

## Attachment 1

### Existing North Carolina Nutrient Criteria Management Strategy

#### Overview

The State of North Carolina has aggressively pursued and endorsed the use of flexible, site-specific measures for the control of nutrients in its surface waters for a number of years. In fact, North Carolina had already implemented a number of the key provisions presented in the November 14, 2001 EPA Office of Science and Technology (OST) memorandum and established an existing, functioning nutrient criteria program that substantially complies with its requirements long before this memorandum was distributed. Specifically, under this existing nutrient control program North Carolina has:

- **Adopted and implemented a suite a nutrient response standards** that includes chlorophyll-a, dissolved oxygen (DO), and pH.
- **Implemented a statewide sampling and ambient monitoring program** for these nutrient response criteria.
- **Developed and implemented use support methodology** to interpret this nutrient criteria ambient water quality data.
- **Listed surface waters as “impaired”** on the North Carolina 303(d) List for exceedances of the nutrient response criteria, based upon this use support methodology.
- **Created nutrient response models for the development of Total Maximum Daily Loads (TMDLs)** for chlorophyll-a. These TMDLs have included nitrogen and phosphorous limits for discharges to those waters listed as nutrient impaired.
- **Developed and implemented nitrogen and phosphorous NPDES permit limits** from these TMDLs.
- **Established an innovative, specialized classification of “Nutrient Sensitive Waters (NSW)”** that has already been applied to three entire river basins and a portion of another two within North Carolina.

In addition to the preceding DWQ actions, the North Carolina General Assembly adopted “House Bill 515” in 1997. Among other things, this legislation mandated strict limits on the discharge of nitrogen and phosphorous into NSW-classified waters.

North Carolina believes that a proactive management strategy based upon adaptive management techniques is the most viable method to control excessive nutrients from point and non-point sources and has developed its comprehensive program accordingly. The underlying principle guiding this strategy and the number one priority for North Carolina’s program has always been to develop flexible nutrient control approaches to prevent future impairments. Utilizing this flexible and proactive approach the North Carolina nutrient control program has already achieved a number of noteworthy accomplishments. Among these are:

- The development and successful implementation of adaptive, site-specific management control strategies for a broad range of nutrient-impaired waters throughout the State.

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- The use of approximately \$100,000,000.00 in agricultural cost share money to control nutrient pollution from non-point sources and the establishment of an innovative nutrient trading program.
- The implementation of mandatory riparian buffers in two of the major riverbasins in the State in an effort to further control nutrient non-point source pollution.

The remainder of this attachment will provide further details regarding the individual elements of North Carolina's existing nutrient control program.

### I. Existing Nutrient Response Criteria

For a number of years, North Carolina has included a suite of nutrient response criteria in its surface water quality standards. These nutrient response criteria include both numeric and narrative standards for chlorophyll-a, dissolved oxygen, and pH. These standards are delineated in 15A NCAC 2B .0211, Fresh Surface Water Quality Standards for Class C Waters and 15A NCAC 2B .0220, Tidal Salt Water Quality Standards for Class SC Waters. The standards specified in 2B .0211 apply to all fresh surface waters of the State, and those standards specified in 2B .0220 are applicable to all tidal salt surface waters of the State.

The specific nutrient response criteria contained in 2B .0211 that apply to all surface fresh waters of the State are provided below:

**Chlorophyll-a:** [As specified in 15A NCAC 2B .0211(3)(a)] *Chlorophyll a (corrected): not greater than 40 ug/l for lakes, reservoirs, and other waters subject to growth of macroscopic or microscopic vegetation not designated as trout waters, and not greater than 15 ug/l for lakes, reservoirs, and other waters subject to growth of macroscopic or microscopic vegetation designated as trout waters (not applicable to lakes and reservoirs less than 10 acres in surface area); the Commission or its designee may prohibit or limit any discharge of waste into surface waters if, in the opinion of the Director, the surface waters experience or the discharge would result in growths of microscopic or macroscopic vegetation such that the standards established pursuant to this Rule would be violated or the intended best usage of the waters would be impaired;*

