	81.49	81.90	539.42	800.02	61.33	0.42	0.00	0.00	639.05	15,930.84	493.48	3.41	63.40	0.00
7/30/2002	325.72	265.72	23.00	23	265.72	547	1425	62	0.42	81.49	81.90	539.41	799.19	61.30	0.42	0.00	0.00	638.78	15,798.38	490.41	3.39	63.40	0.00
7/31/2002	314.17	254.17	23.00	23	254.17	547	1425	62	0.42	81.49	81.90	539.4	798.35	61.27	0.42	0.00	0.00	638.51	15,665.96	487.34	3.36	63.40	0.00
8/1/2002	308.40	248.40	23.00	23	248.40	547	1425	62	0.39	80.83	81.20	539.39	797.59	61.24	0.38	0.00	0.00	638.24	15,535.53	484.32	3.06	62.70	0.00
8/2/2002	284.14	224.14	23.00	23	224.14	547	1425	62	0.39	80.83	81.20	539.37	796.83	61.18	0.38	0.00	0.00	637.97	15,405.14	481.36	3.04	62.70	0.00
8/3/2002	271.43	211.43	23.00	23	211.43	547	1425	62	0.39	80.83	81.20	539.36	796.07	61.15	0.38	0.00	0.00	637.7	15,274.79	478.45	3.02	62.70	0.00
8/4/2002	241.40	181.40	23.00	23	181.40	547	1425	62	0.39	80.83	81.20	539.35	795.30	61.12	0.38	0.00	0.00	637.43	15,144.47	475.53	3.00	62.70	0.00
8/5/2002	213.68	153.68	23.00	23	153.68	547	1425	62	0.39	80.83	81.20	539.34	794.54	61.09	0.38	0.00	0.00	637.15	15,014.19	472.54	2.98	62.70	0.00
8/6/2002	192.89	132.89	23.00	23	132.89	547	1425	62	0.39	80.83	81.20	539.32	793.78	61.03	0.38	0.00	0.00	636.88	14,883.95	469.71	2.97	62.70	0.00
8/7/2002	191.74	131.74	23.00	23	131.74	547	1425	62	0.39	80.83	81.20	539.31	793.02	61.00	0.38	0.00	0.00	636.6	14,753.74	466.77	2.95	62.70	0.00
8/8/2002	192.89	132.89	23.00	23	132.89	547	1425	62	0.39	80.83	81.20	539.3	792.26	60.97	0.38	0.00	0.00	636.32	14,623.57	463.84	2.93	62.70	0.00
8/9/2002	152.47	92.47	23.00	23	92.47	547	1425	62	0.39	80.83	81.20	539.29	791.51	60.94	0.38	0.00	0.00	636.04	14,493.43	460.93	2.91	62.70	0.00
8/10/2002	110.88	50.88	23.00	23	50.88	547	1425	62	0.39	80.83	81.20	539.27	790.75	60.89	0.38	0.00	0.00	635.75	14,363.33	457.92	2.89	62.70	0.00
8/11/2002	73.92	13.92	23.00	23	13.92	547	1425	62	0.39	80.83	81.20	539.26	789.99	60.86	0.38	0.00	0.00	635.47	14,233.27	455.06	2.87	62.70	0.00
8/12/2002	47.36	-12.64	23.00	23	-12.64	547	1425	62	0.39	80.83	81.20	539.25	789.23	60.83	0.38	0.00	0.00	635.18	14,103.24	452.11	2.86	62.70	0.00
8/13/2002	94.71	34.71	23.00	23	34.71	547	1425	62	0.39	80.83	81.20	539.24	788.47	60.81	0.38	0.00	0.00	634.89	13,973.25	449.17	2.84	62.70	0.00
8/14/2002	102.80	42.80	23.00	23	42.80	547	1425	62	0.39	80.83	81.20	539.22	787.72	60.75	0.38	0.00	0.00	634.6	13,843.30	446.23	2.82	62.70	0.00
8/15/2002	147.84	87.84	23.00	23	87.84	547	1425	62	0.39	80.83	81.20	539.21	786.96	60.73	0.38	0.00	0.00	634.31	13,713.39	443.30	2.80	62.70	0.00
8/16/2002	212.53	152.53	23.00	23	152.53	547	1425	62	0.39	80.83	81.20	539.2	786.20	60.70	0.38	0.00	0.00	634.02	13,583.51	440.38	2.78	62.70	0.00
8/17/2002	211.37	151.37	23.00	23	151.37	547	1425	62	0.39	80.83	81.20	539.19	785.45	60.67	0.38	0.00	0.00	633.72	13,453.66	437.40	2.76	62.70	0.00
8/18/2002	244.87	184.87	23.00	23	184.87	547	1425	62	0.39	80.83	81.20	539.17	784.69	60.62	0.38	0.00	0.00	633.43	13,323.86	434.55	2.75	62.70	0.00
8/19/2002	273.74	213.74	23.00	23	213.74	547	1425	62	0.39	80.83	81.20	539.16	783.94	60.59	0.38	0.00	0.00	633.13	13,194.08	431.63	2.73	62.70	0.00
8/20/2002	418.12	358.12	23.00	23	358.12	547	1425	62	0.39	80.83	81.20	539.15	783.18	60.57	0.38	0.00	0.00	632.82	13,064.35	428.61	2.71	62.70	0.00
8/21/2002	274.90	214.90	23.00	23	214.90	547	1425	62	0.39	80.83	81.20	539.14	782.43	60.54	0.38	0.00	0.00	632.52	12,934.65	425.73	2.69	62.70	0.00
8/22/2002	262.19	202.19	23.00	23	202.19	547	1425	62	0.39	80.83	81.20	539.12	781.68	60.49	0.38	0.00	0.00	632.21	12,804.99	422.71	2.67	62.70	0.00
8/23/2002	243.71	183.71	23.00	23	183.71	547	1425	62	0.39	80.83	81.20	539.11	780.92	60.46	0.38	0.00	0.00	631.91	12,675.37	419.83	2.65	62.70	0.00
8/24/2002	213.68	153.68	23.00	23	153.68	547	1425	62	0.39	80.83	81.20	539.1	780.17	60.43	0.38	0.00	0.00	631.6	12,545.78	416.88	2.64	62.70	0.00
8/25/2002	190.58	130.58	23.00	23	130.58	547	1425	62	0.39	80.83	81.20	539.09	779.42	60.41	0.38	0.00	0.00	631.29	12,416.23	413.90	2.62	62.70	0.00
8/26/2002	177.88	117.88	23.00	23	117.88	547	1425	62	0.39	80.83	81.20	539.07	778.67	60.35	0.38	0.00	0.00	630.97	12,286.72	410.81	2.60	62.70	0.00
8/27/2002	210.22	150.22	23.00	23	150.22	547	1425	62	0.39	80.83	81.20	539.06	777.91	60.33	0.38	0.00	0.00	630.66	12,157.24	407.84	2.58	62.70	0.00
8/28/2002	215.99	155.99	23.00	23	155.99	547	1425	62	0.39	80.83	81.20	539.05	777.16	60.30	0.38	0.00	0.00	630.34	12,027.80	404.76	2.56	62.70	0.00

Table 19

Water Model Results Using 100% Wet Cooling Towers for Year 2002 Based on 98 cfs and Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

Date	2002 Broad River flow At Lee Nuclear Site (cfs)	2002 Broad River Flow At Lee Nuclear Site Less 60 cfs For Future Upstream Demand (cfs)	Lee Nuclear Plant Withdrawal From Broad River (cfs)	Lee Nuclear Plant Discharge To Broad River (cfs)	2002 Broad River Flow At Ninety Nine Islands Dam (cfs)	Pond A: Pond Elev. (ft)	Pond A: Pond Vol. (ac-ft)	Pond A: Pond Surface Area (ac)	Pond A: Pond Evap. (cfs)	Pond A: Flow Pumped Out of Pond (cfs)	Pond A: Flow Pumped In To Pond (cfs)	Pond B: Pond Elev. (ft)	Pond B: Pond Vol. (ac-ft)	Pond B: Pond Surface Area (ac)	Pond B: Pond Evap. (cfs)	Pond B: Flow Pumped Out of Pond (cfs)	Pond B: Flow Pumped In To Pond (cfs)	Pond C: Pond Elev. (ft)	Pond C: Pond Vol. (ac-ft)	Pond C: Pond Surface Area (ac)	Pond C: Pond Evap. (cfs)	Pond C: Flow Pumped Out of Pond (cfs)	Pond C: Flow Pumped In To Pond (cfs)
8/29/2002	287.60	227.60	23.00	23	227.60	547	1425	62	0.39	80.83	81.20	539.04	776.41	60.27	0.38	0.00	0.00	630.02	11,898.40	401.70	2.54	62.70	0.00
8/30/2002	197.51	137.51	23.00	23	137.51	547	1425	62	0.39	80.83	81.20	539.02	775.66	60.22	0.38	0.00	0.00	629.69	11,769.04	398.56	2.52	62.70	0.00
8/31/2002	202.13	142.13	23.00	23	142.13	547	1425	62	0.39	80.83	81.20	539.01	774.91	60.19	0.38	0.00	0.00	629.37	11,639.72	395.60	2.50	62.70	0.00
9/1/2002	210.22	150.22	23.00	23	150.22	547	1425	62	0.3	78.95	79.24	539	774.33	60.16	0.29	0.00	0.00	629.05	11,515.42	392.64	1.92	60.74	0.00
9/2/2002	210.22	150.22	23.00	23	150.22	547	1425	62	0.3	78.95	79.24	538.99	773.75	60.14	0.29	0.00	0.00	628.73	11,391.14	389.56	1.91	60.74	0.00
9/3/2002	214.84	154.84	23.00	23	154.84	547	1425	62	0.3	78.95	79.24	538.98	773.17	60.11	0.29	0.00	0.00	628.41	11,266.90	386.58	1.89	60.74	0.00
9/4/2002	339.58	279.58	23.00	23	279.58	547	1425	62	0.3	78.95	79.24	538.97	772.59	60.08	0.29	0.00	0.00	628.09	11,142.69	383.62	1.88	60.74	0.00
9/5/2002	118.97	58.97	23.00	23	58.97	547	1425	62	0.3	78.95	79.24	538.96	772.01	60.05	0.29	0.00	0.00	627.77	11,018.50	379.82	1.87	60.74	0.00
9/6/2002	143.22	83.22	23.00	23	83.22	547	1425	62	0.3	78.95	79.24	538.95	771.43	60.02	0.29	0.00	0.00	627.44	10,894.36	376.63	1.85	60.74	0.00
9/7/2002	145.53	85.53	23.00	23	85.53	547	1425	62	0.3	78.95	79.24	538.94	770.85	60.00	0.29	0.00	0.00	627.11	10,770.24	373.49	1.83	60.74	0.00
9/8/2002	140.91	80.91	23.00	23	80.91	547	1425	62	0.3	78.95	79.24	538.93	770.27	59.97	0.29	0.00	0.00	626.77	10,646.15	370.27	1.82	60.74	0.00
9/9/2002	166.33	106.33	23.00	23	106.33	547	1425	62	0.3	78.95	79.24	538.92	769.70	59.94	0.29	0.00	0.00	626.44	10,522.09	367.15	1.80	60.74	0.00
9/10/2002	168.64	108.64	23.00	23	108.64	547	1425	62	0.3	78.95	79.24	538.92	769.12	59.94	0.29	0.00	0.00	626.1	10,398.07	364.02	1.79	60.74	0.00
9/11/2002	144.38	84.38	23.00	23	84.38	547	1425	62	0.3	78.95	79.24	538.91	768.54	59.91	0.29	0.00	0.00	625.75	10,274.07	360.86	1.77	60.74	0.00
9/12/2002	127.05	67.05	23.00	23	67.05	547	1425	62	0.3	78.95	79.24	538.9	767.96	59.88	0.29	0.00	0.00	625.41	10,150.11	357.85	1.75	60.74	0.00
9/13/2002	114.35	54.35	23.00	23	54.35	547	1425	62	0.3	78.95	79.24	538.89	767.38	59.85	0.29	0.00	0.00	625.06	10,026.17	354.80	1.74	60.74	0.00
9/14/2002	113.19	53.19	23.00	23	53.19	547	1425	62	0.3	78.95	79.24	538.88	766.81	59.82	0.29	0.00	0.00	624.71	9,902.26	351.74	1.73	60.74	0.00
9/15/2002	161.71	101.71	23.00	23	101.71	547	1425	62	0.3	78.95	79.24	538.87	766.23	59.79	0.29	0.00	0.00	624.36	9,778.39	348.66	1.71	60.74	0.00
9/16/2002	720.74	660.74	200.74	23	483.00	547	1425	62	0.3	195.95	196.24	542.45	997.78	69.27	0.29	0.00	117.00	624.35	9,775.02	348.57	1.70	0.00	0.00
9/17/2002	1009.50	949.50	298.00	23	674.50	547	1425	62	0.3	293.21	293.50	547.99	1,422.20	84.59	0.34	0.00	214.26	624.34	9,771.66	348.48	1.70	0.00	0.00
9/18/2002	745.00	685.00	225.00	23	483.00	547	1425	62	0.3	220.21	220.50	551.11	1,701.64	93.93	0.41	0.00	141.26	624.33	9,768.30	348.39	1.69	0.00	0.00
9/19/2002	507.06	447.06	23.00	23	447.06	547	1425	62	0.3	78.95	79.24	551.1	1,700.73	93.91	0.46	0.00	0.00	623.97	9,644.45	345.26	1.69	60.74	0.00
9/20/2002	561.35	501.35	41.35	23	483.00	547	1425	62	0.3	78.95	79.24	551.09	1,699.82	93.88	0.46	0.00	0.00	623.72	9,557.03	343.07	1.68	42.40	0.00
9/21/2002	568.28	508.28	48.28	23	483.00	547	1425	62	0.3	78.95	79.24	551.08	1,698.92	93.86	0.46	0.00	0.00	623.5	9,483.38	341.17	1.67	35.46	0.00
9/22/2002	656.06	596.06	136.06	23	483.00	547	1425	62	0.3	131.27	131.56	552.16	1,801.81	96.74	0.46	0.00	52.32	623.49	9,480.09	341.08	1.66	0.00	0.00
9/23/2002	510.53	450.53	23.00	23	450.53	547	1425	62	0.3	78.95	79.24	552.15	1,800.88	96.72	0.47	0.00	0.00	623.13	9,356.31	338.00	1.66	60.74	0.00
9/24/2002	381.16	321.16	23.00	23	321.16	547	1425	62	0.3	78.95	79.24	552.14	1,799.95	96.69	0.47	0.00	0.00	622.76	9,232.57	334.81	1.64	60.74	0.00
9/25/2002	225.23	165.23	23.00	23	165.23	547	1425	62	0.3	78.95	79.24	552.13	1,799.02	96.66	0.47	0.00	0.00	622.39	9,108.85	331.59	1.63	60.74	0.00
9/26/2002	889.38	829.38	298.00	23	554.38	547	1425	62	0.3	293.21	293.50	556.28	2,223.17	107.89	0.47	0.00	214.26	622.38	9,105.66	331.51	1.61	0.00	0.00
9/27/2002	1998.22	1938.22	298.00	23	1663.22	547	1425	62	0.3	293.21	293.50	560.03	2,647.21	118.55	0.52	0.00	214.26	622.37	9,102.46	331.42	1.61	0.00	0.00
9/28/2002	2818.29	2758.29	298.00	23	2483.29	547	1425	62	0.3	293.21	293.50	563.44	3,071.15	130.03	0.58	0.00	214.26	622.36	9,099.26	331.33	1.61	0.00	0.00
9/29/2002	2009.77	1949.77	298.00	23	1674.77	547	1425	62	0.3	293.21	293.50	566.58	3,494.98	140.03	0.63	0.00	214.26	622.35	9,096.06	331.24	1.61	0.00	0.00
9/30/2002	1305.19	1245.19	298.00	23	970.19	547	1425	62	0.3	293.21	293.50	569.51	3,918.72	148.84	0.68	0.00	214.26	622.34	9,092.87	331.16	1.61	0.00	0.00
10/1/2002	1224.34	1164.34	298.00	23	889.34	547	1425	62	0.22	293.28	293.50	569.99	3,989.82	151.33	0.53	0.00	36.37	623.4	9,449.65	340.31	1.18	0.00	181.06
10/2/2002	913.64	853.64	281.14	23	595.49	547	1425	62	0.22	276.42	276.64	569.99	3,989.78	151.33	0.54	0.00	0.52	624.55	9,843.93	350.32	1.22	0.00	200.00
10/3/2002	972.54	912.54	281.16	23	654.38	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	625.66	10,238.14	360.05	1.25	0.00	200.00
10/4/2002	538.25	478.25	23.00	23	478.25	547	1425	62	0.22	75.90	76.12	569.22	3,874.39	147.79	0.54	57.62	0.00	625.65	10,235.59	359.96	1.29	0.00	0.00
10/5/2002	613.33	553.33	93.33	23	483.00	547	1425	62	0.22	88.61	88.83	569.38	3,898.55	148.36	0.53	0.00	12.70	625.64	10,233.04	359.88	1.29	0.00	0.00
10/6/2002	594.84	534.84	74.84	23	483.00	547	1425	62	0.22	75.90	76.12	569.29	3,886.04	148.04	0.53	5.78	0.00	625.63	10,230.49	359.79	1.29	0.00	0.00
10/7/2002	720.74	660.74	200.74	23	483.00	547	1425	62	0.22	196.02	196.24	569.99	3,989.84	151.33	0.53	0.00	52.84	626	10,361.43	363.12	1.28	0.00	67.30
10/8/2002	462.02	402.02	23.00	23	402.02	547	1425	62	0.22	75.90	76.12	569.22	3,874.45	147.79	0.54	57.62	0.00	625.99	10,358.86	363.03	1.30	0.00	0.00
10/9/2002	182.50	122.50	23.00	23	122.50	547	1425	62	0.22	75.90	76.12	568.43	3,759.08	145.26	0.53	57.62	0.00	625.98	10,356.29	362.93	1.30	0.00	0.00
10/10/2002	254.11	194.11	23.00	23	194.11	547	1425	62	0.22	75.90	76.12	567.63	3,643.73	142.94	0.52	57.62	0.00	625.98	10,353.71	362.93	1.30	0.00	0.00
10/11/2002	816.61	756.61	296.61	23	483.00	547	1425	62	0.22	291.89	292.11	569.99	3,989.94	151.33	0.51	0.00	175.01	626.19	10,432.45	364.85	1.30	0.00	40.99
10/12/2002	769.26	709.26	249.26	23	483.00	547	1425	62	0.22	244.54	244.76	569.99	3,989.78	151.33	0.54	0.00	0.46	627.09	10,763.52	373.30	1.30	0.00	168.22
10/13/2002	701.11	641.11	181.11	23	483.00	547	1425	62	0.22	176.39	176.61	569.99	3,989.78	151.33	0.54	0.00	0.54	627.61	10,959.17	378.30	1.33	0.00	99.97
10/14/2002	594.84	534.84	74.84	23	483.00	547	1425	62	0.22	75.90	76.12	569.9	3,977.25	150.61	0.54	5.78	0.00	627.6	10,956.49	378.20	1.35	0.00	0.00
10/15/2002	727.67	667.67	207.67	23	483.00	547	1425	62	0.22	202.95	203.17	569.99	3,989.79	151.33	0.54	0.00	6.86	628.22	11,192.28	384.83	1.35	0.00	120.23

