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DRAFT August 16, 2010

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North Carolina Division of Water Quality  
1617 Mail Service Center  
Raleigh, NC 27699-1617

RE: Falls Lake Nutrient Management Strategy and Proposed Rules

Dear Mr. Huisman,

I am writing to submit public comments on the proposed Falls Lake Nutrient Management Strategy and proposed rules. I have been a resident of Durham, N.C. since 1970 and am proud of progress made by North Carolina and Durham to create a clean and healthy environment and to restore and protect our ecosystems. My career experience in helping to establish standards to protect our nation's air and water—and in evaluating evidence to support decisions about these standards—convinces me that strong scientific measurements and engineering data are essential for sound decisions about complex environmental problems.

My understanding of the proposed rules is that their primary goal is to ensure that all of the lower Falls Lake below Highway 50 and a portion of the upper Falls Lake comply with North Carolina's chlorophyll-*a* standard. Stage I of the rules begins immediately and extends to 2021. The goals of the Stage I rules are to ensure that the portion of Falls Lake below Highway 50 is in compliance with the chlorophyll-*a* standard and to reduce levels of chlorophyll-*a* in the portion of Falls Lake above Highway 50. To achieve these goals, the Stage I rules require that wastewater treatment plants and agricultural sources reduce nitrogen and phosphorous by 20% and 40% respectively. Stage II of the rules begins in 2021 and extends to 2041. The goal of the Sage II rules is to bring the upper portion of Falls Lake, measured at a location near Interstate 85, into compliance with chlorophyll-*a* standards by 2041. To achieve this goal, Stage II rules require nitrogen and phosphorous reductions of by 40% and 77% respectively from 2006 levels. Compliance costs for the draft rules will not be paid by the principal beneficiaries of the Falls Lake—the City of Raleigh and Wake County—but rather by the municipalities and other sources in the upper portions of Falls Lake.

To assess the evidence that supports the nutrient management strategy and proposed rules, I have reviewed the information available from the N.C. Division of Water Quality.<sup>1</sup> This information indicates that the need

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for the proposed rules results from several tangible legal, engineering, scientific, and economic developments that have occurred since 1970, including

1. The Clean Water Act Amendments of 1972 and related North Carolina legislation such as Session Law 2005-190
2. The engineering design and environmental impact statement for Falls Lake prepared by the U.S. Army Corps of Engineers
3. The increasing scientific knowledge about causes of, and potential solutions to, environmental water quality problems in the Falls Lake
4. The economic and benefits and costs of improving water quality in Falls Lake

Based on my review of this information (which is organized in the four sections on the following pages), I have several comments about the draft rules

- Because available monitoring data and nutrient-response models do not demonstrate conclusively that the draft rules can be attained, the Environmental Management Commission should direct the N.C. Division of Water Quality to take advantage of the flexibility provided in Section 303d of the Clean Water Act Amendments of 1972 —either to develop separate water quality standards for the upper portion of Falls Lake or to conduct a “use attainability analysis” that demonstrates that the North Carolina chlorophyll-*a* standard should be modified for Falls Lake.
- The proposed rules should incorporate all the provisions of the *Consensus Principles* agreed to by most of the local governments in the Falls Lake watershed.
- Because of substantial inequities across the watershed between the economic benefits and costs of the draft rules—as well as the significant cost of the Stage II rules— the Environmental Management Commission should ask the North Carolina legislature to consider approaches to equalize benefits and costs—especially approaches that enable the City of Raleigh to share a substantial portion of the costs to attain chlorophyll-*a* standards in the upper portion of Falls Lake.

### **1.0 The Clean Water Act Amendments of 1972 and related North Carolina Legislation**

The Federal Water Pollution Control Act Amendments of 1972 are the foundation for protecting our nation’s water resources. For thirty years after adoption, these 1972 amendments focused water quality management on upgrades to public and private wastewater treatment plans based on nationally established point-source effluent standards, which were set at a national level based on best available technologies (BAT) for wastewater treatment. By the 1990s, EPA, State agencies, and environmental groups realized that despite

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substantial improvements in wastewater treatment plants, thousands of water bodies across the nation were in violation of ambient water quality standards. This resulted in a new water quality management focus on Section 303d of the 1972 Clean Water Act Amendments, which requires states to (a) identify and list waters not meeting ambient water quality standards, (b) define the pollutants and the sources responsible for the degradation of each listed water, (c) establish total maximum daily loads (TMDLs) necessary to attain those standards, and (d) allocate responsibility to sources for reducing their pollutant releases. Significantly, Section 303d allows states flexibility to develop separate water quality standards for individual water bodies and for individual segments of water bodies.