**Dissolved Oxygen (DO):** [As specified in 15A NCAC 2B .0211(3)(b)] *Dissolved oxygen: not less than 6.0 mg/l for trout waters; for non-trout waters, not less than a daily average of 5.0 mg/l with a minimum instantaneous value of not less than 4.0 mg/l; swamp waters, lake coves or backwaters, and lake bottom waters may have lower values if caused by natural conditions;*

**pH:** [As specified in 15A NCAC 2B .0211(3)(g)] *pH: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;*

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The specific nutrient response criteria contained in 2B .0220 that apply to all tidal salt surface waters of the State are presented below:

**Chlorophyll-a:** [As specified in 15A NCAC 2B .0220(3)(a)] *Chlorophyll a (corrected): not greater than 40 ug/l in sounds, estuaries, and other waters subject to growth of macroscopic or microscopic vegetation; the Commission or its designee may prohibit or limit any discharge of waste into surface waters if, in the opinion of the Director, the surface waters experience or the discharge would result in growths of microscopic or macroscopic vegetation such that the standards established pursuant to this Rule would be violated or the intended best usage of the waters would be impaired;*

**Dissolved Oxygen:** [As specified in 15A NCAC 2B .0220(3)(b)] *Dissolved oxygen: not less than 5.0 mg/l, except that swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions;*

**pH:** [As specified in 15A NCAC 2B .0220(3)(g)] *pH: shall be normal for the waters in the area, which generally shall range between 6.8 and 8.5 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;*

DWQ documents clearly state that these standards were adopted in order to form a basis for nutrient control throughout the State. It was the intention of the Division at the time these standards were adopted, as it remains today, to utilize these nutrient response variables in a manner that will allow for the development of nitrogen and phosphorous limits on a case-by-case basis for those waters where the intended best usage of the water is being impaired by nutrient pollutants. This impairment is determined by the implementation of a viable use support methodology.

## II. Nutrient Criteria Ambient Monitoring and Use Support Methodology

The North Carolina DWQ Ambient Monitoring System actively monitors for chlorophyll-a, dissolved oxygen, and pH in all “slow moving” waters of the State, which are those waterbodies at the greatest risk from the effects of nutrient over-enrichment and eutrophication. North Carolina’s slow moving waters include lakes, estuaries, and coves. In addition, the Division monitors for DO and pH in the remaining “fast moving (rivers and streams)” waters of the State. A viable use support methodology has been implemented within NC in order to interpret this nutrient response criteria ambient data. To date, this methodology has been primarily utilized to rate slow moving waters in which chlorophyll-a exceedances have threatened a designated use. For those waters that meet these requirements, the use support rating is based upon a review of the available nutrient response criteria ambient data for a five- year window. If 10% of the samples taken over the previous five years exceed the standard, the waterbody is rated as

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“partially supporting (PS).” If 25% of the samples taken over the previous five years exceed the standard, then the waterbody is rated as “not supporting (NS).”

This use support methodology has already been successfully employed by DWQ to list nutrient impaired waters on North Carolina’s previous 305(b) Reports and 303(d) Lists.

### **III. 303(d) Listing of Nutrient Impaired Waters, TMDL Development, and Nitrogen and Phosphorous Permit Limits**

Those waters within North Carolina that have been designated as “impaired for nutrients,” based upon the preceding use support methodology, have been included on the appropriate 303(d) List(s). Once listed, the Division initiates the development of a Total Maximum Daily Load in order to meet the exceeded standard in the impaired waters. An integral part of the TMDL process is the creation of a comprehensive nutrient response model. This model includes nitrogen and phosphorous limits for both point and non-point sources in the affected watershed. These limits developed in this process are then utilized to establish total nitrogen and phosphorous permit limitations in the NPDES permits of those dischargers to the affected waterbody. An example of where this course of action has already occurred is in the Catawba Riverbasin. As a result of a site-specific nutrient management plan developed by DWQ for the Lake Wylie area, the City of Gastonia’s Long Creek Wastewater Treatment Plant received permit limits for both total nitrogen and phosphorous. These limits are 1 mg/l for total phosphorous – year round and 6 mg/l for total nitrogen during the summer season. Following the imposition of these nutrient limits, the Long Creek plant expended approximately \$30,000,000 in order to be able to comply with these requirements.

