

## EMC Agenda Item No. 05-11

### **Tar-Pamlico Nutrient Sensitive Waters Implementation Strategy: Phase III**

April 14, 2005

#### **I. Summary**

This document establishes the third phase of a nutrient control Agreement for point source discharges in the Tar-Pamlico River Basin, reaffirms loading goals set in Phase II for all sources in the basin, and proposes timeframes for restoration of nutrient-related estuarine use support. The Agreement was initiated in 1990 in response to nutrient-driven water quality impairments in the Pamlico River estuary, and specifically to address a mandate from the NC Environmental Management Commission to the Division of Water Quality to develop a nutrient reduction strategy. The Agreement provided a cost-effective alternative to uniform technology-based nutrient concentration limits. It later added elements of a nutrient TMDL for the basin, including estuary loading goals and point and nonpoint source allocations. Phase I spanned five years from January 1990 through December 1994, and Phase II covered another ten years through December 2004.

This third phase continues the structure established in Phase II. This structure includes overall performance goals for the nutrient strategy of 30 percent reduction in nitrogen loading from a baseline year of 1991 and no increase in loading of phosphorus from that baseline. An association of point source dischargers, the Tar-Pamlico Basin Association (Association), receives collective annual end-of-pipe nitrogen and phosphorus loading caps. In the event that either cap is exceeded, the Association will fund agricultural practices at a predetermined cost-effectiveness rate to offset those exceedences through the NC Agriculture Cost Share Program.

Phase III spans an additional ten years through December 31, 2014, with an amendment after two years to address several improvements. The Phase III Agreement updates Association membership and related nutrient caps. It proposes actions in the next two years that will improve the offset rate, resolve related temporal issues, and revisit alternative offset options. It also establishes 10-year estuary performance objectives and alternative management options. As in Phase II, parties to the Agreement include the NC Environmental Management Commission (Commission), the Association, the Division of Water Quality (Division), and the Division of Soil and Water Conservation (Soil and Water), which would administer offset payments. In addition, the environmental organizations Environmental Defense and Pamlico Tar River Foundation (PTRF), who did not sign onto Phase II, return as parties to the Phase III Agreement. These two organizations played a key role in establishing the initial trading agreement and continue to work cooperatively with the other parties for the estuary's recovery.

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### II. Background

#### A. Phase I

On September 12, 1989, the Commission classified the Tar-Pamlico River Basin as Nutrient Sensitive Waters (NSW). Figure 1 is a map of the basin. On February 13, 1992, the Commission approved a revised NSW Implementation Strategy that established the framework for a nutrient reduction trading program between point and nonpoint sources of pollution. The Strategy also established certain conditions to be met by an association of dischargers in the basin known as the Tar-Pamlico Basin Association (the Association).

The February 13, 1992 NSW Strategy for the Tar-Pamlico River Basin represented the first phase or "Phase I" of an attempt to establish and achieve a nutrient reduction goal to address eutrophic conditions in the estuary. Phase I covered the period 1990-1994. Parties to the Phase I agreement as approved by the Commission included the Division (then the Division of Environmental Management), the Tar Pamlico Basin Association, Environmental Defense (then the Environmental Defense Fund) and the Pamlico-Tar River Foundation (PTRF).

The Association agreed to meet specific conditions in order to avoid effluent limits for nutrients in their permits and to have the opportunity to reduce nutrient loading in the most cost-effective manner, including the option to fund agricultural best management practices (BMPs). These conditions included the development of an estuarine hydrodynamic computer model, engineering evaluations of wastewater treatment plants, annual monitoring reports on nutrient loading, and minimum payments for the administration and implementation of agricultural BMPs. The Association met all conditions established in Phase I.

The Phase I Agreement set collective, technology-based discharge loading limits for the Association in the form of an annually decreasing, combined nitrogen and phosphorus cap. During the 1990 to 1991 period, low cost operational changes were implemented at several facilities to reduce nitrogen loadings. The engineering evaluation of member facilities and implementation of the study's recommended nutrient removal improvements also yielded significant loading reductions. These changes, combined with installation of nutrient removal at several of the larger facilities, allowed the Association to reduce its nutrient loads and stay beneath its caps throughout Phase I.

#### B. Phase II

The Phase II Agreement spanned ten years from January 1995 through December 2004. Modeling of the Pamlico River estuary during Phase I provided a foundation for water quality-based loading goals for Phase II. Based on the estuary modeling, Phase II established overall performance goals for the nutrient strategy of 30 percent reduction in nitrogen loading from a baseline year of 1991 and no increase in loading of phosphorus from that baseline. Based on these goals, it also established nitrogen and phosphorus discharge loading caps for the Association. These caps also accounted for the load

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reductions achieved through operational changes implemented during the 1990/1991 period. The Association stayed beneath both caps throughout Phase II, steadily reducing its loading of both nutrients despite steady increases in flow. Overall, from 1990 through 2003, the Association decreased nitrogen loads to the river by approximately 45% and phosphorus loads by over 60%, while flows increased approximately 30%. Appendix A is a table of caps and loads for all years of the Agreement through 2003. The success of this collective cap approach may be attributed in part to the element of time it provided for individual facilities to implement nutrient removal as it became most cost-effective for them.

Phase II also established requirements for non-Association point source dischargers and called for rule-making to fully enact those requirements. That rulemaking became effective in April 1997. It required new and expanding dischargers over certain sizes to meet effluent concentration limits and to fully offset new or increased loads using the same offset approach developed for the Association. During Phase II, there were no new dischargers to the basin, and no existing dischargers became subject to the rule's requirements.

Phase II also established instream nutrient goals for nonpoint sources and called for a separate nonpoint source (NPS) strategy. That NPS strategy was put into effect in January 1996 as a voluntary effort that would work from existing programs, seeking additional funds and developing accounting tools. After two years of voluntary implementation, the EMC found progress insufficient and initiated nonpoint source rulemaking. Rules were fashioned after those recently adopted in the adjacent Neuse basin. They addressed riparian buffer protection, agriculture, urban stormwater, and fertilizer management. The rules became effective during 2000 and 2001, and are currently in various stages of implementation.