Under the Federal Water Pollution Control Act Amendments of 1972, the purpose of developing nutrient standards is to protect aquatic life and recreational uses of water in lakes and reservoirs such as Falls Lake. As noted above, states have flexibility in setting nutrient standards and some states have adopted approaches to setting standards that differ significantly from North Carolina's approach. North Carolina chose to adopt a chlorophyll-*a* standard of 40 micrograms/liter ( $\mu\text{g}/\text{L}$ ). This North Carolina standard is not related to any requirements in the Safe Drinking Water Act of 1974 to regulate the public's drinking water supply. In other words, attainment of a chlorophyll-*a* standard throughout Falls Lake is not related to federal or state drinking water standards for Raleigh's drinking water supply.

Within North Carolina, in 2005 the General Assembly passed Session Law 2005-190. This law requires the Environmental Management Commission (EMC) to: study drinking water supply reservoirs, develop nutrient control criteria to manage these reservoirs, and prepare a nutrient management strategy for certain reservoirs (including Falls Lake). North Carolina has not taken advantage of the flexibility allowed in Section 303d to develop separate water quality standards for individual water bodies or water body-segments. North Carolina water quality standards were developed about thirty years ago, and did not consider important factors such as whether the design of constructed lakes and reservoirs impedes or prevents the attainment of water quality standards.

## **2.0 The engineering design for Falls Lake and resulting environmental impacts**

According to the U. S. Army Corps of Engineers (ACE)<sup>2</sup> Falls Lake was originally constructed for the purposes of water supply, flood protection, water quality control, and recreation in the Neuse River Basin. One of the principle objectives of the design—water supply— primarily benefits the City of Raleigh and surrounding towns in Wake County in the “lower” portion of Falls Lake. From the dam located just outside Raleigh, Falls Lake stretches about 22 miles upstream to the confluence of the Eno, Flat, and Little Rivers near Durham.

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Consistent with the ACE design, Falls Lake drains a watershed area of about 494,600 acres (about 770 square miles). When Falls Lake is full, the water surface covers about 12,500 acres.

The ACE design for Falls Lake indicates that some portions of upper portions Falls Lake will not be covered with water in the summer. This outcome results from several factors acknowledged in the ACE design: the reduced summer stream flow into Falls Lake, meteorological trends which result in periodic drought conditions and further reduce summer stream flow, and the extremely shallow depth selected for the upper portions of Falls Lake. In the summer, these design factors contribute to eutrophic conditions in the upper portion of Falls Lake, to increased algal production and density, and to increased chlorophyll-*a* production in the upper shallow portions of Falls Lake. In contrast, the lower portions of Falls Lake near Raleigh and Wake County are deeper, retain water year-round, and—because of increased water depth—have beaches and boat facilities that support recreational uses such as swimming and fishing.

Construction of Falls Lake was completed in 1981, and the dam was closed to begin to impounding water in 1983. The lake reached its design depth in late 1983—and four years of water quality monitoring commenced to measure the actual water quality related to the ACE design. Water quality monitoring reports indicate that upper portions of the Falls Lake exceeded the chlorophyll-*a* standard of 40 µg/L from 1983 – 1987<sup>3,4,5</sup> and periodically in subsequent years. The lower portion of Falls Lake closest to Raleigh and Wake County did not exceed the chlorophyll-*a* standard.

### **3.0 Increasing scientific and engineering knowledge about environmental water quality problems**

The scientific, engineering, and economic analyses developed to analyze the Falls Lake water quality<sup>1</sup> illustrate some of the knowledge developed in North Carolina about water quality management during the past thirty years. This information indicates that agricultural land is the largest contributor of nitrogen and phosphorous and that forests contribute about the same amount of nitrogen (21%) as wastewater treatment plants do (22%). State water quality monitoring reports demonstrate that, from the first year Falls Lake began operation, the upper portion of Falls Lake was not able to meet the chlorophyll-*a* standard. State water quality monitoring reports demonstrate that the portion of Falls Lake near Raleigh attained the chlorophyll-*a* standard from the first year of the lake's operation and has continued to do so.

