

**Lower Neuse Basin Association®**  
**Neuse River Compliance Association®**

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June 14, 2023

Mr. Richard Rogers, Director  
Division of Water Resources, NCDEQ  
1611 Mail Service Center  
Raleigh, N.C. 27699 - 1611

Dear Mr. Rogers:

On behalf of the Lower Neuse Basin Association (“LNBA”) and the Neuse River Compliance Association (“NRCA”) we respectfully submit the attached comments and concerns regarding the 20-Year Neuse and Tar-Pamlico Nutrient Management Strategy Retrospective: An Analysis of Implementation and Recommendations for Adaptive Management (Draft May 16<sup>th</sup>, 2023).

The NRCA member facilities have met their TMDL goals to achieve the nutrient load allocation for Total Nitrogen at the Neuse Estuary. Furthermore, as documented in the Draft Report, the NRCA member facilities have significantly exceeded their TMDL allocation goals. NRCA member facilities have successfully achieved a 68% reduction from their 1995 baseline loads in total nitrogen loading. This has been accomplished with tremendous investments (exceeding \$0.5 billion) from our local governments and member facilities.

We believe that the graphics and charts of the Draft Report adequately portray the water quality changes within the estuaries, and we are delighted that the number and magnitude of fish kills, and algal bloom events have declined. Further, we are encouraged that the organic nitrogen loading in the Neuse is largely associated with naturally occurring high flow events and that BMP implementation has increased in both watersheds. It is also encouraging that the atmospheric deposition of nitrogen is indicating a promising downward trend in the coastal region.

Thank you for the opportunity to provide comments on this report (comments attached). If you require additional information, please contact me or Haywood Phthisic, our Executive Director.

Sincerely,



John Kiviniemi, Chair

cc: LNBA/NRCA Boards  
Haywood Phthisic  
Ms. Karen Higgins  
Mr. Rich Gannon  
Mr. John Huisman

## LNBA/NRCA Comments on Retrospective 20-Year Neuse and Tar Pamlico Nutrient Management Strategy Draft Report

A. The Executive Summary is in need of re-working as it fails to identify the accomplishments of water quality management in the Basins. Rather, the Executive Summary only stresses the importance of highlighting the opportunities for the “*next iteration of basin nutrient management strategies*”. We note that the Neuse and Pamlico estuaries are the second most productive and economically beneficial estuarine lagoons in the nation (second only to Chesapeake Bay). In 1987, Congress declared the Albemarle-Pamlico Sound an “estuary of national significance”. The Neuse and Pamlico sound also supports local commercial fishing, crabbing, shrimping, clamming, and oystering. 90% of North Carolina’s commercial fishing catches are attributed to the Neuse and Pamlico Sound. These waters are NOT impaired. Rather, the TMDLs have not met their goal and the chlorophyll-a standard has not been attained based on the current methodology.

B. The document is not clear as to its overall purpose and intent. The publication, along with the 30-day comment period is suggestive of a regulatory approach. Whether this is a new rule making approach, or a Basin Management Document, or simply a minimal approach to meeting the requirements of reporting under the re-adopted 15A NCAC 02B .0710 and 15A NCAC 02B .0730 administrative codes. In any case, any new regulation concepts should include a solid scientifically justified presentation of why the rules are needed with a review of the likely potential success of achieving the intended goals. If the public is to support new regulations and provide the resources to implement any new regulations, they must be able to understand that achieving the goals is possible and the burdens must be appropriately distributed.

C. The draft document appears to offer the premise to the reader that nutrients are pollutants. **This premise is not accepted.** Nutrients are required and essential to every living organism. Nutrients are delivered to these estuaries from throughout the entire drainage area, airshed, and hydrologically and tidally connected waterbodies (the ocean). Nutrients (N&P) originate from all sources including the leaves, the grass, the crops, animals, humans, and are constantly being recycled. The document should admit clearly that the goals are to manage the activities of people and to reduce the excess nutrients of human activity and are not intended to manage the contributions of nutrients from unmanageable lands, and uncontrollable sources such as hurricane flooding, and major storm events. No stormwater management controls or BMPs are designed to prevent excessive nutrient loading from these events. The authors are encouraged to read the May 2023 evaluation of progress by the Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC) before finalizing this Draft Report.