### III. Association Members

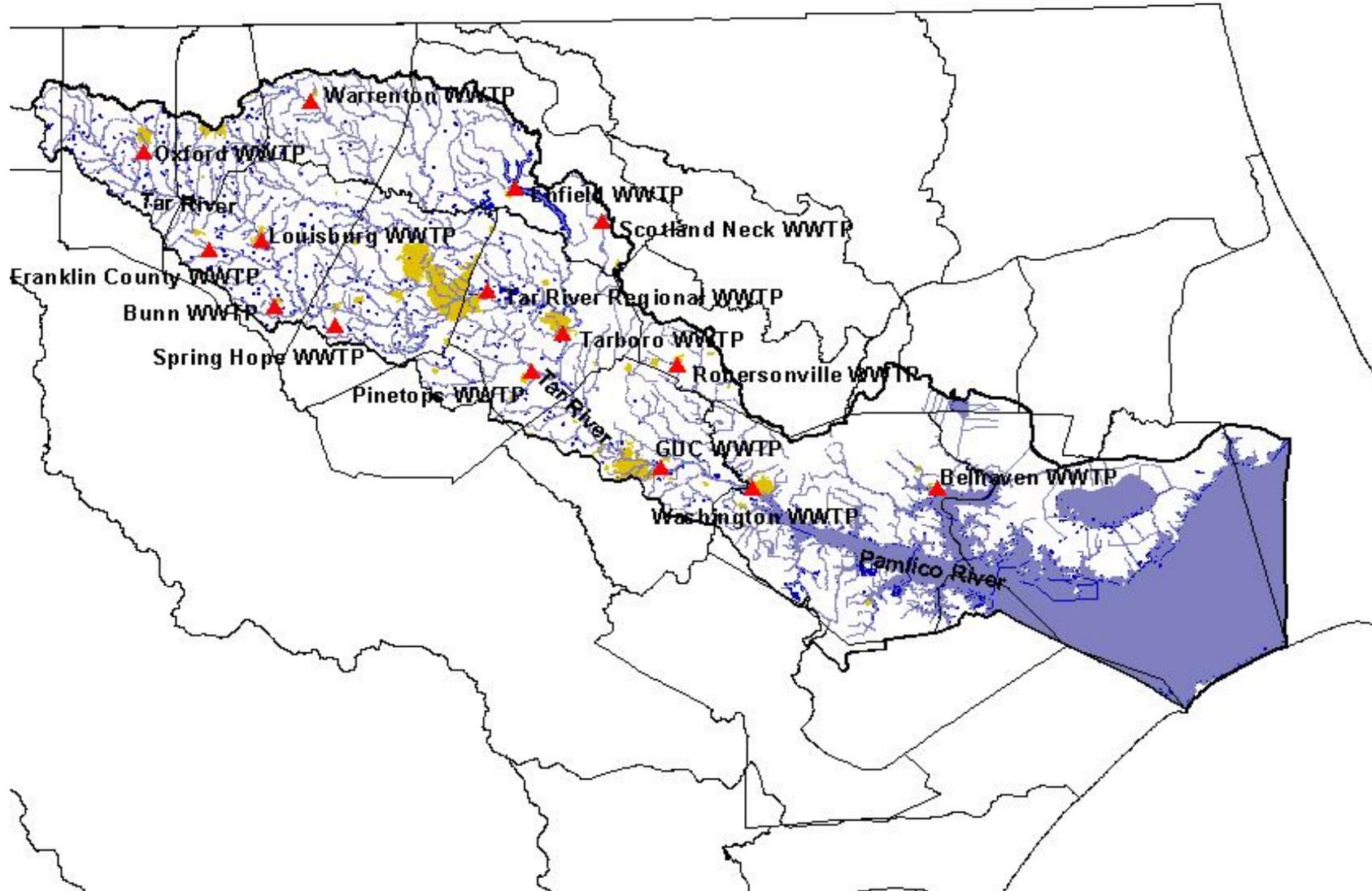
At the signing of this Agreement, the Tar-Pamlico Basin Association is comprised of the following members.

**Table 1. Current Membership of Tar-Pamlico Basin Association**

1. Belhaven	8. Pinetops
2. Bunn	9. Robersonville
3. Enfield	10. Rocky Mount
4. Franklin Water & Sewer Authority	11. Scotland Neck
5. Greenville Utilities	12. Spring Hope
6. Louisburg	13. Tarboro
7. Oxford	14. Warrenton
	15. Washington

This membership reflects one change from the final Phase II membership: removal of the sole industrial discharge, National Spinning. That facility ceased operation in December 2004. At a

Figure 1. Tar-Pamlico Basin Association Members



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total permitted flow of 61.9 MGD, the Association now comprises 98.7% of permitted discharge flows in the Basin, as detailed in Appendix B.

The Association may modify its membership at any time upon notification to the Division. At such time, the Division shall develop calculations to adjust the nitrogen and phosphorus caps using best available information on the nutrient loads produced by the facilities in question in 1991. The calculation method shall be the following:

- (A) For additions that were discharging to the basin in 1991, add 70% of the facility's 1991 end-of-pipe nitrogen load and 100% of the facility's 1991 end-of-pipe phosphorus load.
- (B) For removals of any of the 14 original members to the Phase II Agreement, deduct 87% of the facility's 1991 end-of-pipe nitrogen load and 100% of the facility's 1991 end-of-pipe phosphorus load (the Phase II nitrogen cap equates to 87% of the Association's 1991 end-of-pipe load; this calculation preserves that proportion).
- (C) For removals of any additions to the membership since the initiation of Phase II that were discharging to the basin in 1991, deduct 70% of the facility's 1991 end-of-pipe nitrogen load and 100% of the facility's 1991 end-of-pipe phosphorus load.
- (D) For additions that are proposed new dischargers to the basin, the parties shall establish a method, as needed, in keeping with the loading goals of the Agreement.

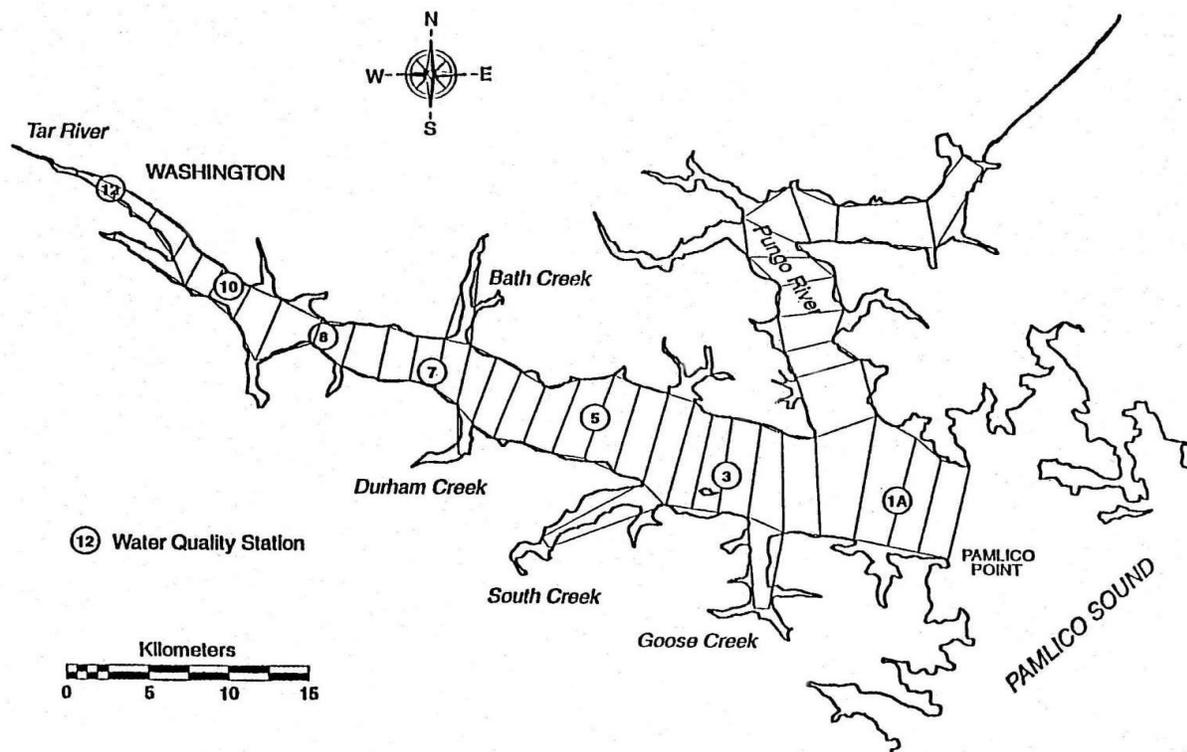
The Division shall modify the Agreement to incorporate such changes. The Agreement shall be considered amended to address changes related to Subsections (A), (B), or (C) above upon signature of the President of the Association and the Director of the Division. Amendments related to Subsection (D) above shall require consent of all parties. Adjusted caps shall apply beginning with the full calendar year nearest in time to the date of the facilities' addition to or removal from the Association. Should the parties agree to adjust the caps at some point based on additional modeling results, this calculation method shall be revisited accordingly and in accordance with the Clean Water Act.