Table 19

Water Model Results Using 100% Wet Cooling Towers for Year 2002 Based on 98 cfs and Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

						Pond A						Pond B						Pond C					
Date	2002 Broad River flow At Lee Nuclear Site (cfs)	2002 Broad River Flow At Lee Nuclear Site Less 60 cfs For Future Upstream Demand (cfs)	Lee Nuclear Plant Withdrawal From Broad River (cfs)	Lee Nuclear Plant Discharge To Broad River (cfs)	2002 Broad River Flow At Ninety Nine Islands Dam (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)
10/16/2002	3823.18	3763.18	281.16	23	3505.02	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	629.23	11,586.25	394.30	1.37	0.00	200.00
10/17/2002	3730.78	3670.78	281.16	23	3412.61	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	630.22	11,980.15	403.61	1.41	0.00	200.00
10/18/2002	2171.47	2111.47	281.16	23	1853.31	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	631.18	12,373.99	412.83	1.44	0.00	200.00
10/19/2002	1755.66	1695.66	281.16	23	1437.50	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	632.13	12,767.76	421.94	1.47	0.00	200.00
10/20/2002	1038.38	978.38	281.16	23	720.22	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	633.05	13,161.46	430.86	1.51	0.00	200.00
10/21/2002	810.84	750.84	281.16	23	492.67	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	633.95	13,555.10	439.68	1.54	0.00	200.00
10/22/2002	977.16	917.16	281.16	23	659.00	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	634.84	13,948.68	448.66	1.57	0.00	200.00
10/23/2002	1098.44	1038.44	281.16	23	780.28	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	635.71	14,342.20	457.51	1.60	0.00	200.00
10/24/2002	743.84	683.84	223.84	23	483.00	547	1425	62	0.22	219.12	219.34	569.99	3,989.78	151.33	0.54	0.00	0.54	636.32	14,622.04	463.84	1.63	0.00	142.72
10/25/2002	868.59	808.59	281.16	23	550.43	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	637.16	15,015.45	472.65	1.66	0.00	200.00
10/26/2002	1123.85	1063.85	281.16	23	805.69	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	637.98	15,408.80	481.46	1.69	0.00	200.00
10/27/2002	930.96	870.96	281.16	23	612.80	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	638.79	15,802.08	490.52	1.72	0.00	200.00
10/28/2002	770.41	710.41	250.41	23	483.00	547	1425	62	0.22	245.69	245.91	569.99	3,989.78	151.33	0.54	0.00	0.54	639.46	16,134.40	498.22	1.75	0.00	169.29
10/29/2002	1432.25	1372.25	281.16	23	1114.09	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	640.24	16,527.57	507.46	1.78	0.00	200.00
10/30/2002	1605.50	1545.50	281.16	23	1287.34	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	641.01	16,920.67	516.38	1.81	0.00	200.00
10/31/2002	1166.59	1106.59	281.16	23	848.43	547	1425	62	0.22	276.44	276.66	569.99	3,989.78	151.33	0.54	0.00	0.54	641.77	17,313.70	524.94	1.84	0.00	200.00
11/1/2002	1166.59	1106.59	278.28	23	851.30	547	1425	62	0.15	273.62	273.78	569.99	3,990.13	151.33	0.36	0.00	0.54	642.51	17,707.89	533.65	1.27	0.00	200.00
11/2/2002	1282.09	1222.09	278.11	23	966.98	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	643.24	18,102.03	542.10	1.29	0.00	200.00
11/3/2002	735.76	675.76	215.76	23	483.00	547	1425	62	0.15	211.10	211.26	569.99	3,990.13	151.33	0.36	0.00	0.36	643.74	18,372.54	547.79	1.31	0.00	137.69
11/4/2002	880.14	820.14	278.11	23	565.03	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	644.45	18,766.62	556.04	1.32	0.00	200.00
11/5/2002	719.59	659.59	199.59	23	483.00	547	1425	62	0.15	194.93	195.09	569.99	3,990.13	151.33	0.36	0.00	0.36	644.88	19,004.98	561.04	1.34	0.00	121.51
11/6/2002	1420.70	1360.70	278.11	23	1105.59	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	645.58	19,398.99	569.01	1.35	0.00	200.00
11/7/2002	1293.64	1233.64	278.11	23	978.53	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	646.27	19,792.96	576.88	1.37	0.00	200.00
11/8/2002	1077.65	1017.65	278.11	23	762.54	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	646.94	20,186.90	584.53	1.39	0.00	200.00
11/9/2002	1201.24	1141.24	278.11	23	886.13	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	647.61	20,580.80	592.23	1.41	0.00	200.00
11/10/2002	1029.14	969.14	278.11	23	714.03	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	648.27	20,974.66	599.77	1.43	0.00	200.00
11/11/2002	1001.42	941.42	278.11	23	686.31	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	648.93	21,368.49	607.03	1.45	0.00	200.00
11/12/2002	3211.01	3151.01	278.11	23	2895.90	547	1425	62	0.15	273.45	273.61	569.99	3,990.13	151.33	0.36	0.00	0.36	649.57	21,762.28	614.03	1.46	0.00	200.00
11/13/2002	3338.06	3278.06	209.78	23	3091.28	547	1425	62	0.15	205.12	205.28	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.52	618.50	1.48	0.00	131.67
11/14/2002	2668.14	2608.14	79.59	23	2551.55	547	1425	62	0.15	74.93	75.09	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.48
11/15/2002	2113.72	2053.72	79.60	23	1997.12	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/16/2002	2541.09	2481.09	79.60	23	2424.49	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/17/2002	4539.30	4479.30	79.60	23	4422.70	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/18/2002	3811.63	3751.63	79.60	23	3695.03	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/19/2002	2783.64	2723.64	79.60	23	2667.04	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/20/2002	2183.02	2123.02	79.60	23	2066.42	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/21/2002	1721.01	1661.01	79.60	23	1604.41	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/22/2002	1824.96	1764.96	79.60	23	1708.36	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/23/2002	1790.31	1730.31	79.60	23	1673.71	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/24/2002	1084.58	1024.58	79.60	23	967.98	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/25/2002	1111.15	1051.15	79.60	23	994.55	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/26/2002	1374.50	1314.50	79.60	23	1257.90	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/27/2002	1640.16	1580.16	79.60	23	1523.56	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/28/2002	1374.50	1314.50	79.60	23	1257.90	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/29/2002	1018.74	958.74	79.60	23	902.15	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
11/30/2002	1247.44	1187.44	79.60	23	1130.84	547	1425	62	0.15	74.94	75.10	569.99	3,990.13	151.33	0.36	0.00	0.36	649.99	22,020.50	618.50	1.49	0.00	1.49
12/1/2002	1049.93	989.93	76.87	23	936.06	547	1425	62	0.1	72.26	72.37	569.99	3,990.35	151.33	0.26	0.00	0.36	649.99	22,021.37	618.50	1.05	0.00	1.49
12/2/2002	839.71	779.71	76.33	23	726.39	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05

Table 19

Water Model Results Using 100% Wet Cooling Towers for Year 2002 Based on 98 cfs and Considering Hypothetical Constraints Associated with FERC Seasonal Flow Release Limits from Ninety-Nine Islands Dam

Date	2002 Broad River flow At Lee Nuclear Site (cfs)	2002 Broad River Flow At Lee Nuclear Site Less 60 cfs For Future Upstream Demand (cfs)	Lee Nuclear Plant Withdrawal From Broad River (cfs)	Lee Nuclear Plant Discharge To Broad River (cfs)	2002 Broad River Flow At Ninety Nine Islands Dam (cfs)	Pond A						Pond B						Pond C					
						Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To (cfs)	Pond Elev. (ft)	Pond Vol. (ac-ft)	Pond Surface Area (ac)	Pond Evap. (cfs)	Flow Pumped Out of Pond (cfs)	Flow Pumped In To Pond (cfs)
12/3/2002	974.85	914.85	76.33	23	861.53	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/4/2002	1247.44	1187.44	76.33	23	1134.12	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/5/2002	2517.98	2457.98	76.33	23	2404.66	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/6/2002	3372.71	3312.71	76.33	23	3259.39	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/7/2002	2679.69	2619.69	76.33	23	2566.36	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/8/2002	2079.07	2019.07	76.33	23	1965.74	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/9/2002	1975.12	1915.12	76.33	23	1861.79	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/10/2002	1686.36	1626.36	76.33	23	1573.03	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/11/2002	2564.19	2504.19	76.33	23	2450.86	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/12/2002	3661.47	3601.47	76.33	23	3548.15	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/13/2002	3904.03	3844.03	76.33	23	3790.70	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/14/2002	6075.50	6015.50	76.33	23	5962.18	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/15/2002	3938.68	3878.68	76.33	23	3825.36	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/16/2002	2991.55	2931.55	76.33	23	2878.22	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/17/2002	2541.09	2481.09	76.33	23	2427.76	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/18/2002	2206.12	2146.12	76.33	23	2092.80	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/19/2002	2240.78	2180.78	76.33	23	2127.45	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/20/2002	3026.20	2966.20	76.33	23	2912.87	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/21/2002	3673.02	3613.02	76.33	23	3559.70	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/22/2002	2772.09	2712.09	76.33	23	2658.77	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/23/2002	2414.03	2354.03	76.33	23	2300.70	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/24/2002	5532.64	5472.64	76.33	23	5419.31	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/25/2002	10349.15	10289.15	76.33	23	10235.82	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/26/2002	5266.98	5206.98	76.33	23	5153.65	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/27/2002	3938.68	3878.68	76.33	23	3825.36	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/28/2002	3511.32	3451.32	76.33	23	3397.99	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/29/2002	2887.60	2827.60	76.33	23	2774.27	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/30/2002	2725.89	2665.89	76.33	23	2612.56	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05
12/31/2002	2829.84	2769.84	76.33	23	2716.52	547	1425	62	0.1	71.72	71.83	569.99	3,990.35	151.33	0.26	0.00	0.26	649.99	22,021.37	618.50	1.05	0.00	1.05

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter Dated: June 22, 2010

Reference NRC RAI Number: ER RAI 128 Supplement, Alternatives

NRC RAI:

Provide details of the quantitative analyses used to evaluate hybrid wet-dry tower options for cooling of the proposed Lee Nuclear Plant during periods of low river flow. Include alternatives considered for cooling water sources and cooling system technologies. Include in the metrics of the analyses foregone net power due to parasitic energy losses, reduced generation efficiency, and frequency of outages due to loss of water supply.