State water quality models demonstrate that it may not possible for the upper portion of Falls Lake to meet nutrient or chlorophyll-*a* standards. For example, State water quality models demonstrate that even if all cities, towns, and agricultural lands in the upper portion of Falls Lake were reforested and wastewater

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treatment plants were removed, a large portion of the upper Falls Lake would not be able to comply with nutrient and chlorophyll-*a* standards.

Unfortunately, the information and analyses available from the N.C. Division of Water Quality do not identify or verify the key cause-effect relationships that are essential to demonstrate attainment of the Falls Lake nutrient management strategy and the proposed rules. Without clear identification and verification of the key cause-effect relationships, it is simply not possible to demonstrate with reasonable certainty that implementing the draft rules will achieve the intended water quality management outcomes.

Furthermore, the information and analyses available from the N.C. Division of Water Quality do not conclusively demonstrate that the upper portion of Falls Lake does have a large impact on the lower portion of the lake. The numerous causeways and constructions in the upper portion of the lake form subareas in the lake. These factors— coupled with the long length of the lake, low summer flows and shallow depth in the upper portion of the lake, and the significant influence in the lower lake of nutrient sources near the dam— raise significant questions about the influence of the upper portion of the lake that are not answered in the North Carolina's information and analysis.

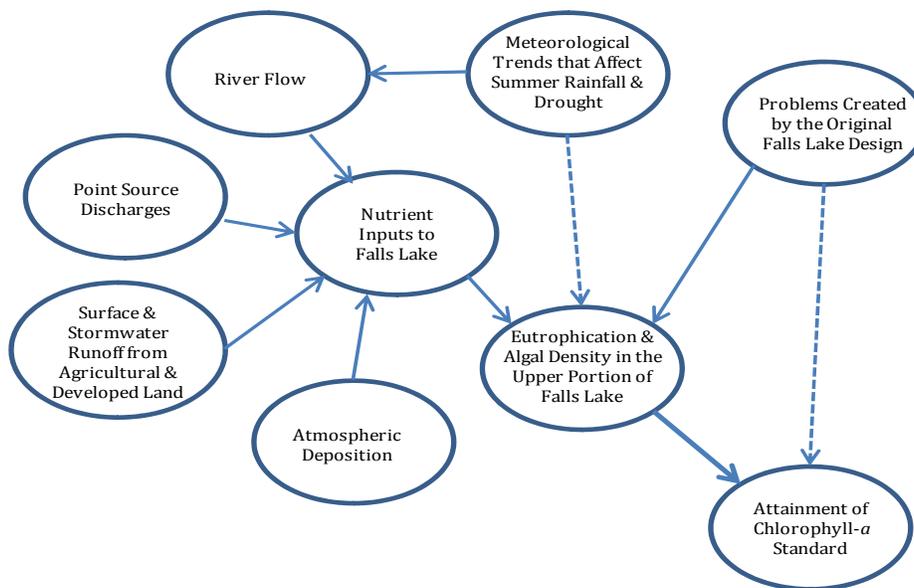
The absence of information to identify and verify key cause-effect relationships is notable also because the National Research Council assessed the knowledge and experience gained by States around the nation and by the U. S. Environmental Protection Agency from 2001-2008, and published reports<sup>6,7</sup> that emphasize the value of carefully designed measurements and decision models to identify and verify cause-effect relationships related to important water quality management decisions. One of these reports<sup>6</sup> also describes the value of a “use attainability analysis” within the framework of the Clean Water Act Amendments of 1972 to determine if a Section 303d water quality standard is flawed<sup>8</sup> and to modify the standard if it can be demonstrated that an impairment is caused by factors such as low water flow, water depth, or other human-engineered features.