### **IV. Nutrient Reduction Targets**

In 1992, the Association contracted with HydroQual, Inc. to perform the estuary modeling. HydroQual developed a two dimensional, laterally averaged hydrodynamic water quality model to predict the impacts of nutrient loading in the estuary. The model extends from Greenville to Pamlico Point a distance of approximately 60 miles. Figure 2 illustrates the model segmentation below Washington. The year 1991 was chosen as the calibration year for the model because it represented when typical impairment of the estuary was evident. It was also the baseline year established in the revised Phase I agreement for tracking nutrient reductions by requiring nutrient monitoring at the facilities.

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Figure 2. HydroQual, Inc. Nutrient Model Segmentation below Washington, NC



### A. Nutrient Assimilative Capacity Exceeded in the Pamlico Estuary

The Division applied the model under the 1991 calibration conditions as well as under various nutrient reduction scenarios and plotted the results for a site located near Washington in order to evaluate possible management strategies. The Washington site was chosen since modeling results indicated that this was where the greatest number of chlorophyll *a* and dissolved oxygen (DO) violations occurred, and the magnitude of the violations was the greatest. Thus, it is the critical portion of the river. Under the 1991 loading conditions, the model indicated that the chlorophyll *a* standard was violated approximately 18 percent of the time at Washington. These predictions are daily averages and are averaged across the river in each segment. Therefore, specific areas within a model segment or given times of day may indicate better or worse water quality than predicted.

Division staff reduced nutrient inputs by varying amounts during model applications to determine what loading reductions were needed to protect water quality standards. Model runs simulated a five-year period to allow improvements in the sediment concentrations to be reflected in water column quality. The results indicated that a 30 percent reduction in total nitrogen (TN) was predicted to significantly reduce the frequency and severity of algal blooms in the estuary. To prevent exceedences of the chlorophyll-*a* standard of 40 ug/l, the model predicted that a 45 percent reduction in total nitrogen may be needed (Figure 3). The model also predicted that nitrogen load reduction would significantly increase dissolved

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oxygen in bottom water, prevent extended anoxic conditions and decrease the frequency of supersaturation conditions (Figure 4).

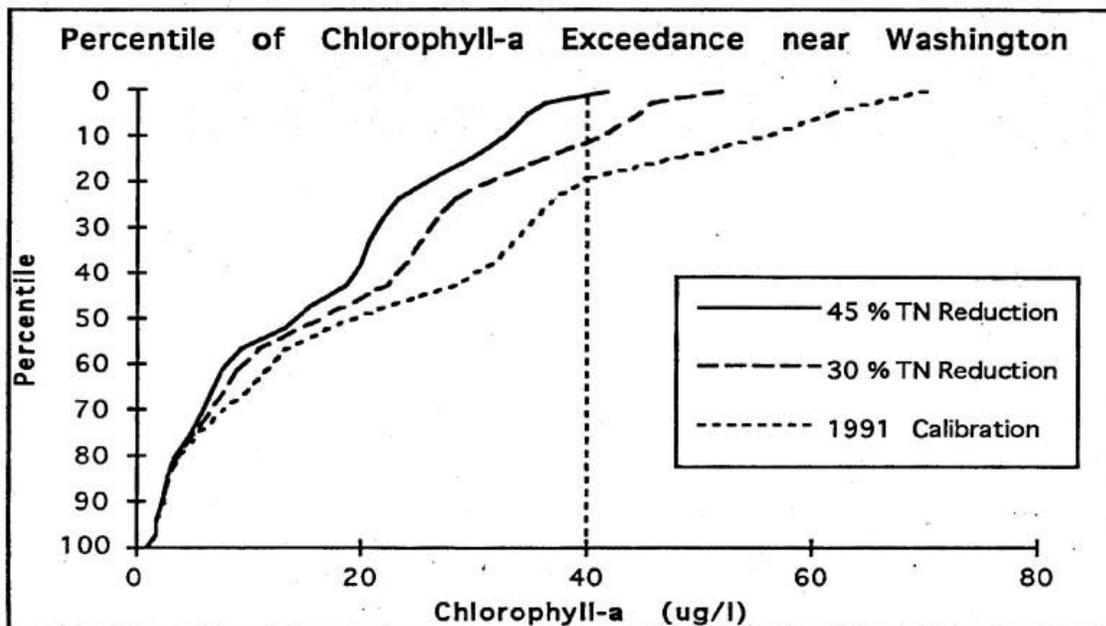
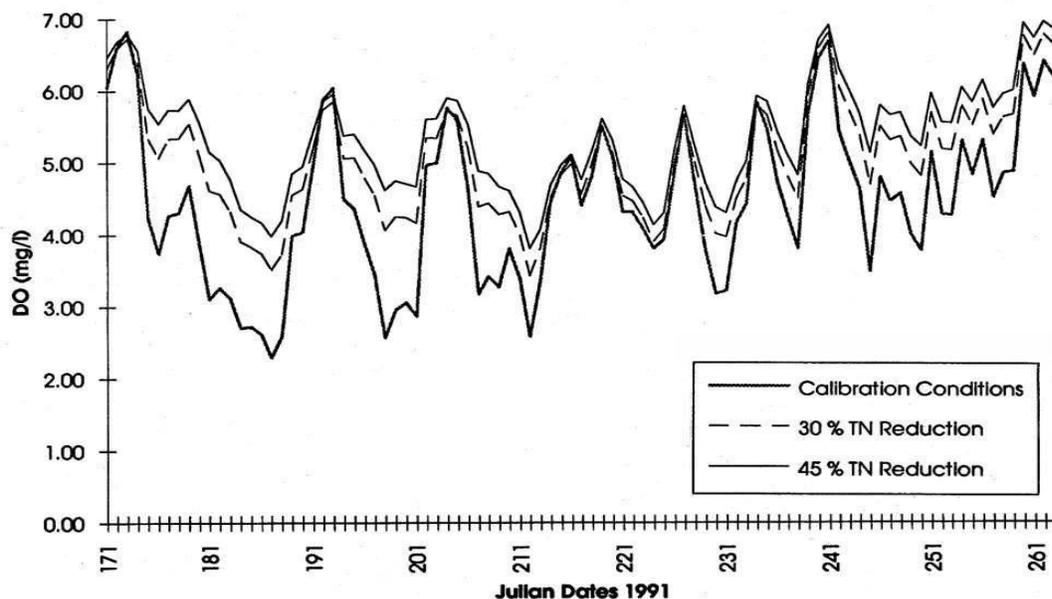