NRC June 2 and 3, 2011 Audit - Request for Supplemental Information:

During the June 2 and 3, 2011 NRC audit, the NRC Staff requested that Duke Energy provide the following supplemental information:

- Present the water balance model/results for the most recent 10 year period of flow data for the Broad River (2001 through 2010)
- Present the water balance model/results based on the hypothetical condition that the seasonal flow release limits in the Federal Energy Regulatory Commission (FERC) license for the Ninety-Nine Islands Dam would apply as constraints on Lee Nuclear Station withdrawals (bounding evaluation)

Duke Energy Response:

Duke Energy is supplementing the previous response to this RAI based on the request for supplemental information identified above. Previous evaluations of hybrid (wet-dry) cooling towers as the heat dissipation system for Lee Nuclear Station also have been updated based on the changes noted below.

Several parameters associated with the water balance model used to determine the volume of supplemental water required to support operations of Lee Nuclear Station through significant droughts (sizing of Make-Up Pond C) were recently updated. First, the daily evaporation rates for Make-Up Ponds A, B and C were updated to consider average pan evaporation values from Clemson, South Carolina from July 1948 through 2010. Updated evaporation data tables are provided in the supplemental response to ER RAI 216 (Enclosure 2 to this letter). In addition, the design margin applied to account for uncertainty in the length/severity of future droughts was reduced slightly from the 25% margin applied in the initial sizing of Make-Up Pond C to a margin of 20 days of consumptive water storage so that a consistent margin was applied to each of the energy alternatives evaluated (nuclear with wet cooling towers, nuclear with hybrid cooling towers and natural gas combined cycle with wet cooling towers).

Because the Proportional Flow Limitation (5% mean annual flow) in regulations implementing Section 316(b) of the Federal Water Pollution Control Act (CWA) is susceptible to differing interpretations, Duke Energy has evaluated two values using the water balance model. First, a Proportional Flow Limitation (5% mean annual flow) of 125 cfs was applied in the water balance model, derived from the full period of record (1926 through 2010) for the Broad River at the Gaffney Station (No. 02153500). Second, a Proportional Flow Limitation (5% mean annual flow) of 98 cfs was applied in the water balance model, derived from the most recent 10 years (2001 through 2010) for the Broad River at the Gaffney Station. In comparing these two cases (98 cfs versus 125 cfs), very little difference is seen in the volume of supplemental water required to support operations of Lee Nuclear Station through significant droughts as reflected in the water balance model results summarized below.

The minimum flow release requirement of 483 cfs from the Ninety-Nine Islands Dam per its FERC License is described in more detail below. The majority of the water balance model evaluations that were performed apply this minimum flow release requirement. The seasonal flow release requirements from the Ninety-Nine Islands Dam per its FERC license are also described below. A hypothetical bounding evaluation of the water balance model, postulating constraints based on these seasonal flow release requirements, would result in an increase in the volume of supplemental water required to support operations of Lee Nuclear Station through significant droughts (results summarized below). Rather than postulating a larger Make-Up Pond C to support this increase in volume of required supplemental water, the volume and depth of the water layer preserved to protect the thermocline is reduced for the purposes of this evaluation. Duke Energy believes that reducing this water layer would result in less overall environmental impacts than increasing the size of Make-Up Pond C.

Different scenarios or cases of the water balance model were evaluated considering different energy alternatives, proportional flow limitations (125 cfs and 98 cfs) and flow release constraints for the Ninety-Nine Islands Dam (483 cfs and seasonal). Several sensitivity evaluations were also performed to justify the margins applied in sizing of Make-Up Pond C. The results of these different cases are presented in ER RAI supplemental responses as summarized below.

Description	Case(s)	ER RAI Supplemental Response (Enclosure to Ltr. WLG2011.07-04)
Energy Alternatives		
Nuclear with wet cooling towers	1 through 3	206 (Enclosure 1)
Nuclear with hybrid cooling towers	4 through 6	128 (Enclosure 3)
Natural gas combined cycle	7 through 9	48/114/123 (Enclosure 4)
Sensitivity Evaluations		
Combined worst evaporation	10	206 (Enclosure 1)
Synthetic drought	11 through 12	206 (Enclosure 1)

Data input tables and results are provided in the supplemental response to ER RAI 216 (ER RAI 216 Supplement, Enclosure 2 to this letter).

Make-Up Pond C Sizing Based on Hybrid (Wet-Dry) Cooling and 5% of Mean Annual Flow of 125 cfs (Case 4)

Water balance model results based on Hybrid Cooling and a 5% mean annual flow of 125 cfs considering the entire 85 year period of record (1926-2010) are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 4. A 20-ft layer is preserved to protect the thermocline while maintaining the full pond elevation of Make-Up Pond C at 630 ft msl (same depth of layer was used in the initial sizing of Make-Up Pond C with Hybrid Cooling). This layer will be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (significant droughts)	2,804 ac-ft	
• 20 days usable storage as margin (worse future droughts)	2,500 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	5,451 ac-ft	610 ft
• Volume and depth to protect thermocline	6,439 ac-ft	20 ft
• Full pond volume and elevation	11,890 ac-ft	630 ft

Additional details for Case 4 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Make-Up Pond C Sizing Based on Hybrid (Wet-Dry) Cooling and 5% of Mean Annual Flow of 98 cfs (Case 5)

Water balance model results based on Hybrid Cooling and a 5% mean annual flow of 98 cfs considering the most recent 10 years (2001-2010) are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 5. A 20-ft layer is preserved to protect the thermocline while maintaining the full pond elevation of Make-Up Pond C at 630 ft msl (same depth of layer was used in the initial sizing of Make-Up Pond C with Hybrid Cooling). This layer will be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (significant droughts)	2,927 ac-ft	
• 20 days usable storage as margin (worse future droughts)	2,500 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	5,574 ac-ft	610 ft
• Volume and depth to protect thermocline	6,316 ac-ft	20 ft
• Full pond volume and elevation	11,890 ac-ft	630 ft

Additional details for Case 5 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Sensitivity of Make-Up Pond C Sizing to Proportional Flow Limitation

A usable volume of 2,804 ac-ft is required in Make-Up Pond C to support station operations considering Hybrid Cooling and a Proportional Flow Limitation of 125 cfs based on the full period of record (1926-2010) as identified in Case 4. A usable volume of 2,927 ac-ft is required considering Hybrid Cooling and a Proportional Flow Limitation of 98 cfs based on the most recent 10 years as the period of record (2001-2010) as identified in Case 5. A negligible difference of only 123 ac-ft (volume of consumptive water required to support approximately one day of station operations) results, with application of a Proportional Flow Limitation of 98 cfs yielding a slightly larger volume of supplemental water being required to support station operations.

Seasonal Flow Release Limits in FERC License from Ninety-Nine Islands Dam

During the June 2 and 3, 2011 audit, the NRC Staff requested that Duke Energy perform a bounding analysis and provide water balance model results with the withdrawal threshold from the Ninety-Nine Islands Reservoir based on the hypothetical condition that the seasonal flow release limits in the FERC license from Ninety-Nine Islands Dam would apply as constraints on Lee withdrawals. This bounding evaluation has been performed and the results are presented below as Case 6. Importantly, Duke Energy's FERC license for Ninety-Nine Islands Hydroelectric Station supports the water balance model evaluations for Cases 4 and 5 above, which consider maintaining a minimum flow of 483 cfs in the Broad River as the threshold flow to support withdrawals of makeup water from the Ninety-Nine Islands Reservoir (to support operations of Lee Nuclear Station and to support refill of Make-Up Ponds B and C [drought contingency ponds]). This perspective is also supported by South Carolina Water Withdrawal Law. Additional information on the FERC operating license for the Ninety-Nine Islands Hydroelectric Station is provided below.

The FERC operating license for Ninety-Nine Islands Hydroelectric Station includes seasonal limits on reservoir levels to one foot below full impoundment (511 feet above msl) from March through May, and two feet below full impoundment from June through February. This allows for a short-term potential of zero outflow (excluding a measured 53 cfs due to dam leakage) to occur, immediately followed by the required minimum flow release (Reference 4). Minimum flow requirements below the dam are 966 cfs (January through April); 725 cfs (May, June and December); and 483 cfs (July through November), when flow is available. If the above referenced flows cannot be maintained during December through June without dropping below the reservoir level restrictions described above, then at least 483 cfs is required to be released. If there is insufficient water to maintain at least 483 cfs of continuous flow release, the operating license provides that one hydroelectric unit can be operated at its minimum hydraulic output for that portion of every hour that is necessary to release the approximate accumulated inflow; inflow can be released at the trash gate, or the inflow can be spilled. Collectively, these limits are referred to as the "low flow protocol". Pursuant to South Carolina Water Withdrawal Law, only the lowest minimum flow identified above (i.e., 483 cfs) constrains withdrawals by Lee Nuclear Station. See South Carolina Water Withdrawal Law § 49-4-150(A)(4) (stating in part that water withdrawal from a licensed flow control impoundment are based on the <u>lowest minimum flow</u> specified in the license for that impoundment).

Make-Up Pond C Sizing Based on Hybrid Cooling and Ninety-Nine Islands Dam Seasonal Flow Release Constraints (Case 6)

Water balance model results based on the bounding evaluation of Hybrid Cooling and hypothetical constraints associated with Ninety-Nine Islands Dam seasonal flow release limits are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 6. An increase in usable volume to support station operations would be required under this scenario, resulting in an 18-ft layer being preserved to protect the thermocline with a full pond elevation of 630 ft msl. This layer should be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (significant droughts)	3,443 ac-ft	
• 20 days usable storage as margin (worse future droughts)	2,500 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	6,090 ac-ft	612 ft
• Volume and depth to protect thermocline	5,800 ac-ft	18 ft
• Full pond volume and elevation	11,890 ac-ft	630 ft

Additional details for Case 6 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

There are no other changes to the information provided in Reference 1 as a result of this update.

Reference:

1. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2010.10-09, dated October 29, 2010 (ML103070311)

2. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2010.12-01, dated December 17, 2010 (ML103550032)

3. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2011.01-03, dated January 26, 2011 (ML110310017)

4. U.S. Federal Energy Regulatory Commission (FERC), 1996, Order Issuing New License, Project No. 2331-002, June 17, 1996

Associated Revision to the Lee Nuclear Station Combined License Application:

None

Attachment:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letters Dated: August 21, 2008; January 21, 2009; and June 22, 2010

Reference NRC RAI Numbers: **ER RAI 48 Supplement, Alternatives**
ER RAI 114 Supplement, Alternatives
ER RAI 123 Supplement, Alternatives

NRC RAI 48:

Provide a quantified evaluation of natural gas-combined cycle power generation as an alternative to the proposed action.

NRC RAI 114:

Provide calculations, references, and the selected control strategies for the natural gas fired emissions.

In the RAI-48 response, applicant provides emissions estimates for (5) natural gas fired combined cycle units in Table 9.2-4. Applicant then includes a reference to EPA AP-42 (5^{th} Ed.) section 1.4 as a reference. It is unclear if the emissions are calculated from this reference; if they are, the applicant should use Section 3.1 for stationary gas turbines, and select the appropriate control strategies they would intend to deploy assuming 114,847,104 MMBtu input per year.

NRC RAI 123:

Provide additional details for the Alternative Energy analysis at the Lee Nuclear Station regarding consumptive make-up water requirements for a combined cycle natural gas-fired power plant. Specifically, provide analysis to describe whether Pond C would be required for this alternative.

NRC June 2 and 3, 2011 Audit – Request for Supplemental Information:

During the audit held on June 2 and 3, 2011, the NRC Staff requested that Duke Energy provide the following supplemental information:

- Present the water balance model/results for the most recent 10 year period of flow data for the Broad River (2001 through 2010)
- Present the water balance model/results based on the hypothetical condition that the seasonal flow release limits in the Federal Energy Regulatory Commission (FERC) license for the Ninety-Nine Islands Dam would apply as constraints on Lee Nuclear Station withdrawals (bounding evaluation)
- Provide land use and ecology impacts for supplemental water options of (a) building a smaller Make-Up Pond C and (b) expanding Make-Up Pond B to support operation of a four unit natural gas combined cycle station at the Lee Nuclear Station site.

Duke Energy Response:

Duke Energy is supplementing the previous responses to these RAIs based on the request for supplemental information identified above.

Natural Gas Combined Cycle Probable Design Change

Duke Energy's response to ER RAI 48 (Reference 1) involved the evaluation of a natural gas combined cycle generation alternative that consisted of five 482 MWe natural gas fired units. Duke Energy's response to ER RAI 114 (Reference 2) provided updates to air emissions anticipated from these units. During the development of the response to ER RAI 123 (Reference 3) Duke Energy determined that 620 MWe natural gas fired units would be more appropriate for comparison of a natural gas combined cycle baseload option, given that Duke Energy is currently constructing one 620 MWe natural gas combined cycle unit at Buck Steam and Dan River Steam Stations, albeit as intermediate, not baseload units. Note that Duke Energy does not currently operate any baseload natural gas combined cycle units. The new natural gas combined cycle units being built at Buck Steam and Dan River Steam Stations are considered intermediate units in Duke Energy's Integrated Resource Planning (IRP) report and these units will not be dispatched as baseload generating units.

Accordingly, Duke Energy's response to ER RAI 123 (Reference 3) provided the projected monthly average consumptive water use for a hypothetical natural gas combined cycle plant providing the same total energy output as the proposed Lee Nuclear Station. This scenario involved power produced by 3.6 units generating 620 MWe per unit. Since a partial unit cannot be constructed, four 620 MWe units would be required in order to replace the generation capacity of the Lee Nuclear Station. This alternative would provide 2480 MWe, which is slightly more than the 2234 MWe provided by the Lee Nuclear Station.

Revisions to Subsection 9.2.2 in the Environmental Report (ER) are provided in Attachment 48S-01. Revised monthly average consumptive water use for a 2480 MWe natural gas combined cycle plant is provided in Table 1 below. The increased net generating capacity resulting from the probable standard design change for a natural gas combined cycle alternative results in increased air quality impacts. In addition, a capacity factor of 0.8 was previously assumed; however, the capacity factor applied has been updated to 0.9 to align with capacity factor projections used in Duke Energy's IRP for baseload generating units. These changes (net generating capacity and capacity factor) result in an increase in the annual BTU input for the natural gas combined cycle generation alternative. Revisions to air quality impacts resulting from the four 620 MWe natural gas combined cycle units and assumed capacity factor are provided as updates to ER text and tables in Attachments 114S-01 through Attachment 114S-03.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lee Nuclear Station	50.9	52.1	55.2	58.2	60.1	61.9	63.0	62.3	60.4	57.4	54.6	51.9
Combined Cycle (four 620 MWe units)	24.2	24.8	26.3	27.7	28.6	29.5	30.0	29.7	28.8	27.3	26.0	24.7

Table 1. Comparison of Monthly Average Consumptive Water Use (cfs)

Supplemental Water Requirements

Broad River flow data indicate that supplemental water would be required for the operation of a coal-fired generation facility and natural gas combined cycle facility during periods of extended drought. Consumptive water use for the coal-fired alternative would be very similar to that of the Lee Nuclear Station; therefore, the coal-fired alternative would require a similarly sized Make-Up Pond C. Revisions to impacts from the coal-fired alternative to include the addition of Make-Up Pond C are provided as updates to ER text in Attachment 123S-01.