D. The document should clearly acknowledge that the Wastewater discharge requirements and the nutrient reductions achieved by the LNBA/NRCA are the most confidently supported metrics mentioned in any management strategy. The LNBA/NRCA has directly measured nutrient load reductions by laboratory analysis of nutrient concentrations and metered flow measurements. These are not estimates but rather confident reports backed by actual measurements. In a similar fashion, the document should clearly explain that the agricultural estimates are based on studies of reducing the level of nutrients that leave the agricultural field and are not direct measurements of nutrient load reductions reaching the surface waters. These agricultural estimates are measures of effort in retaining nutrients on the field and are not confident measurements of nutrient reductions reaching the estuary. Similarly, Nutrient Offsets Trading are not confident direct measures of nutrients reduced or discharged to the estuary. Thus, there is a great deal of uncertainty in the ability to measure the effectiveness of these programs on the load of nutrients delivered to the estuary – especially over the rather short geological time period of two decades. The authors are encouraged to incorporate language from the NC Nutrient Forum regarding Dr. David Genereux’s discussion of Aquifer hydraulics, and the multi-decade legacy of non-point-source pollution. His research focused on the interaction of groundwater and surface water, watershed hydrology, and chemical/isotope hydrology.

According to Genereux...

*“A portion of the nitrogen (N) applied to the land surface in agricultural watersheds finds its way into aquifers with groundwater recharge. Some of this N is lost from groundwater systems by denitrification (conversion to N<sub>2</sub>, the principle gas in the atmosphere), but most of the rest is ultimately discharged to streams and other surface water by groundwater seepage. Because groundwater systems are large, they have the potential to store large quantities of N and other non-point-source pollutants. Also, their large size and relatively small input (recharge) per year lead to slow groundwater flow rates, meaning that groundwater systems can be responsible for large lag times between the release of N at the ground surface and the appearance of that N in surface water. Insights into these storage and lag time processes have come from the combined use of N measurements and age-dating tracers (dissolved chemicals that indicate how long groundwater has been in the ground) in coastal plain aquifers, especially for the “unconfined” aquifer (the aquifer immediately below the ground surface, that is not “confined” at depth beneath a low-permeability layer). Studies have shown the mean transit time through these aquifers, from recharge to discharge, is on the order of a few decades. Because the bulk of water in streams and rivers is discharged from groundwater systems, decades-long transit times in groundwater have important implications for understanding N concentrations in streams and rivers, and their potential response to changes in N release rates and management practices in watersheds. At any given moment, the groundwater discharge supplying water to coastal plain streams has ages ranging from a few years to several decades. Thus, at any given time, the N concentrations of streams and rivers represent the legacy of past, not just present, N use and management. This is a predictable consequence of the hydraulics of groundwater flow in unconfined aquifers (though of course other factors such as denitrification also affect the flux of nitrate from groundwater to surface water). This suggests that persistence and patience on a decadal time scale may be important when evaluating the effects of N and land-use management practices on surface water quality, specifically because of the multi-decade time scale for “flushing” the relevant groundwater systems.”*