Figure 3. Predicted Percentiles of Chlorophyll-a Exceedances of the 40 ug/l Standard at Washington, NC, for Three Nitrogen Loading Scenarios Using HydroQual's Estuarine Model

Figure 4. Predicted Summer Bottom Layer Dissolved Oxygen at Station 3 for Three Nitrogen Loading Conditions



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### **B. Nutrient Reduction Goals for Nitrogen and Phosphorus**

The Phase II Agreement recognized the difficulty in projecting exactly what would be an acceptable level of water quality in the basin. Even if the basin were not developed, blooms would occur naturally at some frequency. In addition, a 45 percent reduction in nitrogen loading was considered potentially infeasible given the limitations of point and nonpoint source treatment technologies and BMP effectiveness. There was also some model error and uncertainty recognized in predictions, which could result in costly treatments that were not needed to meet water quality standards.

The model was calibrated under relatively high nutrient loading conditions in general. However, 1991 was a much dryer than average year; 1991 mean annual flow measured at the USGS Tarboro gauging station was 1,249 cfs, equating to 55% of the mean value for the entire period of record (1936 to present) and falling below the first quartile value. In wetter years, both nutrient loading and estuary response will differ from dry-year results. Therefore, the modeling results must be evaluated within the context of the model calibration.

Moreover, the further a given nutrient loading scenario applied to the model is from calibration conditions, the greater the uncertainty is for obtaining an accurate prediction of the water quality impacts of such loading. The interpretation of modeling results made by DWQ staff at the outset of Phase II was that algal and DO concentrations in the estuary would respond significantly to reductions in nitrogen loading and that a 45 percent TN reduction was needed to eliminate chlorophyll-a violations. However, the model could not be considered fully reliable for conditions so different from those existing at that time. To improve confidence in the modeling results, it was recommended that the model be recalibrated to reflect changing conditions as nutrient loading was reduced. Given the uncertainty inherent to a predictive model, an interim target was established, and the Phase II Agreement recommended that the model be recalibrated to lower nutrient loading conditions after reductions had been achieved in the basin.

The goal for TN reduction set in Phase II as an interim goal and maintained in Phase III is 30 percent from 1991 conditions (relatively dry year). This level of TN reduction was selected because it resulted in most of the predicted change in chlorophyll-a and DO that was observed under TN reduction scenarios applied to the model. The Phase II Agreement forecast the need for further reductions beyond 30 percent, which it proposed to quantify by recalibrating the estuary model in the future under lowered nutrient loading conditions. It identified an ultimate goal of no water quality standard violations.

During the course of Phase II, estuary water quality has improved based on use support assessments summarized in the Division's 1994 and 2004 Basinwide Plans. While differences in assessment methods and technology between the two periods make direct comparisons inexact, the extent of nutrient-related estuary impairment decreased by roughly

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90%. Also, nutrient loading has decreased significantly since 1991 based on trend evaluations done by DWQ staff<sup>1</sup> and Stanley<sup>2</sup>.

Since the initiation of the Phase II Agreement, the state's priorities for available resources have shifted away from revisiting the Pamlico estuary model toward completing assessments for unassessed, impaired waters across the state. While the parties believe that developing current Pamlico estuary modeling would be a useful activity, given the shift in priorities for available resources and the progress made in reducing nutrient loads, the parties have agreed to postpone such modeling efforts pending the results of other evaluations of estuary progress during the course of Phase III. See Minimum Conditions section for further discussion.

The estuary model supported that nitrogen was the most appropriate target nutrient to limit the potential for problematic algal blooms in the middle estuary. The model did not suggest significant improvements in chlorophyll-a levels would be seen in the middle estuary based on additional reductions in phosphorus. It is important, however, to consider the upper and lower bounds of the study area, where phosphorus is more likely to be limiting on a seasonal basis. Phosphorus levels may become more important in the future after significant nitrogen reductions cause a commensurate shift in ratios of nitrogen to phosphorus. However, the proposed targets, if achieved, would result in TN:TP ratios within a desired range.

Another potential problem associated with elevated concentrations in either or both nutrients in this estuary is the loss of important submerged aquatic vegetation (SAV). While it is extremely difficult to model and predict recovery of SAV and their effect on nutrient dynamics, it would not be prudent to support additional increases in a phosphorus rich estuary. Therefore, Phase II recommended and this phase continues the goal of no increase in load of total phosphorus into the estuary from 1991 conditions.

Total Maximum Daily Load (TMDL) targets were set in Phase II for 1,260,000 kg/yr of TN and 180,000 kg/yr of TP at Greenville based on the relatively low flow year 1991. Recognizing that additional point and nonpoint source loadings occur below Greenville, the Phase II Agreement extrapolated loading estimates to Washington "based on yields using the average flow-to-drainage area ratio". This calculation estimated the 1991 TN load delivered to Washington as 1.944 million kg. The associated 30% nitrogen reduction goal established in Phase II and continued in Phase III for all sources was 583,000 kg/yr, making the loading goal for all sources at Washington 1.361 million kg/yr.

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<sup>1</sup> Kennedy, J. Todd, 2003. *Trend Analysis of Nutrient Loading in the Tar-Pamlico Basin*. Internal Memorandum, NC Division of Water Quality Planning Branch, Modeling Unit. May 23, 2003. 9pp. w/figures.

<sup>2</sup> Stanley, Donald W., 2004. *Water Quality in the Pamlico River Estuary: 1997-2003*. Report to PCS Phosphate. East Carolina University, Institute for Coastal and Marine Resources. ICMR Technical Report 04-02. 58pp.