Several parameters associated with the water balance model used to determine the volume of supplemental water required to support operations of Lee Nuclear Station or other baseload generation alternatives through significant droughts (sizing of Make-Up Pond C) were recently updated. First, the daily evaporation rates for Make-Up Ponds A, B and C were updated to consider average pan evaporation values from Clemson, South Carolina from July 1948 through 2010. Updated evaporation data tables are provided in the supplemental response to ER RAI 216 (Enclosure 2 to this letter). In addition, the design margin applied to account for uncertainty in the length/severity of future droughts was reduced slightly from the 25% margin applied in the initial sizing of Make-Up Pond C to a margin of 20 days of consumptive water storage so that a consistent margin was applied to each of the energy alternatives evaluated (nuclear with wet cooling towers, nuclear with hybrid cooling towers and natural gas combined cycle with wet cooling towers).

Because the Proportional Flow Limitation (5% mean annual flow) in regulations implementing Section 316(b) of the Federal Water Pollution Control Act (CWA) is susceptible to differing interpretations, Duke Energy has evaluated two values using the water balance model. First, a Proportional Flow Limitation (5% mean annual flow) of 125 cfs was applied in the water balance model, derived from the full period of record (1926 through 2010) for the Broad River at the Gaffney Station (No. 02153500). Second, a Proportional Flow Limitation (5% mean annual flow) of 98 cfs was applied in the water balance model, derived from the most recent 10 years (2001 through 2010) for the Broad River at the Gaffney Station. In comparing these two cases (98 cfs versus 125 cfs), very little difference is seen in the volume of supplemental water required to support operations of a 2480 MWe natural gas combined cycle plant through significant droughts as reflected in the water balance model results summarized below.

The minimum flow release requirement of 483 cfs from the Ninety-Nine Islands Dam per its FERC License is described in more detail below. The majority of the water balance model evaluations that were performed apply this minimum flow release requirement. The seasonal flow release requirements from the Ninety-Nine Islands Dam per its FERC license are also described below. A hypothetical bounding evaluation of the water balance model, postulating constraints based on these seasonal flow release requirements, would result in an increase in the volume of supplemental water required to support operations of a 2480 MWe natural gas combined cycle plant through significant droughts (results summarized below). Rather than postulating a larger Make-Up Pond C to support this increase in volume of required supplemental water, the volume and depth of the water layer preserved to protect the thermocline is reduced for the purposes of this evaluation. Duke Energy believes that reducing this water layer would result in less overall environmental impacts than increasing the size of Make-Up Pond C.

Different scenarios or cases of the water balance model were evaluated considering different energy alternatives, proportional flow limitations (125 cfs and 98 cfs) and flow release constraints for the Ninety-Nine Islands Dam (483 cfs and seasonal). Several sensitivity evaluations were also performed to justify the margins applied in sizing of Make-Up Pond C. The results of these different cases are presented in ER RAI supplemental responses as summarized below.

Description	Case(s)	ER RAI Supplemental Response (Enclosure to Ltr. WLG2011.07-04)
Energy Alternatives		
Nuclear with wet cooling towers	1 through 3	206 (Enclosure 1)
Nuclear with hybrid cooling towers	4 through 6	128 (Enclosure 3)
Natural gas combined cycle	7 through 9	48/114/123 (Enclosure 4)
Sensitivity Evaluations		
Combined worst evaporation	10	206 (Enclosure 1)
Synthetic drought	11 through 12	206 (Enclosure 1)

Data input tables and results are provided in the supplemental response to ER RAI 216 (ER RAI 216 Supplement, Enclosure 2 to this letter).

Make-Up Pond C Sizing Based on Natural Gas Combined Cycle and 5% of Mean Annual Flow of 125 cfs (Case 7)

Water balance model results based on Natural Gas Combined Cycle and a 5% mean annual flow of 125 cfs considering the entire 85 year period of record (1926-2010) are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 7. A 20-ft layer is preserved to protect the thermocline while maintain the full pond elevation of Make-Up Pond C at 626 ft msl[1] (same depth of layer used in the initial sizing of Make-Up Pond C). This layer will be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (significant droughts)	3,277 ac-ft	
• 20 days usable storage as margin (worse future droughts)	1,200 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	4,624 ac-ft	606 ft
• Volume and depth to protect thermocline	5,737 ac-ft	20 ft
• Full pond volume and elevation	10,361 ac-ft	626 ft

Additional details for Case 7 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2

[1] The full pond elevation of 626 ft msl used in this response differs from the 617 ft msl full pond elevation presented during the June 2 and 3, 2011 NRC audit. The 617 ft msl full pond elevation was based on the supplemental water required for 3.6 units generating 620 MW per unit rather than the supplemental water required for the four 620 MWe units that would actually be built under this scenario.

to this letter). Histograms showing drawdowns of Make-Up Pond B and Make-Up Pond C for this scenario, originally provided in Duke Energy's response to ER RAI 123 (Reference 3) have been revised and are provided as Attachments 123S-02 through 123S-05.

Make-Up Pond C Sizing Based on Natural Gas Combined Cycle and 5% of Mean Annual Flow of 98 cfs (Case 8)

Water balance model results based on Natural Gas Combined Cycle and a 5% mean annual flow of 98 cfs considering the most recent 10 years (2001-2010) are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 8. A 20-ft layer is preserved to protect the thermocline while maintaining the full pond elevation of Make-Up Pond C at 626 ft msl (same depth of layer used in the initial sizing of Make-Up Pond C). This layer will be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (significant droughts)	3,380 ac-ft	
• 20 days usable storage as margin (worse future droughts)	1,200 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	4,727 ac-ft	606 ft
• Volume and depth to protect thermocline	5,634 ac-ft	20 ft
• Full pond volume and elevation	10,361 ac-ft	626 ft

Additional details for Case 8 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Sensitivity of Make-Up Pond C Sizing to Proportional Flow Limitation

A usable volume of 3,277 ac-ft is required in Make-Up Pond C to support station operations considering Natural Gas Combined Cycle and a Proportional Flow Limitation of 125 cfs based on the full period of record (1926-2010) as identified in Case 7. A usable volume of 3,380 ac-ft is required considering Natural Gas Combined Cycle and a Proportional Flow Limitation of 98 cfs based on the most recent 10 years as the period of record (2001-2010) as identified in Case 8. A negligible difference of only 103 ac-ft (volume of consumptive water required to support approximately one day of station operations) results, with application of a Proportional Flow Limitation of 98 cfs yielding a slightly larger volume of supplemental water being required to support station operations.

Seasonal Flow Release Limits in FERC License from Ninety-Nine Islands Dam

During the June 2 and 3, 2011 audit, the NRC Staff requested that Duke Energy perform a bounding analysis and provide water balance model results with the withdrawal threshold from the Ninety-Nine Islands Reservoir based on the hypothetical condition that the seasonal flow release limits in the FERC license from Ninety-Nine Islands Dam would apply as constraints on withdrawals. This bounding evaluation has been performed and the results are presented below as Case 9. Importantly, Duke Energy's FERC license for Ninety-Nine Islands Hydroelectric Station supports the water balance model evaluations for Cases 7 and 8 above, which consider maintaining a minimum flow of 483 cfs in the Broad River as the threshold flow to support withdrawals of makeup water from the Ninety-Nine Islands Reservoir (to support operations of a 2480 MWe natural gas combined cycle plant and to support refill of Make-Up Ponds B and C [drought contingency ponds]). This perspective is also supported by South Carolina Water Withdrawal Law. Additional information on the FERC operating license for the Ninety-Nine Islands Hydroelectric Station is provided below.

The FERC operating license for Ninety-Nine Islands Hydroelectric Station includes seasonal limits on reservoir levels to one foot below full impoundment (511 feet above msl) from March through May, and two feet below full impoundment from June through February. This allows for a short-term potential of zero outflow (excluding a measured 53 cfs due to dam leakage) to occur, immediately followed by the required minimum flow release (Reference 7). Minimum flow requirements below the dam are 966 cfs (January through April); 725 cfs (May, June and December); and 483 cfs (July through November), when flow is available. If the above referenced flows cannot be maintained during December through June without dropping below the reservoir level restrictions described above, then at least 483 cfs is required to be released. If there is insufficient water to maintain at least 483 cfs of continuous flow release, the operating license provides that one hydroelectric unit can be operated at its minimum hydraulic output for that portion of every hour that is necessary to release the approximate accumulated inflow; inflow can be released at the trash gate, or the inflow can be spilled. Collectively, these limits are referred to as the "low flow protocol". Pursuant to South Carolina Water Withdrawal Law, only the lowest minimum flow identified above (i.e., 483 cfs) constrains withdrawals by the natural gas combined cycle plant. See South Carolina Water Withdrawal Law § 49-4-150(A)(4) (stating in part that water withdrawal from a licensed flow control impoundment are based on the lowest minimum flow specified in the license for that impoundment).

Make-Up Pond C Sizing Based on Natural Gas Combined Cycle and Ninety-Nine Islands Dam Seasonal Flow Release Constraints (Case 9)

Water balance model results based on the bounding evaluation of a natural gas combined cycle plant and hypothetical constraints associated with Ninety-Nine Islands Dam seasonal flow release limits are summarized below. This Make-Up Pond C sizing evaluation is designated as Case 9. An increase in usable volume to support station operations would be required under this scenario, resulting in only a 16-ft layer being preserved to protect the thermocline with a full pond elevation of 626 ft msl. This layer should be sufficient to avoid disruption of the natural thermal stratification or turnover pattern.

• Usable volume to support station operations (significant droughts)	4,279 ac-ft	
• 20 days usable storage as margin (worse future droughts)	1,200 ac-ft	
• Dead storage volume below inlet of intake	147 ac-ft	
• Volume and elevation (without protection for thermocline)	5,626 ac-ft	610 ft
• Volume and depth to protect thermocline	4,735 ac-ft	16 ft
• Full pond volume and elevation	10,361 ac-ft	626 ft

Additional details for Case 9 are provided in a data table on Make-Up Pond C Sizing for Different Scenarios (Table 16) submitted as supplemental response to ER RAI 216 (Enclosure 2 to this letter).

Expansion of Make-Up Pond B Based on Natural Gas Combined Cycle and 5% Mean Annual Flow of 125 cfs

At the June 2 and 3, 2011 NRC audit, the NRC Staff requested that Duke Energy evaluate enlarging Make-Up Pond B to provide supplemental cooling water for a Natural Gas Combined Cycle generation alternative. Duke Energy's response to ER RAI 128 (Reference 4) concluded that expanding Make-Up Pond B to provide supplemental cooling water for a hybrid (wet-dry) cooling alternative was not an environmentally superior alternative. Water balance model results based on Natural Gas Combined Cycle and 5% Mean Annual Flow of 125 cfs relative to expansion of Make-Up Pond B are summarized below. Note that these results reflect only the additional volume of supplemental water required to support station operations through significant droughts beyond the usable storage volume of 3,156 ac-ft of storage used from existing Make-Up Pond B.

Under this scenario, the intake for Make-Up Pond B would need to be placed at a lower elevation than what is proposed for Lee Nuclear Station. This elevation has not been calculated; therefore, the dead storage of Make-Up Pond B is assumed to be equal to the dead storage of Make-Up Pond C for comparison. A maximum drawdown of 30 ft on Make-Up Pond B has been considered in the water balance model evaluations. This maximum drawdown results in only a 6-ft layer being preserved at the top of Make-Up Pond B to protect the thermocline. This same 6-ft layer would also need to be preserved at the top of an expanded Make-Up Pond B. Results from thermal modeling to support permitting activities reflect that this 6-ft layer would be sufficient to avoid disruption of the natural thermal stratification or turnover pattern in Make-Up Pond B; however, the thermocline will be significantly lowered in the pond during the infrequent maximum drawdowns of Make-Up Pond B.

- Usable volume to support station operations (significant droughts) 3,277 ac-ft
- 20 days usable storage as margin (worse future droughts) 1,200 ac-ft
- Dead storage volume below inlet of intake 147 ac-ft
- Volume (and depth) to protect thermocline 487 ac-ft (6 ft)
- Additional volume required in Make-Up Pond B 5,111 ac-ft

The increase in usable volume and maintaining a 6-ft protection layer at the top of the pond would be obtained by excavating much of Make-Up Pond B and adjacent land to the north to an elevation of 510 ft msl as shown in Attachment 123S-08.

Environmental Impacts

Natural Gas Combined Cycle Plant and Pipeline Upgrades

The construction of a natural gas combined cycle plant could be sited on less than 200 ac on the Lee Nuclear Station site. A majority of the plant construction could be accomplished within the area previously disturbed during construction of the Cherokee Nuclear Station. Additional area would be required for site-specific structures, systems and components such as intake structures, refill structures, raw water and refill pipelines, cooling tower blowdown and discharge pipelines, switchyard, and transmission lines. Additional area would be impacted during construction to provide construction laydown areas, spoil areas, and borrow areas. Vegetation impacted due to the construction of the natural gas combined cycle plant, four 620 MWe units, is summarized in Attachment 123S-06.

The natural gas combined cycle plant would require a new four mile pipeline to be constructed within a 70-ft wide permanent right-of-way corridor. Routing for a pipeline was not selected; therefore, impacts have not been quantified. Construction of the pipeline would require new right-of-way to be acquired from private land owners and then clearing of vegetation during construction. Temporary right-of-way of an additional 30-ft to 50-ft width would be required during construction. The pipe would be trenched into the ground, temporarily impacting streams and wetlands within the right-of-way. The 70-ft right-of-way would be maintained in an herbaceous or scrub-shrub state, permanently converting forested vegetation types, including forested wetland, to other habitat. The pipeline could fragment habitat and provide corridors for invasive species.

Additionally, the main natural gas trunkline that serves the region does not have current capacity to provide enough natural gas to operate a baseload natural gas combined cycle plant of 2480 MWe at the Lee Nuclear Site. Therefore, impacts to vegetation, wetlands, and streams would result from the 50 to 60 miles of required upgrades to trunkline pipes. This pipeline runs from the natural gas producing states along the Gulf of Mexico to the Northeast. Segments in Alabama and Georgia would need to be upgraded. Specific impacts resulting from the trunkline piping upgrades are not known. Additional piping should be able to be located within the existing right-of-way. Temporary impacts to vegetation, wetlands, and streams would result from trenching in the piping and the additional laydown areas needed for construction.

Make-Up Pond C

Construction of a Make-Up Pond C at a full pond elevation of 626 ft msl would have impacts similar in nature to those for the Lee Nuclear Station Make-Up Pond C at a full pond elevation of 650 ft msl. Make-Up Pond C at a full pond elevation of 626 ft msl would have a surface area of approximately 363 ac as shown in Attachment 123S-07. All existing man-made ponds would be drained due to dam safety issues. A dam would be constructed on London Creek at the location proposed for the Lee Nuclear Station Make-Up Pond C dam to provide the maximum volume storage to pond surface area ratio. Areas required for construction related infrastructure (spoil areas, borrow areas, etc.) would be smaller than what would be required for a pond at 650 ft msl, but would likely be on the same scale. Detailed design on these features has not been conducted, so this evaluation assumed the same construction layout as the Make-Up Pond C for the 650 ft msl pond. Impacts to vegetation, wetlands, streams, and open water due to the construction of a Make-Up Pond C for continued operation of a natural gas combined cycle plant during periods of extended drought are provided in Attachment 123S-06. Impacts to the land use and ecology would be somewhat less than those for the Lee Nuclear Station Make-Up Pond C, but would still be SMALL to MODERATE overall.