### **IV. Nutrient Sensitive Waters (NSW) Classification**

North Carolina established itself as a leader in innovative approaches to the control of nutrients in surface waters when it adopted its Nutrient Sensitive Waters (NSW) classification for nutrient-polluted waterbodies. In responses to nuisance algal blooms and fish kills in North Carolina’s surface waters, the NC Environmental Management Commission (EMC) established the NSW supplemental classification in May 1979 as a legal basis for controlling the discharge of nutrients, primarily nitrogen and phosphorous, into surface waters. This designation, which is codified in 15A NCAC 2B .0223, is applied by the EMC “upon a finding that such waters are experiencing or are subject to excessive growths of microscopic or macroscopic vegetation. Excessive growths are growths which the Commission determines impair the use of the water for its best usage as determined by the classification applied to such waters.” The NSW classification mandates the development of a nutrient management strategy for those waters so designated. These management strategies may be voluntary (incentive based) or mandatory and apply to both point and non-point sources of nutrient pollution. In

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North Carolina, the implementation of these nutrient management strategies led to the unprecedented use of state-funded agriculture cost-share dollars for the control of agriculturally-related non-point sources. To date, the expenditure of agriculture cost-share money for these purposes has reached approximately \$100,000,000.00. This level of expenditure clearly demonstrates North Carolina's commitment to the control of nutrient pollution. The determination to classify a specific waterbody as NSW is based upon a comprehensive and detailed scientific evaluation of a myriad of parameters including, but not limited to: exceedances of the nutrient response standards, fish kill frequencies, frequency and duration of algal blooms, sediment loading, and a thorough examination of the relative contribution of point and non-point sources to the overall nutrient problem.

Within North Carolina, the entire Chowan, Neuse, and Tar-Pamlico riverbasins and a portion of the Upper Cape Fear and White Oak riverbasins have received the NSW designation to date. Additional site specific nutrient management strategies have been developed by DWQ for Lakes Wylie, Jordan, and Santeetlah. In the case of the Neuse and Tar-Pamlico, this designation has resulted in the implementation of a mandatory nutrient management strategy throughout their complete riverbasins. These required management strategies have established a wide range of controls for both point and non-point sources of nutrient pollution in order to accomplish, in the case of the Neuse, the stated goal of reducing nitrogen loading by 30%. The specific requirements of the Neuse management strategy are delineated in rules 2B .0232 through 2B .0242 of Chapter 15A of the North Carolina Administrative Code. These rules contain specific nutrient management strategies for wastewater dischargers, stormwater management, agricultural operations, and overall nutrient management. In addition, the Neuse NSW rules establish mandatory 50-foot wide riparian buffers to help control nutrient run-off. The specific requirements of the Tar-Pamlico mandatory nutrient management strategy are detailed in 15A NCAC 2B .0255 through 15A NCAC 2B .0261. Similar to the Neuse, the Tar-Pamlico strategy also implements mandatory 50-foot wide riparian buffers along the banks of the river and its tributaries. Furthermore, an innovative nutrient trading program for point sources has been incorporated as an integral part of the Tar-Pamlico NSW management strategy (15A NCAC 2B .0229). This flexible approach to the control of additional nutrient loading has been the subject of recent national attention. The resources that have been allocated to the implementation of these nutrient reduction strategies within North Carolina have been substantial. At present, over 20 person-years of effort have already been applied to meeting non-point source nutrient reduction goals in the Neuse and Tar-Pamlico riverbasins.

### **V. House Bill 515**

In 1997, the North Carolina General Assembly adopted proactive legislation intended to provide additional protection to North Carolina's waters from the effects of nutrient pollution and eutrophication. These protective measures were contained in Part VI, Nitrogen and Phosphorous Limits for Surface Waters, of House Bill 515. This legislation mandated total nitrogen and phosphorous permit limits for specific discharges

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to those waters that had been designated as Nutrient Sensitive Waters, as described above. Specifically, House Bill 515 established a total nitrogen permit limit of 5.5 mg/l and phosphorous limit of 2.0 mg/l for all new dischargers commencing after July 1, 1997, and those dischargers existing before this date and with a discharge greater than 500,000 gallons per day. The effect of this legislation was to mandate stringent limitations on the discharge of nitrogen and phosphorous on a wide range of point sources.