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### C. Annual Association Loading Targets for Total Nitrogen and Total Phosphorus

The Phase II Agreement established annual end-of-pipe nitrogen and phosphorus loading caps for the fourteen Association members. While the parties recognize that some assumptions and procedures involved in the nitrogen calculation could be refined, we agree that the net effect of such efforts relative to the strategy nitrogen goal renders these issues essentially moot. The Phase II nitrogen cap reasonably incorporates a 30% reduction for the Association, accounting for 1990 to 1991 load reduction efforts. A separate technical memorandum details the calculations that support this determination.

Subsequent to 1995, the initial Phase II nutrient caps were adjusted twice and the Agreement was modified accordingly. The caps were increased for the addition of Robersonville in 2001 and Scotland Neck in 2002 using the method described in Section III above.

For Phase III, the parties agree to use the final Phase II end-of-pipe nitrogen cap of 426,782 kg TN and the final phosphorus cap of 73,694 kg TP, and to adjust them for the new change in membership noted in Section III above using the method outlined there. The resulting calculation is provided as follows.

**Table 2. Revised End-of-Pipe Nutrient Loading Caps for Tar-Pamlico Basin Association**

	<b>Total Nitrogen (kg/yr)</b>	<b>Total Phosphorus (kg/yr)</b>
Final Phase II Association Cap (16 members)	426,782	73,694
Bethel 1991 Load <sup>a</sup>	+ .7 (6,595) = 4,616	+ 1,134
National Spinning 1991 Load (removal) <sup>b</sup>	- .87 (31,177) = - 27,124	- 1,768
Phase III Association Cap (15 members)	404,274	73,060

<sup>a</sup> The Town of Bethel's wastewater flows were tied into Greenville's system during Phase II. The Bethel facility discharged to the basin in 1991. Therefore, although the Town is not now officially a member of the Association since it has no separate discharge, adjustment to the nutrient caps is necessary and follows the same method used for additions to the Association outlined in Section III.

<sup>b</sup> National Spinning ceased discharging at the end of 2004, resulting in a permanent point source load reduction that measured 31,177 kg/yr in 1991.

If loading exceeds either cap in any year of this Agreement, then the Association shall offset that exceedence by funding nonpoint source nutrient controls as described in Section V. Relaxation of these caps in future amendments to this Agreement would only be contemplated if monitoring and modeling results suggest all water quality standards and goals are being met and that assimilative capacity is available to the Association while maintaining a margin of safety, all consistent with the TMDL.

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### D. Nonpoint Source Loading Targets

The goal to be accomplished at Washington is to reduce total nitrogen loading by 30 percent from 1991 loadings. As calculated in Phase II, this reduction amounts to 583,000 kg/yr. Since the point source allocation was established at 8 percent of the total reduction needed, nonpoint source activities in the basin were assigned a reduction of approximately 536,360 kg/yr at Washington (i.e., 583,000 X 92%) to achieve a 30 percent reduction from all sources. This goal was translated upstream to “the source” using the same 30 percent instream decay assumption used for point sources. The Phase II Agreement called for a nonpoint source strategy, which was approved by the Commission in December 1995 and was referred to as the voluntary plan. It apportioned the nonpoint source reduction target among agriculture, urban, forestry, and wetlands categories based on export coefficient calculations. The Division subsequently reapportioned these allocations to the manageable nonpoint source categories of agriculture and urban.

In implementing nonpoint source management efforts during Phase II, the Division found that while instream nonpoint source loading goals were an important concept, functional application instead favored use of the N and P *percentage* reduction and maintenance targets in land-based accounting methods by nonpoint sources. Compliance with instream loading targets would have additionally required some combination of complex modeling with significant uncertainty of processes occurring between edge of management unit and the water column instream, and a significant amount of quantitative water quality monitoring to support that modeling. Given the scale of uncertainties that would be associated with such an effort and that no new resources were available to implement the program, nonpoint source management has evolved using land-based accounting methods.

### E. Non-Association Facilities Loading Requirements

The Phase II Agreement established requirements for existing and expanding domestic and industrial dischargers and all new facilities to enter the basin. Those requirements are maintained in Phase III. Existing domestic facilities permitted at or above flows of .5 million gallons per day (MGD) have received 6 mg/l TN and 1 mg/l TP effluent concentration limits in all NPDES permit renewals beginning in Phase II, while existing industrial dischargers have received Best Available Technology (BAT) limits. These limits are maintained in Phase III.

Phase II Agreement requirements for expanding and new facilities were codified as rules 15A NCAC 2B .0229 and .0237, which were effective April 1, 1997. No changes are recommended to these requirements under Phase III. Any future changes would require rule amendment. Domestic and industrial dischargers expanding to .5 MGD or greater and all new dischargers are required to offset all new nutrient loads at 110 percent of the rate established in Section V. Payment for the life of the permit is required at issuance or renewal. In addition, domestic and industrial dischargers expanding to at least .5 MGD are faced with 6 mg/l TN and 1 mg/l TP effluent concentration limits and BAT limits respectively, while new dischargers of any kind receive 1 mg/l TP effluent concentration

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limits if they exceed .05 MGD permitted flow, and additionally 6 mg/l TN effluent concentration limits if they exceed .5 MGD permitted flow.

During Phase II, no expanding nor new dischargers were issued permits pursuant to these requirements. Appendix B provides tables of all dischargers sorted by permitted flow.

The parties propose to improve the offset rate during Phase III as detailed in Section V. Accordingly, the Division proposes to subsequently amend the non-Association rules to incorporate those improvements.

### V. Nutrient Offset Program

The purpose of this agreement is to allow Association facilities to achieve the Division's nutrient reduction goals by funding other more cost-effective nutrient reduction measures than the cost of meeting effluent limits at the Association facilities. This alternative involves funding nonpoint source controls that achieve reductions in nutrient loading to the estuary at least equivalent to the magnitude of cap exceedences in a given year.

#### A. Offset Options

The Phase II Agreement established certain nonpoint source management options for Association funding to offset cap exceedences. The parties agree to continue providing the following options for at least the first two years of Phase III:

- Implementation of certain nutrient-reducing agricultural BMPs under the NC Agriculture Cost Share Program. Soil and Water shall administer offset funds for this purpose. Funds shall be allocated to operations within the Tar-Pamlico River Basin, and shall be targeted geographically and by practice for the most cost-effective nutrient reductions to the estuary practicable. Soil and Water shall track and report the disposition of these funds to the Division annually. Soil and Water shall ensure and demonstrate that offset-funded BMPs are separate from and in addition to BMPs implemented to meet requirements of the Tar-Pamlico agriculture rule.
- Support of a Soil and Water staff position for administration of offset funds and technical assistance for implementation of other agricultural management activities under the nutrient strategy.
- Support for operation and maintenance of a continuous flow gauging station in the Tar River at Greenville or other mainstem location as close as practical to the estuary.