Make-Up Pond B Excavation

Expanding existing Make-Up Pond B to provide supplemental make-up water during times of drought for the Lee Nuclear Station was evaluated in the ER Supplement and Duke Energy's response to ER RAI 128 (Reference 4). Raising the height of the Make-Up Pond B dam and excavating the entire pond were evaluated to provide the supplemental storage volume. These evaluations identified flood protection concerns with raising the Make-Up Pond B dam to increase storage. Upon further evaluation, Duke Energy determined that it would not be possible to obtain the volume of storage required for the natural gas combined cycle plant while maintaining 3:1 slopes within the existing pond footprint. Therefore, Duke Energy evaluated an option to excavate the land adjacent to the northern and western shore of the pond to obtain the required storage volume. With this approach, the northern portion of Make-Up Pond B and the adjacent uplands would be excavated to 510 ft msl while maintaining 3:1 slopes. To accomplish this expansion, Make-Up Pond B would be completely drained and excavators used to obtain the required depth. Approximately 69 ac of Make-Up Pond B and 81 ac of additional area would be excavated as shown in Attachment 123S-08. Approximately 11 million cubic yards of unconsolidated material would be excavated.

If Make-Up Pond B were excavated to provide supplemental make-up water, the pond would be completely dewatered. Existing fish and other aquatic communities would be eliminated during the excavation. Removal of the surface water would substantially reduce hydrology of wetlands adjacent to Make-Up Pond B and would lead to temporary impacts. Excavation into the uplands would impact forested and non-forested communities. Impacts to vegetation due to the Make-Up Pond B excavation are provided in Attachment 123S-06.

Permanent storage would be required for the excavated material. Approximately 264 ac would be needed to place the material. Duke Energy considered whether spoil material could be placed on the Lee Nuclear Site; however, topography and proposed infrastructure constraints significantly limit the area available for stockpiling spoil materials. Owing to the large volume of spoil material (11 million cubic yards), transporting the material to offsite locations was determined to not be practical considering potential impact to traffic, local roadways, and cost. Therefore, Duke Energy evaluated stockpiling the material on the proposed Make-Up Pond C site.

Since the presentation of the spoil areas during the June 2 and 3, 2011 NRC audit, Duke Energy conducted further evaluation on the size and location of the spoil piles to account for existing site topography. Duke Energy first evaluated locating the spoil material only in uplands on the Make-Up Pond C site; however, steep onsite topography limits the use of many upland areas when considering the requirement for a minimum of 3:1 slopes. Therefore, the old agricultural fields and more disturbed streams north of London Creek (relative to those south of London Creek) were considered for stockpiling as shown in Attachment 123S-09. Additional space for laydown areas or other work space may be required in addition to the permanent spoil pile area, but have not been included for this conceptual layout. Erosion and sediment control best management practices (BMPs), such as sediment traps and basins, would need to be constructed in accordance with NPDES permit requirements.

In order to place the excavated material at the Make-Up Pond C site, a temporary haul road would need to be constructed from the Make-Up Pond B area and then cross London Creek via a temporary road crossing. A portion of the existing Rolling Mill Road could be upgraded to minimize impacts. A haul road has not been designed for this alternative. In areas where excavated material would be placed, vegetation would be cleared and topsoil would be removed to serve as cover for the spoil material. Excavated material would be placed primarily within uplands, but would also need to be placed within open water areas, streams, and wetlands due to site topography. Impacts to vegetation, wetlands, streams, and open water are summarized in Attachment 123S-06. The significant altering of the site topography and removal of forested areas would have observable effects within the watershed such as increased runoff and altered catchment areas. This could lead to changes in hydrology of the onsite streams, including London Creek. Additional incising and stream instability would likely occur.

Erosion and sediment control measures such as sediment traps and basins would be required in accordance with NPDES permits. Although such BMPs have not been designed for this alternative, they would need to be placed at the downslope areas of the stockpiles, likely within existing streams and wetlands, and potentially increasing the acreage of impact.

Impacts to land use and ecology resulting from the expansion and dredging of Make-Up Pond B and stockpiling material at the Make-Up Pond C site would be less than constructing a Make-Up Pond C for the Lee Nuclear Station, but would still be SMALL to MODERATE overall.

Summary and Conclusion

A natural gas combined cycle plant with either a Make-Up Pond C or an expanded Make-Up Pond B would have impacts to land use and ecology of SMALL to MODERATE. Creation of Make-Up Pond C and expansion of Make-Up Pond B have impacts of a similar scale, albeit somewhat different in nature. Creation of a Make-Up Pond C would have greater acreage of impact to vegetation, wetlands, and streams; however, excavating Make-Up Pond B would have greater impacts to open waters, aquatic communities and greater watershed impacts. Additionally, according to the Charleston District of the U.S. Army Corps of Engineers SOP for mitigation (Reference 8), fill impacts, such as the stockpile placement, have a greater impact to wetlands and streams than flooding due to open water creation. Duke Energy believes that the impacts to aquatic resources from the dewatering of Make-Up Pond B and watershed impacts from the placement of spoil material on the Make-Up Pond C site would have greater overall impact to land use and ecological resources than creating Make-Up Pond C. Therefore, Duke Energy is including a Make-Up Pond C at full pond elevation 626 ft msl for supporting a natural gas combined cycle alternative in revisions to the ER (Attachment 114S-01).

Additional environmental impacts (e.g. air quality, socioeconomics) from the construction of a natural gas combined cycle alternative are discussed in the revisions to the ER (Attachment 114S-01). As shown on Table 9.2-3 (Attachment 123S-10), the scale of impacts for land use and ecology are the same for the Lee Nuclear Station and the natural gas combined cycle alternative.

Air quality impacts for the natural gas combined cycle alternative are MODERATE, while air quality impacts for the Lee Nuclear Station are SMALL. The natural gas combined cycle alternative has a less beneficial socioeconomic effect, MODERATE (Beneficial), than the Lee Nuclear Station, LARGE (Beneficial). Therefore, the natural gas combined cycle alternative would not result in an appreciable reduction in environmental impacts and would not be an environmentally preferable alternative.

References:

1. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2008.12-11, dated December 12, 2008 (ML083510883)

2. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2009.03-14, dated March 18, 2009 (ML090790314)

3. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2010.07-08, dated July 22, 2010 (ML102070357)

4. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2010.10-09, dated October 29, 2010 (ML103070311)

5. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2010.12-01, dated December 17, 2010 (ML103550032)

6. Letter from B.J. Dolan to Document Control Desk, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019, *AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Request for Additional Information,* Ltr# WLG2011.01-03, dated January 26, 2011 (ML110310017)

7. U.S. Federal Energy Regulatory Commission (FERC). 1996. Order Issuing New License. Project No. 2331-002, June 17, 1996

8. U.S. Army Corps of Engineers, Charleston District. 2010. Guidelines for Preparing a Compensatory Mitigation Plan (Working Draft). October 7, 2010

Associated Revisions to the Lee Nuclear Station Combined License Application:

1. Revisions to Environmental Report, Subsection 9.2.2
2. Revisions to Environmental Report, Subsection 9.2.3.2
3. Revisions to Environmental Report, Table 9.2-4
4. Revisions to Environmental Report, Table 9.2-5
5. Revisions to Environmental Report, Subsection 9.2.3.1
6. Revisions to Environmental Report, Table 9.2-3

Attachments:

Attachment 48S-01	Revisions to Environmental Report, Subsection 9.2.2
Attachment 114S-01	Revisions to Environmental Report, Subsection 9.2.3.2
Attachment 114S-02	Revisions to Environmental Report, Table 9.2-4
Attachment 114S-03	Revisions to Environmental Report, Table 9.2-5
Attachment 123S-01	Revisions to Environmental Report, Subsection 9.2.3.1
Attachment 123S-02	Figure 1. 2480 MW Combined Cycle Plant Water Usage Impact on Water Surface Elevations of Make-Up Ponds with Refill from the Broad River (85-year record) with Future Water Demands
Attachment 123S-03	Figure 2. 2480 MW Combined Cycle Plant Water Usage on Water Surface Elevations of Make-Up Ponds with Refill from the Broad River (1954 – 1956 drought) with Future Water Demands
Attachment 123S-04	Figure 3. 2480 MW Combined Cycle Plant Water Usage Impact on Water Surface Elevations of Make-Up Ponds with Refill from the Broad River (1999 – 2002 drought) with Future Water Demands
Attachment 123S-05	Figure 4. 2480 MW Combined Cycle Plant Water Usage Impact on Water Surface Elevations of Make-Up Ponds with Refill from the Broad River (2007 – 2009 drought) with Future Water Demands
Attachment 123S-06	Table 2. Environmental Impacts Considering a Natural Gas Combined Cycle Plant.
Attachment 123S-07	Figure 5. Make-Up Pond C Full Pond Elevation 626 Ft. MSL – Footprint and Water Depths
Attachment 123S-08	Figure 6. Make-Up Pond B Excavation
Attachment 123S-09	Figure 7. Possible Spoil Locations at Make-Up Pond C Site.
Attachment 123S-10	Revisions to Environmental Report, Table 9.2-3

Attachment 48S-01

Revisions to Environmental Report
Subsection 9.2.2

1. Revise COLA, Part 3, ER Chapter 9, Subsection 9.2.2, Page 9.2-5, as follows:

Conventional Technologies (technologies in common use):

Baseload Technologies

800 MW class Supercritical Coal (Greenfield)

2-1117 MW Nuclear units, AP1000

~~2410~~ 2480 MW Natural Gas Combined Cycle

Peak / Intermediate Technologies

4-160 MW Combustion Turbines – GE 7FA

460 MW Unfired + 40 MW Inlet Chilling Combined Cycle - 7FA

460 MW Unfired + 120 MW Duct Fired + 40 MW Inlet Chilling Combined Cycle – 7FA

2. Revise COLA, Part 3, ER Chapter 9, Subsection 9.2.2, Page 9.2-7, as follows:

Existing manufacturers' standard-sized units include a natural-gas-fired combined-cycle plant of ~~482~~ 620 MW net capacity, consisting of two ~~172~~ 160 MW natural gas turbines ~~(e.g., General Electric Frame 7FA)~~ and ~~138~~ 300 MW of heat recovery capacity. Duke Energy assumed ~~five 482~~ four 620 MWe units, having a total capacity of ~~2410~~ 2480 MWe, as the natural-gas-fired alternative at the Lee Nuclear Site capacity of two AP1000 units. The total generation from this replacement power source is ~~2410~~ 2480 MWe and would only slightly overestimate the impacts from an exact replacement of Lee Nuclear Station Units 1 and 2. Table 9.2-4 shows the amounts of the ~~2410~~ 2480 MWe natural gas-fired plant emissions. Table 9.2-5 presents the assumed basic operational characteristics of the natural-gas-fired units. For the purposes of analysis, Duke Energy has assumed that there would be sufficient natural gas availability.

Attachment 114S-01

Revisions to Environmental Report

Subsection 9.2.3.2

1. Revise COLA, Part 3, ER Chapter 9, Subsection 9.2.3.2 as follows:

9.2.3.2 Natural Gas Generation (Combined Cycle)

A ~~482~~ 620 MWe NGCC unit has been identified as a probable standard size unit to be used. This alternative would require ~~five 482~~ four 620 MWe units to adequately replace the Lee Nuclear Station's generating capacity. The total generation from this replacement power source is ~~2410~~ 2480 MWe and would ~~only~~ slightly overestimate the impacts from an exact replacement of the Lee Nuclear Station's ~~2400~~ 2234 MWe. A combined cycle natural gas plant would require supplemental make-up water during times of extended drought. In order to supply this make-up water, the combined cycle natural gas plant would require a Make-Up Pond C approximately half the surface area of that required for the operation of the Lee Nuclear Station.

The economics of combined cycle technology are largely dependent on the price of natural gas, which is highly volatile. As noted in Subsection 9.2.2, the overall cost of generating electricity from natural gas is currently higher than the costs for nuclear generation ($0.0353/kWh vs. $0.0266/kWh).

Construction of a natural gas pipeline from the plant location to a supply point where a firm supply of gas is available would be needed. There is currently no gas pipeline to the Lee Nuclear Site. A combined cycle natural gas plant would require the construction of approximately 4 miles of pipeline in a new corridor. Additionally, the existing trunkline in the region does not currently have enough capacity to support the operation of a natural gas combined cycle plant. Pipeline upgrades would be necessary and would likely include looping in approximately 50 to 60 mi of new pipe within the existing corridor. The existing right-of-way would likely be able to accommodate this line. It is anticipated that the environmental impacts of constructing a gas pipeline to the Lee Nuclear Site would be similar to those associated with constructing a new transmission line right-of-way. Soil impacts from construction of the natural gas pipeline are considered ~~MODERATE~~ SMALL because of the disturbance to the topsoil along its route.

The overall impacts associated with the construction and operation of the natural-gas-fired alternative using a closed-cycle cooling system are summarized in Table 9.2-3 and discussed in the following subsections.

9.2.3.2.1 Water Use and Quality

A trade-off of water quality impacts would be associated with a large baseload NGCC plant. Though water requirements are less for combined cycle plants than for conventional steam electric plants, the site would require the construction of a new intake structure to provide water needs for the facility. New base gas combined cycle units would likely utilize closed-loop cooling towers. Because water requirements for combined cycle generation are less than for conventional steam electric generation, evaporation from combined cycle cooling towers would be less than the anticipated evaporation associated with the Lee Nuclear Station's cooling tower system. Sediment caused by construction activities ~~would~~ could impact adjacent waters. Plant discharges would comply with all appropriate permits. No low-level radioactive waste discharges to surface water are associated with a combined cycle unit. The overall impacts are characterized as SMALL.

9.2.3.2.2 Waste Management

The solid waste generated from this type of facility would be minimal. The only significant waste would be from spent SCR catalyst used for NO_x control. The SCR process would generate approximately 1500 cubic feet (cu. ft.) of spent catalyst material per year. The overall impacts are characterized as SMALL.

9.2.3.2.3 Air Quality

Natural gas is a relatively clean-burning fuel. The combined-cycle operation is highly efficient (60 percent versus 33 percent for the coal-fired alternative) because the heat recovery steam generator does not receive supplemental fuel. The natural-gas-fired alternative would release similar types of emissions, but in lesser quantities than the coal-fired alternative, and in much larger quantities than the nuclear alternative.

The largest environmental impact from this type of facility would result from the air emissions. The emissions resulting from burning natural gas only would be ~~195.2~~226.0 T. per year of SO_2, ~~7465~~8642 T. per year of NO_x, ~~379~~438.8 T. per year of particulate matter (PM), and ~~1723~~1994 T. per year of carbon monoxide (CO). A facility of this size would add ~~6,316,591~~7,312,568 T. per year of CO_2 to the environment. Assumptions and calculations for these emissions are provided in Table 9.2-5 and Table 9.2-4 respectively. The overall impacts are characterized as MODERATE.