### VI. Demonstrated Successful Results from the NC Approach

A demonstration of the viability and validity of North Carolina's approach to nutrient control can be found in the successes produced by this program, such as the dramatic improvements that have been gained in the Chowan Riverbasin. In 1979, all waters of the Chowan Riverbasin were designated as NSW. The Chowan River was the first waterbody in the State to receive this supplemental classification because of water quality problems associated with nutrient enrichment. For the Chowan River, this NSW classification became effective in September 1979, thereby enabling the Division of Water Quality to establish nutrient limits in the NPDES permits of the wastewater treatment plants that discharged into this riverbasin. Furthermore, in 1990, the Division implemented a site-specific management strategy that included the following major points:

- Reduction in phosphorous inputs from point and non-point sources by 35 to 40 percent
  - Point Sources
    - Land application systems for municipal wastewater treatment plants
    - Phosphorous limits of 1 mg/l in the North Carolina portion of the basin
  - Non-point Sources
    - Target funds from the Agriculture Cost Share Program to the Chowan Riverbasin
- Reduction of nitrogen inputs from all sources by 20 percent
  - Point Sources
    - Land application systems for municipal wastewater treatment plants
    - Nitrogen limits of 3 mg/l in the North Carolina portion of the basin
  - Non-point Sources
    - Target funds from the Agriculture Cost Share Program to the Chowan Riverbasin

**Results:** Since the implementation of this management strategy the following results have been achieved:

- A significant reduction in the frequency and duration of algal blooms
- The nitrogen reduction goal of 20% has been met.
- Total phosphorous has been reduced by 29%.

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- Over \$1,942,634 of Agriculture Cost Share funding has been directed towards the Chowan basin over the last five years.
- All municipal POTW's in the basin have switched to non-discharge systems for the treatment of domestic wastewater.

North Carolina emphatically believes that the proactive, flexible, adaptive, and site-specific approach to nutrient control that was successfully employed in the Chowan River, has already been and can, again in the future, be adapted and applied to other nutrient impaired or threatened waters in the State in order to achieve similar positive results.

### Conclusion

North Carolina is justifiably proud of its proactive approach to the regulation and control of excessive nutrients in its surface waters. This approach has been based on the realization that this State's rivers, lakes, estuaries, and coves are some of its most valuable natural and economic resources and a thorough understanding of the risk posed to these waters by nutrient pollution and over-enrichment. The Division's nutrient control activities and programs have been guided by the underlying principle that a proactive strategy based on adaptive management techniques will be the most successful method to comprehensively control nutrient pollution. This approach has led to North Carolina already establishing a suite of nutrient response criteria and implementing a number of site-specific nutrient management plans across the State. These adaptive, site-specific plans have resulted in strict nitrogen and phosphorous permit limits for many affected dischargers and the expenditure of millions of dollars of agriculture cost share funds in an effort to control nutrient run-off from non-point sources. North Carolina's proactive approach to the control of nutrients in its surface waters has led to the adoption of a special Nutrient Sensitive Waters designation for nutrient polluted waters and the adoption of House Bill 515 by the NC General Assembly. This legislation mandated strict nitrogen and phosphorous limits for many of the dischargers to the NSW-designated waters. Furthermore, mandatory riparian buffers have been required in two of North Carolina's largest riverbasins as a result of this NSW designation. By employing a multi-tiered, innovative strategy to combat this water quality problem, North Carolina has made great strides in controlling and reducing the level of nutrient pollution in its surface waters and, in so doing, has aggressively protected the designated best usage of these resources. The substantial successes achieved in the control and reduction of excessive nutrients in the Chowan River provide concrete validation of North Carolina's overall strategy and demonstrate the effectiveness of flexible, site-specific approaches to nutrient control.