During the first two years of Phase III, the Division shall convene the parties at least semi-annually to further evaluate these and other activities for suitability as offset options. The Division shall present any resulting modifications to the Agreement to the Commission for approval by January 1, 2007 or as soon as practicable thereafter based on the results of that evaluation.

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Other potential nonpoint source control options that may be contemplated in the future include the following:

- Development and implementation of nutrient management plans for non-agricultural nutrient sources, and
- Wetland and riparian buffer restoration projects.

### B. Offset Credits

**1. Flat Rate.** A flat offset rate was established for Phase II and is continued for the first two years of Phase III at \$29/kg of nitrogen in excess of the annual cap unless information on actual projected load reductions and costs, including uncertainty estimates and associated issues as itemized below, demonstrate to the parties that a different offset rate should be used. This flat rate was based on a report by Research Triangle Institute entitled *Cost-Effectiveness of Agricultural BMPs for Nutrient Reduction in the Tar-Pamlico Basin* (January, 1995), which included a safety factor and an administrative cost factor. During the first two years of Phase III, the Division shall work in consultation with the parties to develop improvements to the offset rate that address the following issues:

- Develop an offset rate for exceedences of the phosphorus cap.
- Update cost-effectiveness data developed in the 1995 RTI report.
- Add current BMPs not addressed in the 1995 RTI report.
- Project BMP implementation for the foreseeable future, including relative numbers and geographic distribution if possible.
- Include uncertainty estimates with all cost-effectiveness values.
- Replace the current value with single nitrogen and phosphorus values weighted for projected BMP implementation. Include spatial weighting if possible to account for differences in estuary delivery due to BMP distribution within the basin. Evaluate the use of uncertainty bounds to replace the current safety factor.
- Revisit the administrative cost factor.
- Resolve understanding on payment longevity and credit life initiation.

To replace the current offset rate with the results of this effort, the Division shall present any modifications to the Agreement to the Commission for approval by January 1, 2007 or as soon as practicable thereafter.

**2. Banked Credit Life.** The Association may choose to make payments in anticipation of future cap exceedences and to bank credits toward those exceedences. During the first two years of Phase III, the Division shall work with the parties to resolve questions related to the longevity of banked credits and the rate at which banked credits can be redeemed. The Division shall resolve these questions for both existing banked credits and establish guidance on the disposition of future payments for banked credit. The

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Division shall present any resulting modifications to the Agreement to the Commission for approval by January 1, 2007 or as soon as practicable thereafter.

3. **Payment Schedule.** The annual payment for BMPs shall be made when the Division has confirmed loading results quantified in the Association's annual loading report submitted by March 1.
4. **Phase II Credits.** The Association did not exceed its caps during Phase II, but did make payments to fund the flow gauge and partially fund the Soil and Water staff position. With these payments, the Association banked credit toward future cap exceedences at the \$29/kg rate. As tabulated in Appendix C, the Association accumulated \$343,960 in advance offset payments for 11,860 kg N reduction credit.
5. **Funding Sources.** If the dischargers can secure additional funding from sources such as federal grants, exclusive of funds available to the states, these funds can be used to make nutrient reduction payments or to fulfill other conditions to this agreement described below. Any additional funds that the dischargers secure for nonpoint source controls must be in addition to that which would have occurred from federal, state, and local sources if not for the existence of this agreement.

### VI. Minimum Conditions to this Agreement

The parties agree to meet the following minimum conditions:

#### A. Monitoring

Association facilities shall continue to monitor effluent TP and TN and the Association shall submit an annual report to the Division every March 1 detailing this monitoring data from the previous year. The annual report will be used to determine compliance with this strategy. The Division may authorize less frequent monitoring (i.e., other than weekly) where the discharger demonstrates that less frequent sampling is adequate to characterize facility loadings. All facilities shall abide by monitoring protocols defined or referenced in their NPDES permits.

Where a facility fails to report flow data, its flow for the unreported period shall be estimated based on the ratio of the facility's reported flow in the remainder of the year to the combined flow of the other Association POTW members during the same time period. Where a facility fails to report TP or TN concentrations, the facility's nutrient concentrations for the unreported period shall be estimated by the Division using the best available data.

#### B. Evaluation of Progress

The Division shall conduct estuary use support assessment and nutrient loading trend evaluation on the established Basinwide Planning schedule in 2008 and 2013. If estuary

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impairment worsens in either period or if the impairment is not eliminated by 2013, then the Division shall initiate a process to re-model the estuary and revise the TMDL for all sources.

Worsening impairment may include:

- A significant increase for the 5-year period in the magnitude or frequency of chlorophyll *a* standard exceedences in the impaired reach of the Pamlico River mainstem,
- Impairment of the Pamlico River mainstem for any other parameter related to eutrophication, or
- Increase in the spatial extent of chlorophyll *a* impairment in the Pamlico River mainstem.

If estuary impairment worsens in either period or if the impairment is not eliminated by 2013, the Division may also consider the need for additional nonpoint source management actions, which may include but would not be limited to addressing any of the following:

- Nutrient and hydrologic loading from existing developed areas,
- Onsite wastewater systems,
- Atmospheric emissions sources.

### **VII. Local Water Quality Impacts**

This Agreement does not preclude the Division from requiring individual point sources to remove nutrients where a localized water quality problem exists. The Division shall provide copies of any proposed wasteload allocation or permit requiring nutrient control for an Association member so that the Association, Environmental Defense, and PTRF may provide timely comments on the proposed agency action.

### **VIII. Decision-Making Authority**

The Division shall have final decision-making authority with regard to the adequacy of nutrient tradeoffs and allocations. The Soil and Water Conservation Commission shall have final decision-making authority with regard to agricultural BMP implementation. All other designated nonpoint source management agencies shall retain their responsibilities within the basin.

### **IX. Nonpoint Source Controls**

The Phase II Agreement called for a nonpoint source strategy, which was approved by the Commission in December 1995. The Commission then received annual reports on the progress of implementation under this 'voluntary plan'. It determined after two years of implementation that progress was insufficient and initiated rulemaking for nonpoint sources. Modeled after rules implemented in the adjacent Neuse River Basin in 1998, a set of rules addressing four subject areas went into effect during 2000 and 2001:

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1. Agriculture
2. Urban stormwater
3. Riparian buffer protection
4. Fertilizer management

The agricultural community was required to achieve a collective 30% reduction in nitrogen losses within 5 years, and to ensure no increase in phosphorus losses within four years of the development of a phosphorus accounting method. Under the stormwater rule, 5 counties and 6 municipalities were required to regulate new development to achieve 30% reduction in nitrogen export and no increase in phosphorus export from basinwide average pre-development conditions. These local governments were also required to identify and eliminate illicit discharges to the stormwater system, conduct education programs, and identify retrofit sites on existing developed lands. The riparian buffer rule established protections for existing riparian areas 50 feet in width basinwide, and required establishment of such buffers where none exist upon change of land use. The nutrient management rule requires fertilizer applicators basinwide to either have certified plans in place for lands to which they apply fertilizer, or to take training within 5 years on developing such plans. Homeowners were not subject to this requirement; instead the Division was to develop and implement an education program targeting homeowners.