9.2.3.2.4 Other Impacts

Land - ~~Use of the Lee Nuclear Site for a natural-gas-fired combined cycle plant would require no new lands.~~ A major combined cycle generation station can be located on less than 200 ac on the Lee Nuclear Site. A Make-Up Pond C would be required to provide supplemental water to the combined cycle generation station during periods of extended drought. Make-Up Pond C would be approximately 363 acres and would also include additional area for the main dam, stockpiles, laydown areas, temporary haul roads, and other ancillary features similar to what is required for the construction of Make-Up Pond C for the Lee Nuclear Station.

One obstacle to the consideration of combined cycle generation using only natural gas is the availability of the gas. Based on current technology, a facility of this size would require in excess of 100 billion cu. ft. per year of natural gas. If legislation is passed~~,~~ requiring the reduction of CO_2 levels, increased use of natural gas in the generation mix would be required in order to meet these standards, resulting in reduced availability of natural gas. There are four natural gas pipelines, all located in the same right-of-way, approximately 4 mi. northwest of the site. A large, new baseload combined cycle facility would require extending one or more of the existing gas pipelines to the site, which would disturb significant acreage between the right-of-way and the plant site. Additionally, the existing gas pipelines do not have adequate capacity to provide sufficient fuel for a natural gas-fired combined cycle plant. Approximately 50 to 60 mi of pipeline would need to be upgraded and would involve temporary impacts to land. ~~This assumes that the current gas supply is adequate to fuel a new facility along with the current users. If these lines do not have adequate capacity to service the current users as well as the new site, a new pipeline would need to be run, which would have a larger impact than assumed here. The overall impacts are characterized as MODERATE.~~

NUREG-1437 estimated that approximately 3,600 ac. of land would be required for wells, collection stations, and pipelines to bring the natural gas to a 1,000-MWe NGCC facility. For a NGCC facility of 2480-MWe, the additional land would be 8,928 ac. Overall, the land-use impacts from a natural gas-fired combined cycle facility would be SMALL to MODERATE.

Ecology - Locating a new combined cycle facility at the Lee Nuclear Site would alter the ecology. On-site impacts would likely not be as significant as with coal-fired generation due to the smaller footprint requirement. A smaller Make-Up Pond C to support natural-gas-fired combined cycle facility operation would impact less vegetation, wetlands, and streams than Make-Up Pond C for the Lee Nuclear Station; however, impacts to the resources would still be noticeable and on the same scale. Impacts from a new intake (impingement and entrainment) and discharge (waste heat to a receiving water body) would be created. ~~However,~~ Ecological impacts created by new gas transmission needs could create significant off-site issues. Impacts would include wildlife habitat loss and reduced productivity, and could include habitat fragmentation and a local reduction in biological diversity. ~~Impacts from a new intake (impingement and entrainment) and discharge (waste heat to a receiving water body) would be created.~~ These ecological impacts would vary depending upon the corridor selected for the gas pipeline and the locations of the trunkline upgrades. However, the overall impacts are characterized as SMALL to MODERATE.

Human Health - A new combined cycle power plant introduces small risks to workers and the public. The generic environmental impact statement (GEIS) analysis noted that there could be human health impacts from the inhalation of toxins and particulates. Regulatory agencies, such as the EPA, have established regulatory requirements for power plant emissions and discharges to protect human health. A new combined cycle plant would comply with these regulatory requirements. The overall impacts are characterized as SMALL.

Socioeconomics - Construction of a major combined cycle plant would take approximately 2 – 3 years. Construction of a new combined cycle station of this size would employ a construction workforce of approximately 800, which would stimulate the economy of the region. The surrounding communities would experience demands on housing and public services. After construction, the workers would leave, and the operating plant would provide new jobs. However, long-term job opportunities would be less than for a coal-fired station and substantially less than those during operation of the Lee Nuclear Station.

Operational impacts could result in moderate socioeconomic benefits in the form of jobs, tax revenue, and plant expenditures. However, by comparison, these benefits will be less than those achieved through operation of the Lee Nuclear Station.

The size of the construction workforce for a combined cycle plant and plant-related spending during construction could be substantial. Operational impacts, once the combined cycle plant is constructed, would result in approximately 807 fewer jobs available to the regional economy (Lee Nuclear Station Units 1 and 2 would employ 957 workers compared to a projected 150 for the combined cycle plant). The overall impacts are characterized as ~~MODERATE~~ SMALL (Adverse) to MODERATE (Beneficial).

Aesthetics - The ~~five~~ four power plant units with their approximately ~~200-ft~~ 160-ft stacks could be visible at a distance of several miles. Combined cycle generation would introduce additional mechanical sources of noise that would be audible off-site. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment (e.g., combustion turbine units and mechanical-draft cooling towers) associated with normal plant operations. Intermittent sources include the equipment related to ammonia handling and solid waste disposal. Noise levels associated with a combined cycle generation facility are expected to be similar to those of a nuclear facility as discussed in Subsection 5.8.1.5. The overall impacts are characterized as SMALL ~~to MODERATE~~.

Cultural Resources - The GEIS analysis concluded that impacts to cultural resources would be relatively small unless important site-specific resources were affected. Construction impacts would be similar to those for construction of two nuclear units, which have been discussed and evaluated for the Lee Nuclear Site in Subsections 2.5.3 and 4.1.3. The overall impacts are characterized as SMALL.

Environmental Justice - Environmental justice effects depend upon the nearby population distribution. Construction activities offer new employment possibilities, but have negative effects on the availability and cost of housing, which disproportionately affects low-income populations. The overall impacts are characterized as SMALL.

9.2.3.2.5 Conclusion

A natural gas-fired combined cycle facility would be a viable replacement for Lee Nuclear Station baseload generation. Land-use and ecology impacts for the natural gas-fired combined cycle facility would be less than the Lee Nuclear Station but would be a similar scale of impact. However, the air quality~~, land, ecology, socioeconomic,~~ ~~and aesthetic~~ impacts would be greater than the impacts from construction and operation of the Lee Nuclear Station. Socioeconomic effects would not be as beneficial as effects from the construction and operation of the Lee Nuclear Station; therefore, socioeconomic impacts would be greater with the natural gas-fired combined cycle alternative.

Duke Energy concludes that a natural gas-fired combined cycle facility is not an environmentally preferred alternative to the chosen resource, the Lee Nuclear Station.

Attachment 114S-02

Revisions to Environmental Report

Table 9.2-4

TABLE 9.2-4
AIR EMISSIONS FROM GAS-FIRED ALTERNATIVE

Parameter	Result
Annual Gas Consumption	~~2,404,470~~2,783,598 T. per year
Annual BTU Input	~~114,847,104~~132,955,776 MMBtu per year
SO_2	~~195.2~~226.0 T. SO_2 per year
NO_x	~~7465~~8642 T. NO_x per year
CO	~~1723~~1994 T. CO per year
PM	~~379~~438.8 T. PM per year
PM_{10}	~~109~~126.3 T. filterable PM_{10} per year
CO_2	~~6,316,591~~7,312,568 T. CO_2 per year

Notes:

Btu	British thermal unit
CO	Carbon monoxide
CO_2	Carbon dioxide
kWh	Kilowatt hour
lb.	Pound
MW	Megawatt
NO_x	Oxides of Nitrogen
PM	Particulate Matter
PM_{10}	Particulates having diameter less than 10 microns
SO_2	Sulfur dioxide
T.	Ton
yr.	Year

Attachment 114S-03

Revisions to Environmental Report

Table 9.2-5

TABLE 9.2-5
GAS-FIRED ALTERNATIVE CHARACTERISTICS
(Sheet 1 of 2)

Characteristic	Basis
Unit size = ~~482~~620 MW ISO rating net Two ~~112~~160 MW-combustion turbines ~~138~~300 MW-heat recovery boiler	Standard size (Duke Energy experience)
Number of units = ~~5~~4	Approximate capacity to replace ~~2400~~2234 MWe net (twin AP1000 units)
Fuel type = natural gas	Assumed
Fuel heating value = 23,882 Btu/lb (HHV)	Typical for natural gas used in NC (Duke Energy experience)
SO_2 Emission Factor = 0.0034 lb/MMBtu	Used when sulfur content is not available
NOx control = selective catalytic reduction (SCR) with water injection	Best available for minimizing NOx emissions
Fuel NOx Emission Factor = 0.13 lb/MMBtu	SCR control in conjunction with water-steam injection (Reference 15, Table 3.1-1)
Fuel CO_2 Emission Factor = 110 lb/MMBtu	Based on 99.5% conversion of fuel carbon to CO_2 (Reference 15, Table 3.1-2a)
Fuel CO Emission Factor = 0.03 lb/MMBtu	SCR control in conjunction with water-steam injection (Reference 15, Table 3.1-1)
Heat rate = 6800 Btu/kWh	Typical for combined cycle gas-fired turbines (@ ISO)
Capacity factor = 0.~~8~~9	Typical for baseload units in Integrated Resource Planning (IRP) models

TABLE 9.2-5
GAS-FIRED ALTERNATIVE CHARACTERISTICS
(Sheet 2 of 2)

Notes	
Net	The difference between "net" and "gross" is electricity consumed on-site.
Btu	British thermal unit
ISO Rating	International Standards Organization rating at standard atmospheric conditions of 59°F 60% relative humidity and 14.696 lb. of atmospheric pressure per sq. in.
kWh	Kilowatt hour
MM	Million
MW	Megawatts
MWe	Megawatts electric
NOx	Nitrogen oxides
HHV	High Heating Value

Attachment 123S-01

Revisions to Environmental Report
Subsection 9.2.3.1

1. Revise COLA, Part 3, ER Chapter 9, Subsection 9.2.3.1, Paragraph 2, as follows:

For purposes of this analysis, Duke Energy defined the pulverized coal-fired alternative as consisting of four conventional boiler units, each with a net capacity of 530 MW for a combined capacity of 2120 MW. This coal-fired alternative, for purposes of this analysis, is located at the proposed project site. The coal-fired alternative would require supplemental make-up water during periods of extended drought in amounts similar to the Lee Nuclear Station and would therefore require a Make-Up Pond C similar in size. Table 9.2-1 presents the assumed basic operational characteristics of the coal-fired units.

2. Revise COLA, Part 3, ER Chapter 9, Subsection 9.2.3.1.3, Paragraphs 1 through 5, as follows:

Land - In NUREG-1437, the NRC staff estimated that approximately 1700 ac. are needed for a 1000-MW coal-fired plant. Duke Energy experience indicates that a 2120-MWe coal-fired plant requires approximately 2000 ac. This area includes land for the coal pile, a limestone pile, an ash and scrubber solids disposal area, and plant buildings and structures, but it does not include land for an associated coal mine, access road, and railroad spur. Construction of a 2120-MWe coal-fired plant would also require the construction of a Make-Up Pond C to provide supplemental make-up water during times of extended drought. A Make-Up Pond C for a 2120-MWe coal-fired plant would be similar in size to the Make-Up Pond C required for the Lee Nuclear Station and would have similar land impacts.

NUREG-1437 estimated that approximately 22,000 ac. of land are affected for mining the coal and disposing of the waste to support a 1000-MW coal-fired plant during its operational life. A replacement 2120-MWe coal-fired plant to substitute for the proposed project affects approximately 46,640 ac. of land.

Construction of the alternative permanently changes the land use at the site, and most likely involves an irretrievable but moderate loss of forest land and/or farmland. No significant effects to plant site soils are anticipated because of the use of erosion control practices during and following construction.

The effect of the coal-fired alternative on land use is best characterized as SMALL to MODERATE, similar to the proposed project.

Ecology - The coal-fired generation alternative introduces construction effects and new incremental operational effects. Even assuming siting at a previously disturbed area, the effects alter the ecology. Ecological effects to a plant site and utility easements include effects on ~~threatened or endangered species,~~ wildlife habitat loss, reduced wildlife reproduction, habitat fragmentation, and a local reduction in biological diversity. The construction of a Make-Up Pond C has ecological impacts similar to that of the Make-Up Pond C for the Lee Nuclear Station. Use of cooling makeup water from a nearby surface water body has adverse aquatic resource effects. If needed, maintenance of a transmission line and a rail spur has ecological effects. There are effects to terrestrial ecology from cooling tower drift. Overall, the ecological effects are SMALL to MODERATE, similar to the proposed project.

3. Revise COLA, Part 3, ER Chapter 9, Subsection 9.2.3.1.3, Paragraph 23, as follows:

Cultural Resources - ~~Studies likely are needed to identify, evaluate, and address mitigation of the potential effects of new plant construction on historic and archaeological resources before construction begins at any site. The studies likely are needed for areas of potential disturbance at the proposed plant site and along associated corridors where new construction occurs (e.g., roads, rail lines, or other rights-of-way)~~. Cultural resource studies have been conducted at the proposed Lee Nuclear Site and Make-Up Pond C Site. Impacts from the construction of a coal-fired generation plant at the Lee Nuclear Site would be similar to those associated with the construction of the Lee Nuclear Station. Historic and archaeological resource effects can generally be effectively managed and as such are considered SMALL.

4. Revise COLA, Part 3, ER Chapter 9, Subsection 9.2.3.1.3, Paragraph 25, as follows:

Conclusion: Duke Energy identified and evaluated a coal-fired facility as an alternative to the Lee Nuclear Station and concludes that it is not an environmentally ~~superior~~ preferred alternative to the chosen resource, the Lee Nuclear Station.