The Figure below illustrates a hypothetical decision-model representing key cause-effect relationships for decisions about the Falls Lake nutrient management strategy and attainment of the chlorophyll-*a* standard. I do not find measurement-verified data in the information and analyses available from the N.C. Division of Water Quality<sup>1</sup> to demonstrate that the chlorophyll-*a* standard can be attained and maintained in the upper portion of Falls Lake. In contrast, I do find several water quality monitoring reports that indicate that upper portions of the Falls Lake exceed the chlorophyll-*a* standard from 1983 – 1987<sup>3,4,5</sup> and periodically thereafter.

These data, coupled with problems with the ACE design for Falls Lake (described in Section 2.0) may form a basis for a use attainability analysis for the upper portion of Falls Lake.

**Figure**

Hypothetical decision-model for Falls Lake nutrient management strategy, illustrating key cause-effect relationships that must be verified to support decisions about actions to attain chlorophyll-*a* standards



The information that is provided from the N.C. Division of Water Quality to support the Falls Lake nutrient management strategy<sup>1</sup> and proposed rules attempts to support the attainability of the Stage II chlorophyll-*a* standard through: (a) the application of a point-based methodology to calibrate a nutrient-response model—rather than the standard practice of using an area-based methodology, (b) the selection of a single point-location in the upper portion of Falls Lake for a compliance determination, and (c) assumptions not verified by measurement data about the different amounts of nutrients that come from a variety of sources in the upper portion of the lake. Absent substantial measurement data, this analytic approach is not a convincing one and does not support a finding that the proposed rules can be attained.

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#### **4.0 The potential costs and benefits of improving water quality in Falls Lake**

The information and analyses available from the N.C. Division of Water Quality demonstrate that, for a principal objective of the Falls Lake design—water supply—the City of Raleigh and Wake County are the beneficiaries and that the value of this benefit is estimated to range from \$ 420 million - \$ 1.1 billion.<sup>9</sup> In contrast to the benefits estimates, the combined cost for Stage I of the draft rules is less than \$ 605 million,<sup>9</sup> and the combined cost for Stage II of the draft rules is less than \$ 946 million<sup>9</sup> when using financial procedures that significantly discount the present value of future expenditures. According to this fiscal analysis, these costs will be paid by residents of Durham City and utility customers in Granville County and Hillsboro. None of these costs will be paid by the City of Raleigh and Wake County.

In conclusion, the information and analysis provided to support the proposed Falls Lake Management Strategy and rules indicate that the State of North Carolina has not taken advantage of flexibility in the Clean Water Act Amendments of 1972 to establish its strategy and proposed rules, and has not develop strong scientific measurements and engineering data to support its assertions that the strategy and proposed rules can be attained. Further, the State's analysis does not explain why factors related to the ACE design for Falls Lake and why monitoring data from 1983-1987 in the upper portion of the lake have not been used to develop an alternate management strategy for consideration by the Environmental Monitoring Commission. In light of these issues, the significant inequities in benefits and costs for the proposed rules, and the significant costs of the Stage II rules, I recommend the development of an alternate strategy and proposed rules that do take into consideration the flexibility provided by the Clean Water Act Amendments of 1972 and do incorporate all the *Consensus Principles* agreed to by most of the local governments in the Falls Lake watershed.

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## References

1. Background Information for the Falls Lake Nutrient Management Strategy and Draft Rules. Available from <<http://portal.ncdenr.org/web/wq/ps/nps/fallslake>> last accessed August 12, 2010.
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5. U.S. Geological Survey Water Quality Data, available from < <http://waterdata.usgs.gov/usa/nwis/qw> > last accessed on August 12, 2010.
6. See, for example, the National Research Council Committee to Assess the Scientific Basis of the Total Maximum Daily Load Approach to Water Pollution Reduction. *Assessing the TMDL Approach to Water Quality Management*. National Academy Press, 2001.
7. See, for example, the National Research Council Committee on Reducing Stormwater Discharge Contributions to Water Pollution. *Urban Stormwater Management in the United States*. National Academy Press, 2008.
8. National Research Council, *Assessing the TMDL Approach to Water Quality Management*, *op.cit.*, pages 90-93.
9. *Fiscal Analysis for Proposed Nutrient Strategy for Falls Lake Reservoir*. North Carolina Planning Division Planning Section. June 14, 2010.