To date, the nonpoint source rules have been effectively implemented. The Division implemented the riparian buffer rule effective January 2000. The agricultural community reported a 34% collective reduction in nitrogen loss between 1991 and 2001, increasing to 45% through 2003. Agriculture will continue to implement BMPs. An agricultural phosphorus accounting approach is scheduled for completion during 2005. Local governments enacted stormwater programs, including new development requirements, between September and December 2004. Local Cooperative Extension Service offices were trained during Winter 2003 to carry out nutrient management training for applicators and were expected to provide that training over the following two years. Additional instream monitoring projects are being sought to better quantify actual loading levels from different source types.

In addition to the nutrient strategy's nonpoint source rules, other nonpoint source control initiatives in the Tar Pamlico River Basin continue beyond the terms of this Agreement. Several of the major initiatives include the following voluntary and regulatory programs:

- State and federal regulation of confined animal operations,
- Phase II of federal NPDES stormwater regulation, encompassing several urbanized areas in the Basin,
- State Coastal stormwater regulation applicable to Beaufort County,
- State-mandated local stormwater regulation in Water Supply Watersheds throughout the Basin,
- State regulations protecting High Quality Waters and waters supporting listed aquatic species,
- State and federal wetlands and stream protection and mitigation regulations,
- A host of state and federal agriculture cost share and incentive programs, and technical assistance and education for farmers,
- NC Nonpoint Source Management Program and NC Coastal Nonpoint Source Program, providing state-wide and coastal NPS goal-setting, coordination, and grant funding (CWA

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Section 319 and CZARA Section 6217 respectively) for protection and restoration of water quality related to nonpoint sources of pollution,

- Other Clean Water Act water quality grant programs including Sections 104(b)(3) and 106, and
- Clean Water Management Trust Fund, a state grants program funding a range of water quality protection and improvement activities.

### X. Violation of Terms of this Agreement

If the terms of this agreement are violated, then the following strategy shall be implemented following a presentation to the Commission. During the first two years of Phase III, the Division shall convene the parties to evaluate refinements to these terms to make them more meaningful and applicable to specific types of violations. The Division shall present any resulting modifications to the Agreement to the Commission for approval by January 1, 2007 or as soon as practicable thereafter based on the results of that evaluation.

- A. All *new* dischargers shall evaluate non-discharge alternatives as their primary option and implement a non-discharge system unless they can demonstrate that non-discharge is technically or economically infeasible.
- B. All *new* dischargers  $> 0.05$  MGD who cannot utilize a non-discharge alternative shall meet effluent limits of 1 mg/l on total phosphorus monthly average.
- C. All *new* dischargers with design flows  $> 0.5$  MGD who cannot utilize a non-discharge alternative shall meet effluent limits on total nitrogen of 6 mg/l monthly average. They shall meet total phosphorus limits of 1 mg/l year round.
- D. All *new* dischargers affected by nutrient limits will be expected to comply with the limits when the wastewater treatment plant becomes operational.
- E. All *existing* discharges with design flows  $> 0.5$  MGD shall meet effluent limits on total nitrogen of 6 mg/l monthly average. Total phosphorus shall be limited to 1 mg/l monthly average for these facilities. These facilities will be given three years from the date of EMC action following strategy failure to comply with these limits. A reopener clause will be placed in all renewed NPDES permits in the Basin to allow the inclusion of effluent nitrogen and phosphorus limits.
- F. All *new, expanded and existing* dischargers shall offset any excess nutrient loading beyond the loads that would result from applying the above concentration limits to actual annual flows by funding nonpoint source controls according to procedures described in Sections IV.E. and V. of this document.

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**Tar-Pamlico Nutrient Sensitive Waters Implementation Strategy: Phase III**

Agreed to on April 14, 2005 by:

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Alan W. Klimek, P.E.  
Director  
Division of Water Quality

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David S. Vogel  
Director  
Division of Soil and Water Conservation

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Barrett L. Lasater  
President  
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Jane Preyer  
Southeast Regional Director  
Environmental Defense

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Mary Alsentzer  
Executive Director  
Pamlico Tar River Foundation

Approved by:

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David H. Moreau, Chairman  
NC Environmental Management Commission

**APPENDIX A**  
**ANNUAL NUTRIENT LOADS AND CAPS, TAR-PAMLICO BASIN ASSOCIATION**

**PHASE I**

<b>Combined N+P</b>	1991 <sup>1</sup>	1992 <sup>1</sup>	1993 <sup>1</sup>	1994 <sup>1</sup>
Loading Cap <sup>a</sup> (kg/yr)	525,000	500,000	475,000	425,000
Actual Load (kg/yr)	461,394	436,128	417,217	371,200
% of Cap	88	87	88	87
Average Daily Flow (MGD)	24.88	26.86	28.46	26.65

**PHASE II**

<b>Separate N, P</b>	1995 <sup>2</sup>	1996 <sup>2</sup>	1997 <sup>2</sup>	1998 <sup>2</sup>	1999 <sup>2</sup>	2000 <sup>2</sup>	2001 <sup>3</sup>	2002 <sup>4</sup>	2003 <sup>4</sup>	2004 <sup>4</sup>
Loading Cap <sup>a</sup> (kg/yr)	N: 405,256 P: 69,744	N: 421,972 P: 73,060	N: 426,782 P: 73,694	N: 426,782 P: 73,694	N: 426,782 P: 73,694					
Actual Load (kg/yr)	N: 372,582 P: 37,360	N: 354,219 P: 43,266	N: 320,670 P: 36,532	N: 344,781 P: 36,864	N: 309,476 P: 32,052	N: 297,988 P: 30,277	N: 279,958 P: 32,730	N: 279,330 P: 34,076	N: 309,724 P: 30,856	N: 256,791* P: 33,566*
% of Cap	N: 92 P: 54	N: 87 P: 62	N: 79 P: 52	N: 85 P: 53	N: 76 P: 46	N: 74 P: 43	N: 66 P: 45	N: 65 P: 46	N: 72 P: 42	N: 60* P: 45*
Average Daily Flow (MGD)	31.03	33.57	29.84	33.31	33.39	32.74	30.21	30.54	36.86	29.56

Loads were estimated by NC Division of Water Quality as the sum of calendar-year monthly load values for each facility, which are based on minimum biweekly nutrient concentrations and daily mass flows.

<sup>a</sup> Cap values and changes result from the following:

1. Phase I – Original 12-member Association.
2. Phase II through 2000 – 14-member Association.
3. Robersonville added in 2001, making a 15-member Association.
4. Scotland Neck added in 2002, making a 16-member Association.