Attachment 123S-02

Figure 1

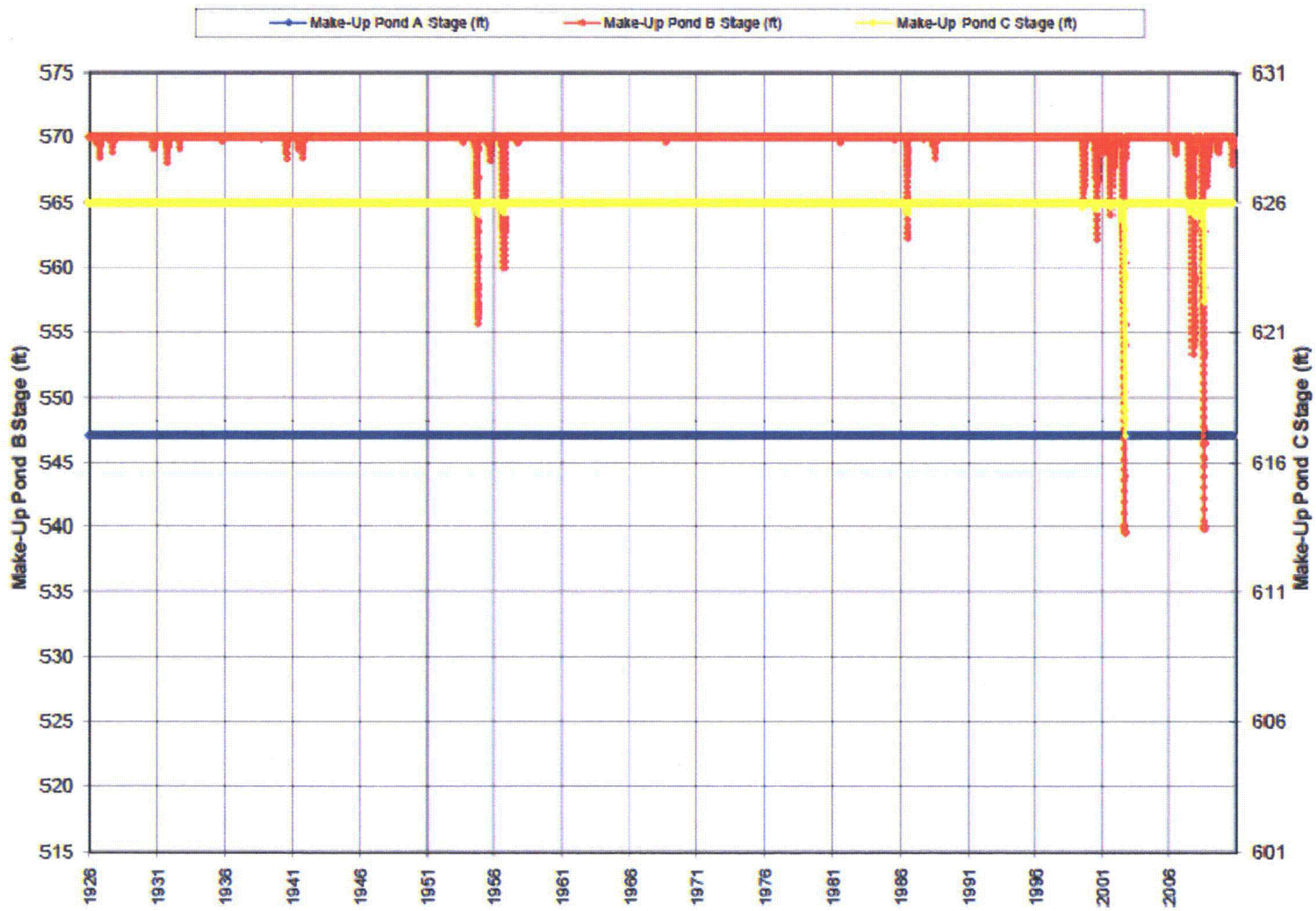
2480 MW Combined Cycle Plant

Water Usage Impact on Water Surface Elevations

of Make-Up Ponds with Refill from the Broad River

(85-year record) with Future Water Demands

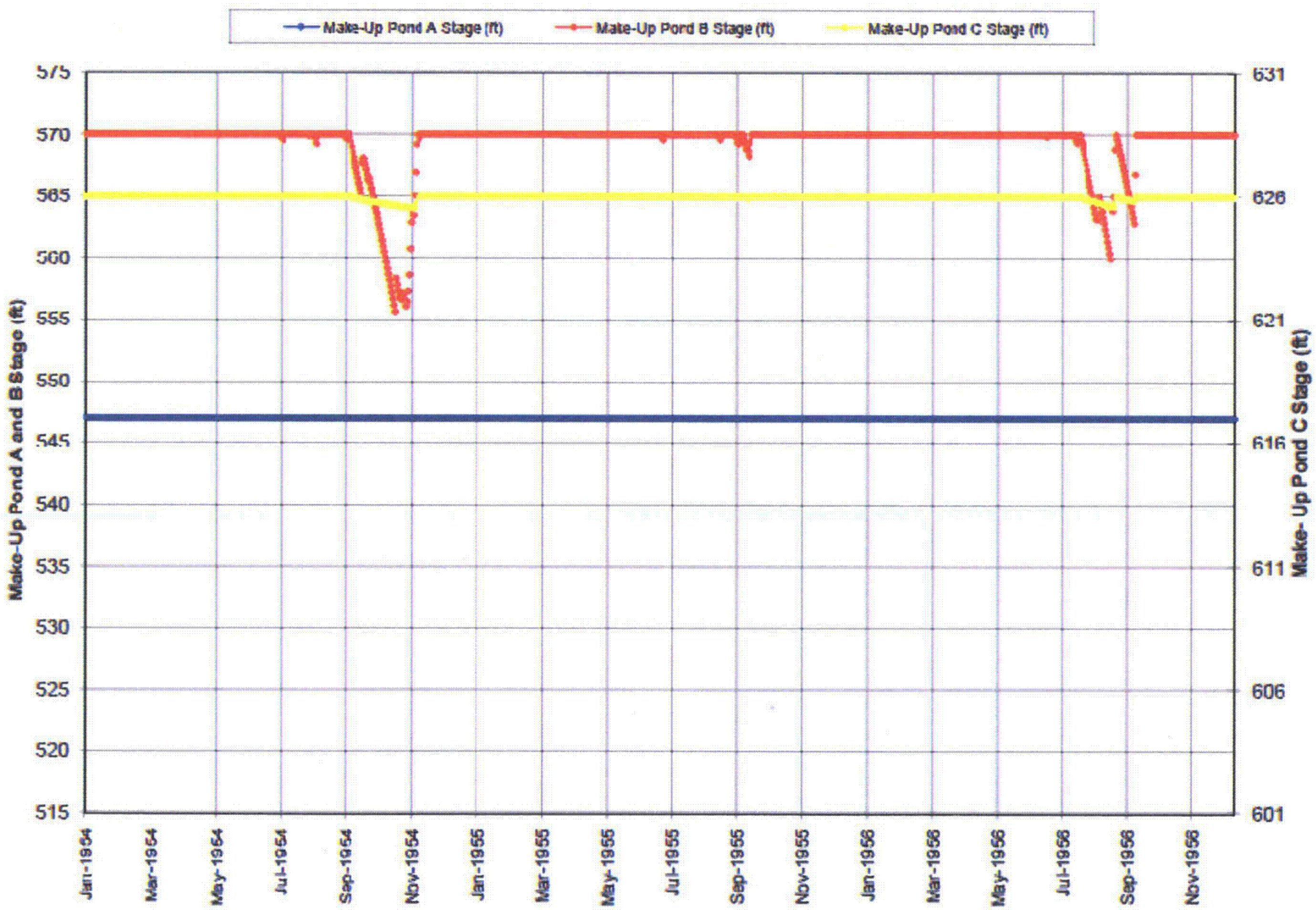
Figure 1. 2480 MW Combined Cycle Plant Water Usage Impact on Water Surface Elevations of Make Up Ponds with Refill from the Broad River (85-year record) and Future Water Demands



Attachment 123S-03

Figure 2
2480 MW Combined Cycle Plant
Water Usage on Water Surface Elevations
of Make-Up Ponds with Refill from the Broad River
(1954 – 1956 Drought) with Future Water Demands

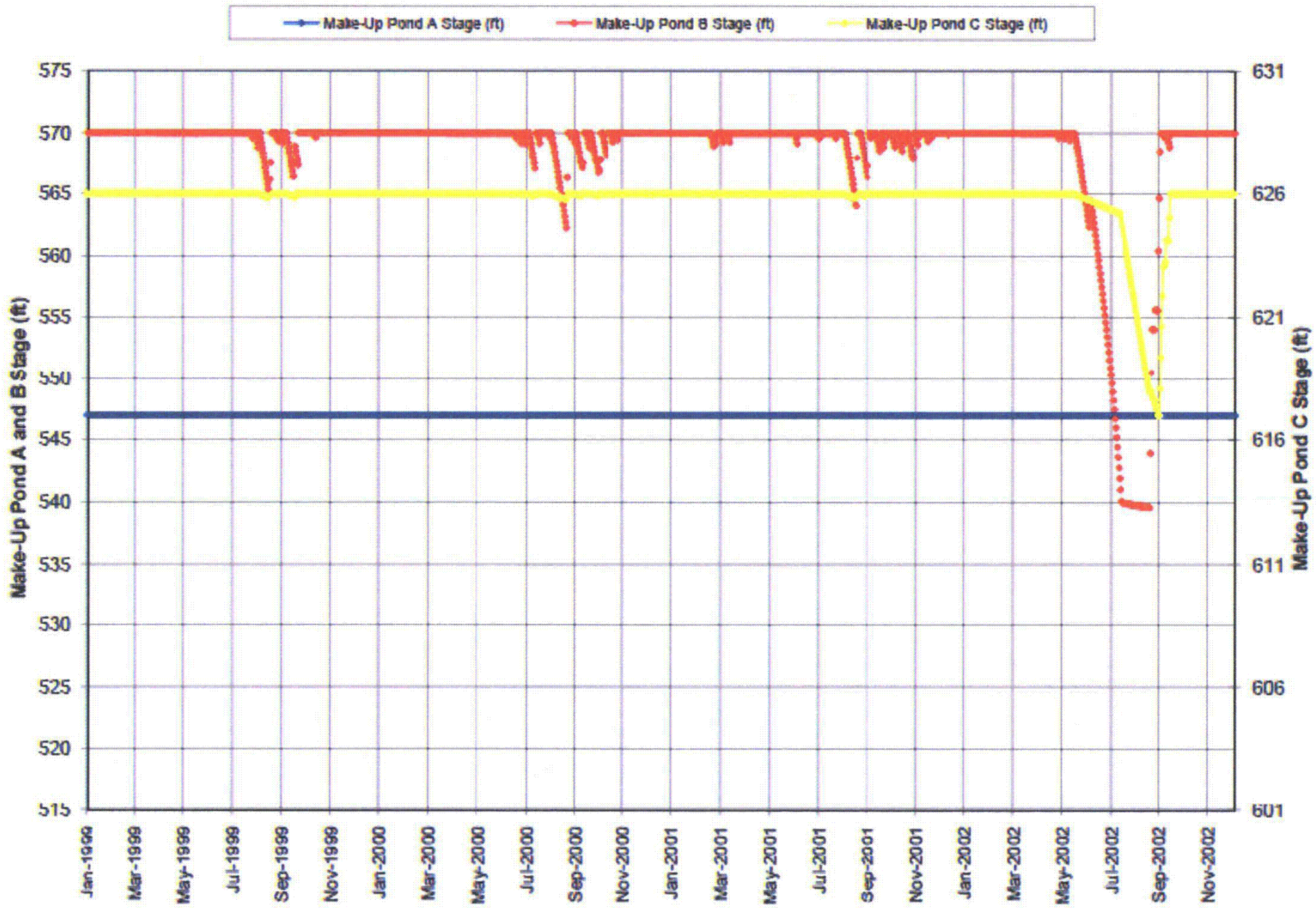
Figure 2. 2480 MW Combined Cycle Plant Water Usage Impact on Water Surface Elevations of Make Up Ponds with Refill from the Broad River (1954 - 1956 drought) and Future Water Demands



Attachment 123S-04

Figure 3
2480 MW Combined Cycle Plant
Water Usage Impact on Water Surface Elevations
of Make-Up Ponds with Refill from the Broad River
(1999 – 2002 Drought) with Future Water Demands

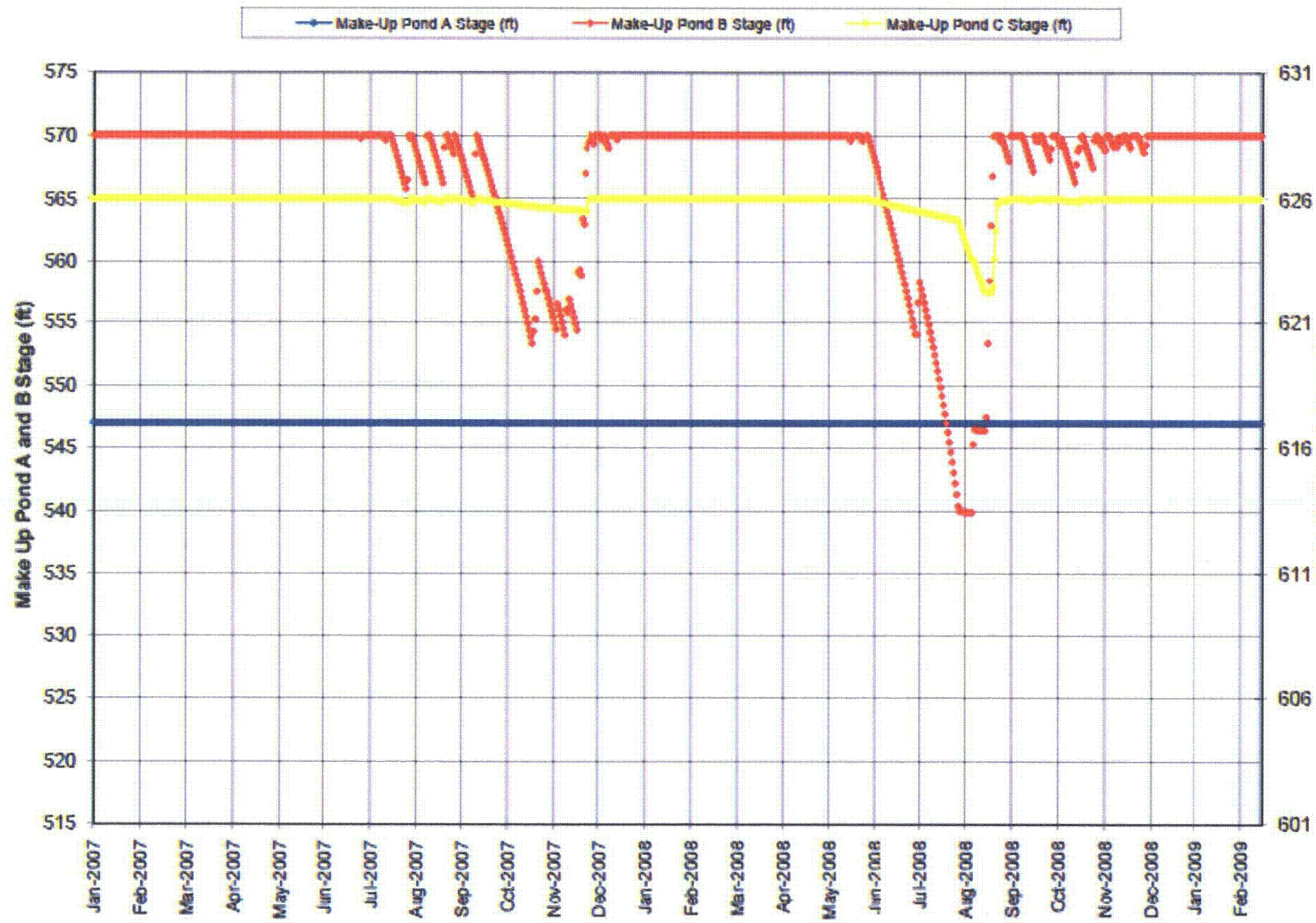
Figure 3. 2480 MW Combined Cycle Plant Water Usage Impact on Water Surface Elevations of Make Up Ponds with Refill from the Broad River (1999 - 2002 drought) and Future Water Demands



Attachment 123S-05

Figure 4
2480 MW Combined Cycle Plant
Water Usage Impact on Water Surface Elevations
of Make-Up Ponds with Refill from the Broad River
(2007 – 2009 Drought) with Future Water Demands