E. We note that page 22 of the Draft offers Neuse Loading analysis for several monitoring stations above Ft Barnwell which collectively drains only about 63% of the Neuse. The Neuse Estuary also includes a rather nutrient elevated contribution from the Trent River basin. Coincidentally, we have noted a large population of poultry in Jones and Lenoir Counties with approximately 22 million broilers collectively according to 2021 figures supplied by the USDA NC Field Office. Figure 52 of the Draft Report is apparently well outdated showing only 8 million broiler and layers combined within the entire Neuse Basin – this growth in poultry operations is significant and should be characterized more appropriately. It is alarming, as the Draft Report suggests (p84/85), *“Instead, at Ft. Barnwell poultry had the highest yields, roughly 3 times greater than urban sources comprised of wastewater influent and effluent, septic and street runoff. The poultry yield equated to the total permitted wastewater discharge organic nitrogen load for the basin, which was one quarter of the permitted total nitrogen discharge load for the basin. In addition, poultry DON yield at the Trenton gauging station capturing less than one third of the Trent River watershed, which enters the mainstem below Ft. Barnwell, was half again the Ft. Barnwell poultry yield, suggesting that the entire Trent watershed yield could potentially rival that at Ft. Barnwell.*

F. It is unclear why the document does not estimate the nutrient loading from Forestry and other unmanaged lands in the Basins. According to the land use analysis presented on page 47, approximately 60% of each drainage basin (58% Neuse and 63% Tar/Pam) is composed of Forest, Wetlands, Baren land, and Grasslands. Each of these “unmanaged” or perhaps “natural” lands are not exempt from contributing nutrients to the estuaries. How can “unmanaged” lands be expected to reduce nutrients by 30%? Certainly, DWR is not suggesting that local governments carry the burden for reducing nutrients from forestry- or are they? It is suggested to re-populate the tables on land use by omitting the “open water” category. The delineation of the open waters offered in Figure 32 illustrates the point. The open water category line for each basin is determined by an arbitrary line that is not appropriate for considerations of percentage land cover analysis. This discussion also suggests that DWR should develop scientifically supportable scenario analysis testing the hypothesis that even an all forested basin can result in exceedances of the chlorophyll-a water quality standard as

currently applied through the 303(d) methodology. Even with new regulations, nitrogen losses from agricultural fields, forestry, and wetlands, will continue to result in surface water nitrogen loading for many decades.

**G.** The DWR Draft document has not introduced or referenced the concerns for internal nutrient loading. Nutrient loads are deposited in the benthic sediments of these lagoonal systems – this is a natural process. Fortunately, hurricanes and extreme flooding events can transport vast amounts of sediment out of the estuaries, through the inlets to the Ocean. However, when there is a drought or a long period of time without any hurricane activity these internal nutrients may be resuspended or otherwise fuel algal biomass blooms and salt wedges and retention time increases within the estuaries can exacerbate these issues. These issues are worth discussing and are NOT controllable by increasing the addition of new rules and regulations. Even if BMP's and SCM's are implemented further, severe storms, increases in floods, and lack of appropriate maintenance will not help to alter the condition of our coastal estuaries. There is more nutrient loading from large, uncontrollable storms, than a number of small one-inch precipitation events. Long-term BMP effectiveness estimates are typically measured at the field edge and are rarely measured on nearby receiving surface waters. Many monitoring studies of BMP effectiveness have had little to no effect on receiving waters.

**H.** Please improve the quality of the Graph on page 80. This is a very important figure and yet it cannot be read clearly.

**I.** There is no mention, within the Draft Document, of the project underway to perform modeling analysis on the Neuse River Watershed. Division Planning for this project has been underway for some time and is expected to be completed by February 2024. The results from this project may impact the validity of the statements made within the Draft Report under review. Perhaps the DWR should re-consider delaying the mention of possible new regulations and new management studies prior to the completion of this first-of-its-kind watershed model of the Neuse Basin. This project, coupled with the modeling performed by the UNRBA in the upper basin can offer insights based on non-biased analysis rather than conjecture or idealism.