\* These values provided by Association, not yet reviewed by DWQ.

## APPENDIX B

Table of Point Source Dischargers to the Tar-Pamlico River Basin

Permit	Owner	Facility	Permitted Flow (MGD)	Sub-basin	Receiving Stream
<b>Association Members</b>					
NC0030317	City of Rocky Mount	Tar River Regional WWTP	21.0	02	TAR RIVER
NC0023931	Greenville Utilities Commission	GUC WWTP	17.5	05	TAR RIVER
NC0020605	Town of Tarboro	Tarboro WWTP	5.0	03	TAR RIVER
NC0025054	City of Oxford	Oxford WWTP	3.5	01	Fishing Creek
NC0020648	City of Washington	Washington WWTP	3.65	07	TAR RIVER
NC0069311	Franklin County	Franklin County WWTP	3.0	01	Cedar Creek
NC0020834	Town of Warrenton	Warrenton WWTP	2.0	04	Fishing Creek
NC0026042	Town of Robersonville	Robersonville WWTP	1.8	06	Flat Swamp
NC0020231	Town of Louisburg	Louisburg WWTP	1.37	01	TAR RIVER
NC0026492	Town of Belhaven	Belhaven WWTP	1.0	07	Battalina Creek
NC0025402	Town of Enfield	Enfield WWTP	1.0	04	Fishing Creek
NC0023337	Town of Scotland Neck	Scotland Neck WWTP	0.675	04	Canal Creek
NC0020061	Town of Spring Hope	Spring Hope WWTP	0.4	02	TAR RIVER
NC0020435	Town of Pinetops	Pinetops WWTP	0.3	03	Town Creek
NC0042269	Town of Bunn	Bunn WWTP	0.15	01	Crooked Creek
		<b>Total Permitted Flow =</b>	<b>62.35</b>		

## APPENDIX B (CONTINUED)

Permit	Owner	Facility	Permitted Flow (MGD)	Sub-basin	Receiving Stream
<b>Non-Association Domestic Less than 0.05 MGD</b>					
NC0036919	Town of Pantego	Pantego WWTP	.006	07	Pantego Creek
NC0040584	Pantego Rest Home	Pantego Rest Home	.004	07	Pantego Creek
NC0037231	Martin County Schools	Bear Grass El Sc WWTP	.005	06	Turkey Swamp
NC0038580	Halifax County Schools	Eastman M School WWTP	.0048	04	Little Fishing Creek
NC0038610	Halifax County Schools	Pittman El School WWTP	.0096	04	Burnt Coat Swamp
NC0038644	Halifax County Schools	Dawson El School WWTP	.0073	04	Deep Creek
NC0050415	Edgecombe County Schools	Phillips Middle School	.010	02	Moccasin Creek
NC0050431	Edgecombe County Schools	North Edgecombe H Sl	.02	02	Swift Creek
NC0037885	Nash/Rocky Mount Schools	Southern Nash Junior H S	.015	02	TAR RIVER
NC0047279	C&J Bradshaw LLC	Heritage Meadows WWTP	.010	01	North Fork Tar River
NC0029131	Kittrell Job Corps Center	Kittrell Job Corps Center	.025	01	Long Creek
NC0048631	Interstate Property Mgmt Inc	Long Creek Court WWTP	.007	01	Long Creek
<b>Non-Association Domestic 0.05 to 0.5 MGD</b>					
NC0069426	Dowry Creek Community Assc.	Dowry Creek	.05	07	Pungo River
NC0021521	Town of Aurora	Aurora WWTP	.12	07	South Creek
NC0025691	Town of Littleton	Littleton WWTP	.28	04	Butterwood Creek
NC0050661	Town of Macclesfield	Macclesfield WWTP	.175	03	Bynums Mill Creek
NC0042510	Total EnvSolutions Inc	Lake Royale WWTP	.080	01	Cypress Creek
<b>Non-Association Domestic 0.5 MGD or Greater</b>					
None					
<b>Non-Association Industrial Discharging Nutrients</b>					
NC0003255	PCS Phosphate Company Inc	PCS Phosphate Co- Aurora	NL	07	PAMLICO RIVER
NL = No Limit					
<b>Total Permitted Flow =</b>			<b>0.83</b>		

## APPENDIX C

### Association Nitrogen Offset Credit Register

Date of Funding Check	Purpose of Funds	Funds Origin	Payment	Cumulative Payment	Offset Rate (\$/kg N)	N Credit (kg)	N Credit Balance, 12/31/04 Expiration (kg)*	N Credit Balance, Unresolved Expiration (kg)*
<b>Phase I</b>								
9/30/1992	Agriculture BMPs	TPBA	\$ 150,000	\$ 150,000	56	2,679	2,679	
9/30/1992	Chicod Creek BMPs	EPA 104(b)3	\$ 250,000	\$ 400,000	56	4,464	7,143	
9/30/1992	Chicod Creek BMPs	EPA 104(b)3	\$ 100,000	\$ 500,000	29	3,448	10,592	
9/30/1993	Daniel's/Nutrient BMPs	EPA 104(b)3	\$ 350,000	\$ 850,000	29	12,069	22,661	
<b>Phase II</b>								
5/31/1996	Coordinator position	TPBA	\$ 30,000	\$ 30,000	29	1,034		1,034
6/30/1996	Coordinator position	TPBA	\$ 22,860	\$ 52,860	29	788		1,822
7/26/1996	Greenville gauging station	TPBA	\$ 33,600	\$ 86,460	29	1,159		2,981
11/20/1997	Greenville gauging station	TPBA	\$ 17,100	\$ 103,560	29	590		3,571
7/7/1998	Coordinator position	TPBA	\$ 30,000	\$ 133,560	29	1,034		4,605
6/4/1999	Coordinator position	TPBA	\$ 30,000	\$ 163,560	29	1,034		5,640
12/5/1999	Greenville gauging station	TPBA	\$ 17,800	\$ 181,360	29	614		6,253
12/29/2000	Greenville gauging station	TPBA	\$ 18,700	\$ 200,060	29	645		6,898
7/9/2001	Coordinator position	TPBA	\$ 30,000	\$ 230,060	29	1,034		7,933
12/5/2001	Greenville gauging station	TPBA	\$ 17,700	\$ 247,760	29	610		8,543
4/4/2002	Coordinator position	TPBA	\$ 30,000	\$ 277,760	29	1,034		9,577
2/26/2003	Greenville gauging station	TPBA	\$ 18,100	\$ 295,860	29	624		10,202
5/6/2003	Coordinator position	TPBA	\$ 30,000	\$ 325,860	29	1,034		11,236
1/7/2004	Greenville gauging station	TPBA	\$ 18,100	\$ 343,960	29	624		11,860

\* Subject to revision after first two years of Phase III Agreement.