Figure 4. 2480 MW Combined Cycle Plant Water Usage Impact on Water Surface Elevations of Make Up Ponds with Refill from the Broad River (2007 - 2009) and Future Water Demands



Attachment 123S-06

Table 2
Environmental Impacts Considering
a Natural Gas Combined Cycle Plant

Table 2. Environmental Impacts Considering a Natural Gas Combined Cycle Plant

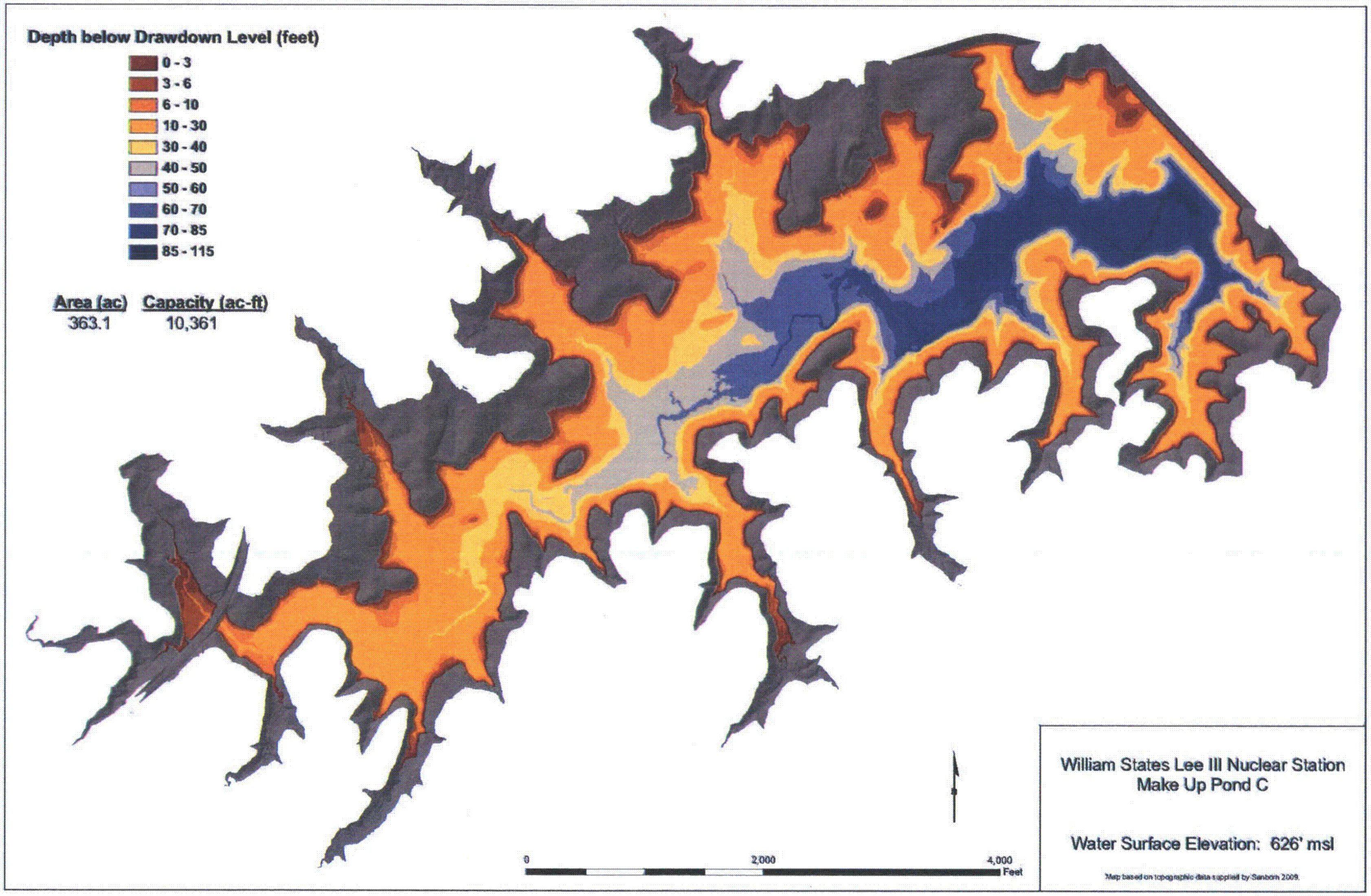
	Land Use (ac)	Cover Type										
		MH	MHP	PMH	NJW	OFM	USC	AW	OW	OPMH	P	NAW
Natural Gas Combined Cycle w/Make-Up Pond C (Full Pond Elevation 626 ft msl)												
Lee Nuclear Site	134.41	15.35	14.57	7.70	0.03	79.53	7.93	0.00	3.15	5.83	0.24	0.08
Make-Up Pond C Impact	812.83	280.48	79.98	18.41	0	222.68	14.50	0.00	16.00	0.26	180.52	0
Total	**947.24**	**295.83**	**94.55**	**26.11**	**0.03**	**302.21**	**22.43**	**0.00**	**19.15**	**6.09**	**180.76**	**0.08**
Natural Gas Combined Cycle w/Expanded Make-Up Pond B												
Lee Nuclear Site	134.41	15.35	14.57	7.70	0.03	79.53	7.93	0.00	3.15	5.83	0.24	0.08
Make-Up Pond B Impact	149.82	5.97	20.00	11.35	0.00	17.77	6.95	0.00	70.04	17.73	0.01	0.00
Spoils at Make-Up Pond C Site	264.47	66.64	13.85	0.00	0.00	151.78	0.00	0.00	14.52	0.00	17.68	0.00
Total	**548.7**	**87.96**	**48.42**	**19.05**	**0.03**	**249.08**	**14.88**	**0.00**	**87.71**	**23.56**	**17.93**	**0.08**

	Wetlands (ac)	Streams (ft)	Open Water (ac)
Natural Gas Combined Cycle w/Make-Up Pond C (Full Pond Elevation 626 ft msl)			
Lee Nuclear Site	0.03	254	2.88
Make-Up Pond C Impact	2.63	51,142	13.86
Total	**2.66**	**51,396**	**16.74**
Natural Gas Combined Cycle w/Expanded Make-Up Pond B			
Lee Nuclear Site	0.03	254	2.88
Make-Up Pond B Impact	0.00	0	70.04
Spoils at Make-Up Pond C Site	1.00	7406	11.13
Total	**1.03**	**7,660**	**84.05**

Attachment 123S-07

Figure 5
Make-Up Pond C Full Pond Elevation 626 Ft. MSL
Footprint and Water Depths

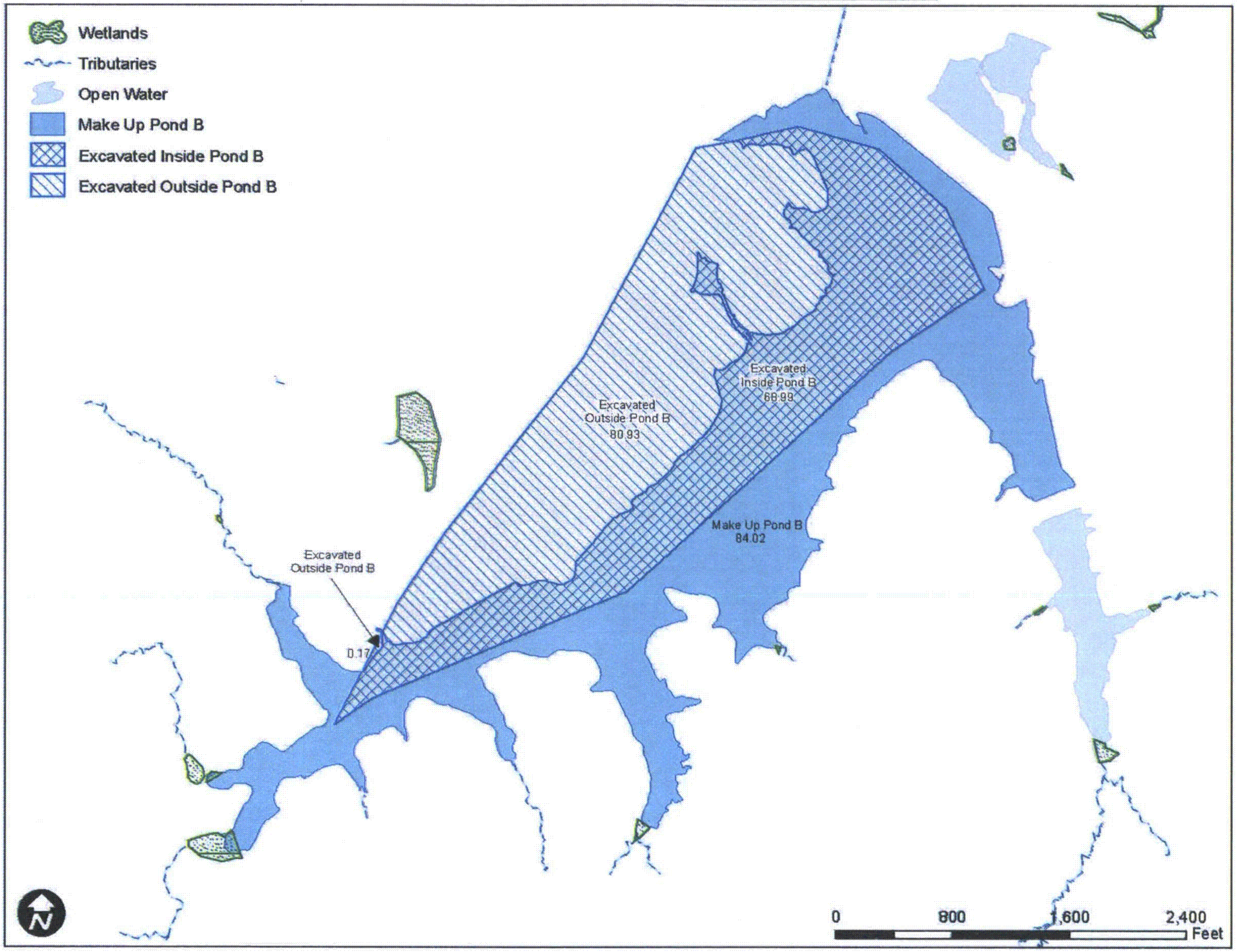
Figure 5. Make-Up Pond C Full Pond Elevation 626 Ft. MSL – Footprint and Water Depths



Attachment 123S-08

Figure 6. Make-Up Pond B Excavation

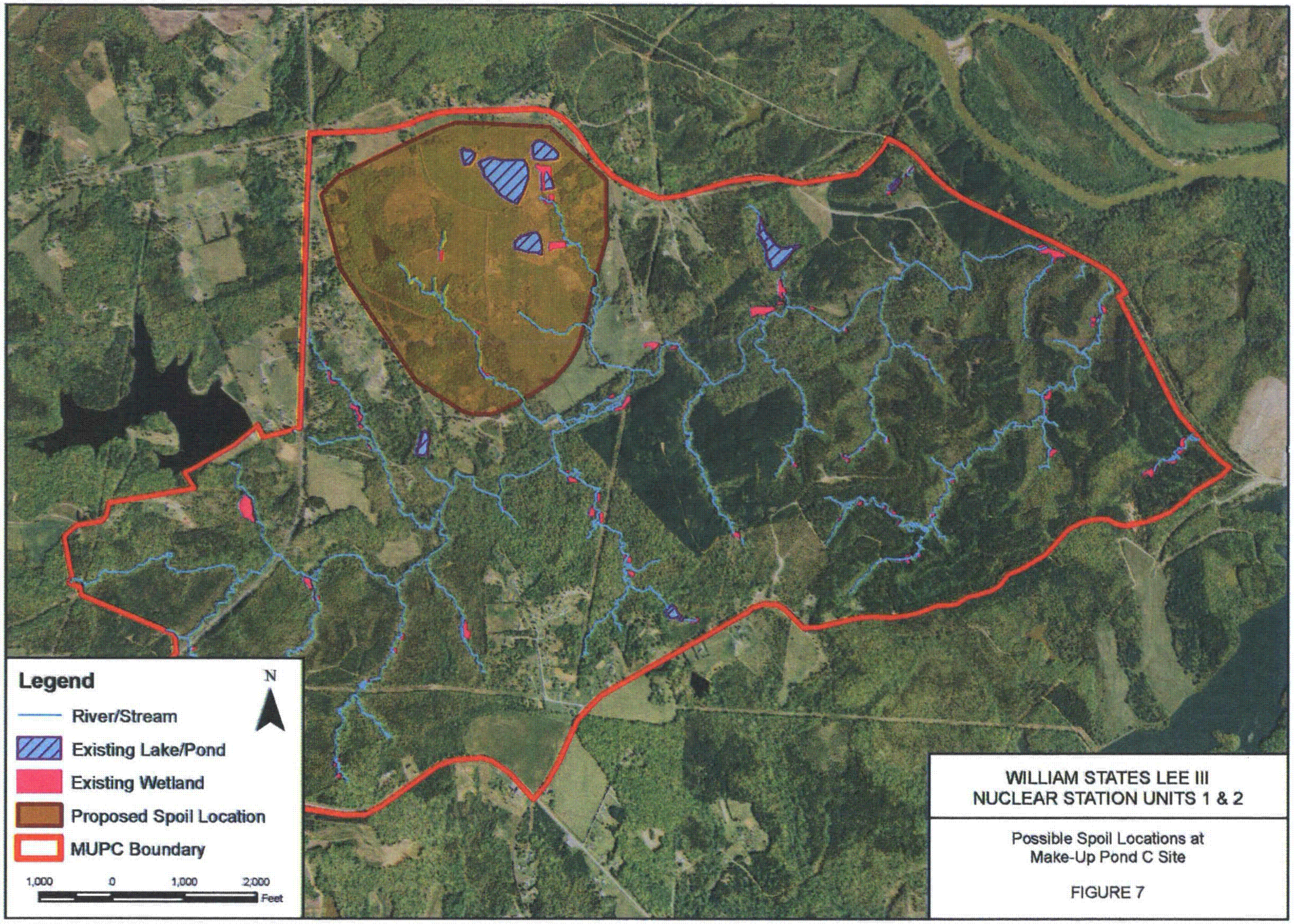
Figure 6. Make-Up Pond B Excavation



Attachment 123S-09

Figure 7
Possible Spoil Locations
at Make-Up Pond C Site.

Figure 7. Possible Spoil Locations at Make-Up Pond C Site



Attachment 123S-10

Revisions to Environmental Report

Table 9.2-3

Table 9.2-3
Comparison of the Environmental Impacts of the Coal-Fired and Natural Gas Alternatives to the Lee Nuclear Station

	Environmental Impacts		
Attribute	Lee Nuclear Station	Coal-Fired Alternative	Natural Gas Generation
Air Quality	SMALL	MODERATE	MODERATE
Waste Management	SMALL	MODERATE	SMALL
Land	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Ecology	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Water Use & Quality	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	SMALL
Socioeconomics	SMALL (Adverse) to LARGE (Beneficial	SMALL (Adverse) to LARGE (Beneficial)	SMALL (Adverse) to MODERATE (Beneficial)
Aesthetics	SMALL	SMALL	SMALL ~~to MODERATE~~
Cultural Resources	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL	SMALL