The DWR internet web pages have published a complete copy of the Quality Assurance Plan for this endeavor. RESPEC (the contractor) identifies the goal of this effort is to meet the requirements of SL 2020-18 Section 15(c) by developing nitrogen delivery factors for the Neuse River Watershed. *“The project will produce a calibrated watershed model for the development and evaluation of modern nutrient strategies. As directed by SL 2020-18, the priority of this effort is to determine delivery factors for point-source discharges and nutrient offset credits. We will use the calibrated and validated watershed model to rigorously estimate the proportion of end-of-pipe nutrient loading from wastewater sources that reach the Neuse River Estuary. Since the delivery factors also play a key role in the availability and cost of nutrient trades between wastewater facilities and from wastewater facilities to watershed treatment best management practices (BMPs), the watershed model we develop will provide a rigorous and unbiased approach to estimating relative nutrient contributions from the vast array of nonpoint nutrient sources throughout the watershed. The current Neuse Nutrient Strategy seeks to reduce nonpoint-source nutrients from cropland agriculture and new development while providing important protection through the preservation of riparian buffers. The watershed model can be used to confirm existing nitrogen trading schemes and to identify other nonpoint nutrient sources and their relative impacts on nutrient loading to the Neuse River Estuary. Understanding these sources offers opportunities to develop new trading strategies.”*

**J.** The notion of reallocating load responsibilities or similar alternatives under the TMDL's will likely be vigorously challenged by the LNBA/NRCA and others if the reallocations means to pass the responsibility of managing nutrients from unmanaged lands (forests, wetlands, barren land, grasslands etc.) on to the responsibilities of NPDES permit holders. For example, will the nutrient loads from the Croatan National Forests located near New Bern be reallocated to the City of Goldsboro or the City of Raleigh? Because of concerns such as this, the section on reallocating load responsibilities needs to be expanded and clearly defined as to the intentions being considered and the potential realities of

implementation must be included in the revised Draft. The authority to reallocate nutrient loads (an essential component to healthy biota) is not readily apparent. DWR should explain their rationale for suggesting this potential approach.

**K.** The LNBA/NRCA has concerns about the limited opportunity to comment on the Draft Report. The 30-day comment period may be purposeful for the DWR since this report is already past-due (April 2023) according to the NCAC. However, the LNBA/NRCA recognizes that local governments, agricultural groups, Small Municipal Wastewater Dischargers, and other NGO organizations may not have had the opportunity to review such an extensive document with potentially significant impacts on their future financial resources – either because of a limited notice and distribution of the Draft Report or because of limited staff time and staff resources. DWR should accommodate additional time for a more complete analysis of management strategies mentioned in this Draft. Such an important NCAC reporting requirement should be finalized with a high degree of confidence in the postulated options for new regulations.

**L.** American River proclaimed (October, 2022) the Neuse River Basin as the National “River of the Year” for the progress that has been achieved since the late 1990s. There is no mention of this in this draft report.

**M.** It is questionable whether the EMC is authorized to adopt additional rules which will redistribute loads from sources not further managed. The authority to impose rules for addressing such problems is found in N.C. Gen. Stat. 143B-282(d). While the statute allows grouping sources into categories that are contributing to the water quality impairment, it limits that authority to the impairment contribution from such groups. There is no authority to add to the category the contributions of unrelated groups.

*“(d) The Environmental Management Commission may adopt rules setting out strategies necessary for assuring that water quality standards are met by any point or nonpoint source or by any category of point or nonpoint sources that is determined by the Commission to be contributing to the water quality impairment. These strategies may include, but are not limited to, additional monitoring, effluent limitations, supplemental standards or classifications, best management practices, protective buffers, schedules of compliance, and the establishment of and delegations to intergovernmental basin wide groups.”*

**N. Agriculture** - *“Each Agriculture rule provides for a collective strategy for farmers to meet a 30% nitrogen loss reduction within five years.”*

This sentence creates the misimpression that all farmers in the basins were regulated. The sentence should be revised, at a minimum, to read: “. . . a collective strategy for the categories of farmers regulated by the rules to meet . . .” Later the report acknowledges that there is only limited regulation of swine CAFOs and no regulation of poultry CAFOs. The report relies on “edge-of-management” unit accounting for reductions. The report should be amended to include new scientific conclusions on the effectiveness of that methodology for measuring agricultural compliance from the crop growing sector.

**O. New Development Stormwater** - This section should be expanded to include more about the accomplishments of the 15 local governments that implemented the new development rule beginning in 2002. The NRCA submitted a scientific study in 2016 showing that the collective loading of TN had been reduced by 30% at the Clayton bridge. While it was a combination of point source and nonpoint source loading, a request for more information from Raleigh’s stormwater program could provide information on the effectiveness of the program. That can also be compared to the program implemented in Falls Lake where all local governments were required to implement new development controls beginning in 2012. That program is a key part of the success in stabilizing or reducing the nutrient loading into Falls Lake in the past 11 years.

**P. Changes in Loading to the Estuaries** – “However, it is also important to recognize that the loading changes presented in this report are estimates that are heavily influenced by climate and changes in hydrologic conditions in each basin that in some years may impact the reductions achieved by regulated sources. Nutrient loading estimates vary year by year based on differences in annual rainfall and corresponding increases and decreases in flow. As such, the loading estimates provided in this section were evaluated to demonstrate how highly variable loading can be and are not presented as an indicator of how well the regulated community have complied with the reduction requirements of the two nutrient management strategies.”

**Does this conclusion also support the conclusion that the WQS should not be instantaneous but revised to accommodate the varied conditions over an appropriate time span to reflect the natural conditions of the waterbodies?**

**Q. Trent River Loading** – The information contained in this report creates conflict in loading to the estuary. The stream gage used to calculate nutrient loading only captures one-third of the basin watershed. So is the load **3 times the amount** at the USGS station 02092500 and sampling site J8690000. Also, there is a statement indicating Fort Barnwell is a compliance point.....how is Fort Barnwell a compliance point when its location is several miles upstream of NC 43, Streets Ferry, the beginning of the estuary?

**R.** *Should the increase in loading from high flow events be placed in the category of “natural background loading”?*

40 CFR 130.2 (e) **Load or loading.** An amount of matter or thermal energy that is introduced into a receiving water; to introduce matter or thermal energy into a receiving water. Loading may be either man-caused (pollutant loading) or natural (natural background loading).

**S. Fish Mortality Events** - Figures 25. and 26. Show two limited periods of fish kill events in both estuaries. Unlike the fish kill events in the mid-to-late 1990s, these events were not a result of the more toxic algal events resulting in human health problems. The report fails to discuss if these a part of a normal cycle of chlorophyll-a impacts in estuarine systems. The lack of any significant fish kills since 2014 in both estuaries is a positive signal as the chlorophyll-a status of the estuaries despite increases in some nitrogen sources. Also, statements as such as “people not reporting fish kills” because of apathetic behavior is not believable as organizations like Sound Rivers are on top of these issues.

**T. Land Use Changes** - The upper portion of the watershed below Falls Lake drains parts of metropolitan areas including the cities of Durham, Raleigh, and a number of growing Raleigh-adjacent communities including Cary. Durham does not flow into the Neuse River below Falls Lake.

**U. Livestock and Animal Feeding Operation Permitting** - Annual data for livestock is available from the USDA with cooperation from the NCDA&CS. Why does the report not use the annual data instead of relying on 5 year census data?

This set of topics should also include information on the net gain of nutrients into the watersheds from animal operations. DEQ was investigating the impact of the substantial volumes of feed imported into the State in the late 1990's. That impact continues, but is given no examination. The resulting surplus of nutrient that remain in the basins as animal wastes is a continuing source of nutrient overloading and gain for the estuaries. The animal permitting does not require control of the excess nutrient during events greater than the 25 year storm. Previous research by Dr. Paerl and others has examined the impact of that loading from tropical storm and hurricanes.

The Chesapeake report does examine this source of loading with its impacts on surface water as well as ground water. See pages 17-19 of the "Evaluation of Management Efforts to Reduce Nutrient and Sediment Contributions to the Chesapeake Bay Estuary."

**V. Poultry** - The poultry information for 2021-2022 for the highest producing counties is shown in an earlier comment. Why doesn't the report show all available data instead of selecting data? The sources of information are the same for both sets of data.

**W. Changes in Atmospheric Deposition** - The open water of the estuaries themselves had a large effect on the outcome, and inclusion of differing extents of estuary acreage yielded very different results, with the Neuse TMDL attributing about 5% of N loading to open water while the Tar-Pamlico assigned 33% to it. Regardless, neither TMDL proposed management actions for this portion of basin loading (actually the document officially recognized as the basis of the Tar-Pamlico TMDL, the 1994 Basinwide Plan, only budgeted nutrient sources and did not propose management actions; instead, Phase II of the point source dischargers' agreement with the state, established in 1995, provided the management plan), nor did they reassign it to other sources. They simply did not discuss its fate.

The addition of such information to the budget for reducing nutrient loading to the basins will require the TMDLs to be reopened. If that source of loading is added, the decision must be made whether it is a natural source of loading or the responsibility of other sources. In the late 1990's, the State examined the atmospheric impact of loading from animal operations and the resulting impacts from its transport to other basins. That research should be included in the scope of the problem.

**X. Analysis of Key Findings** - Given that both Neuse and Pamlico estuaries remain roughly as "impaired" or not meeting the standard today as they were at the outset of these strategies, a reasonable first question is, how much progress has been made in nutrient loading to the estuaries, and by what sources?

This finding ignores the history of the estuaries which DWR showed included not only chlorophyll-a levels in excess of the WQS, but frequent and substantial fish kills as well as important human health problems for toxic algal blooms. For the present, the information does not show an actual "impairment" of any protected use; instead, it shows limited exceedances of the chlorophyll-a WQS at isolated monitoring stations. It does show a significant impact from the loading from the significantly unregulated Trent River flows into the estuary at New Bern.

**Y. Estuary Temporal Nutrient Loading Trends** - As these trends have emerged, Paerl and colleagues have built a compelling case (Paerl et al, 2020; Paerl et al, 2019; Paerl et al, 2018) that distinct increases have occurred in coastal NC rainfall and flooding from intensified tropical cyclone activity since the late 1990's, and they have, among other things, mobilized large amounts dissolved organic carbon from freshwater wetlands, and increased N and P loading, including dissolved organic nitrogen, and have delivered them to the estuaries.

As discussed in prior comments, this research shows the need to revise the methodology for determining whether the protected uses are being protected, and the extent to which additional measures are required. The instantaneous determination of achievement of the chlorophyll-a WQS at individual monitoring stations to push the estuary into a status of "impaired" for 303(d) purposes is flawed and does not represent the ecosystem. Based on the enabling statute for development of classifications and standards, the EMC should be considering the appropriateness of the methodology used to determine if the chlorophyll-a WQS is being violated.

**Z. Trends in Basin Nutrient Sources** - While the Agriculture rules do not regulate AFOs, these operations can potentially have effects on nutrient loading. As seen in the Watershed Changes section, according to the Agricultural Census for 2002 through 2017, cattle inventories fluctuated and overall showed a modest decrease

in these basins. Hogs also fluctuated somewhat but stayed roughly the same. Poultry showed a decreasing followed by increasing trend, finishing close to starting population for this time period. It will be worthwhile to add the preceding 10 years of this tracking to understand the entire trend back from baseline.

DWR did not discuss the changing dynamic in poultry production due to the establishment of a new processing facility at Kinston as well as a second processing facility located in the Cape Fear basin. In addition, DWR relied on dated information when more current annual production by county information is available from the USDA and the NCDA&CS, the same sources from which it presented data information. Broiler production has increased with the largest county for broiler production located in the Trent River basin.