CONSERVANCY Of Southwest Florida

CLEAN WATER NETWORK of FLORIDA

December 1, 2010

Marine Numeric Nutrient Criteria Technical Advisory Committee
Florida Department of Environmental Protection (FDEP)

Estuarine Numeric Nutrient Criteria Scientific Advisory Board
US Environmental Protection Agency (EPA)

VIA EMAIL

RE: Development of Estuarine Numeric Nutrient Criteria

Dear Marine Numeric Nutrient Criteria Technical Advisory Committee (MTAC) and Estuarine Numeric Nutrient Criteria Scientific Advisory Board (NNC SAB) Members:

The Conservancy of Southwest Florida and Clean Water Network of Florida, after participating in the past two MTAC meetings and in anticipation of the first EPA SAB meeting, would like to submit the following comments regarding estuarine numeric nutrient criteria development on behalf of our more than 10,000 members. Our organizations hope that these comments and recommendations will assist the MTAC and SAB in developing criteria that are scientifically sound, meet federal Clean Water Act requirements, are adequately effective in regulating and controlling nutrient pollution sources, and sufficiently protective for restoring the water quality of Florida's estuaries.

Criteria Should Be Set As Concentrations

Developing these criteria is a policy exercise, based on both science and law. At the October FDEP TAC meeting, FDEP staff indicated that EPA would accept either concentrations or loadings as water quality criteria – and offered that the TAC should let science direct whether concentrations or loadings should be used. It is important to relay however that federal regulation requires that criteria be set as concentrations.

EPA rules at 40 C.F.R. § 131.11(b) require states to establish numerical values based on Section 304(a) Guidance, which has been published in the EPA Water Quality Standards Handbook which states that criteria be: "a criterion maximum *concentration* (CMC) to protect against acute (short-term) effects; and a criterion continuous *concentration* (CCC) to protect against chronic (long-term) effects (emphasis added)."

Of course, to calculate a load, one needs a concentration anyhow to combine with flow - so it inherently cannot be easier to determine a load limit than a concentration limit. If criteria are not met, then a loading threshold (TMDL) would be developed anyhow for that waterbody. However, by regulating only by a load criterion, one not only creates a standard that is not directly measurable in the waterbody, but do not provide any specified concentration limit. This prevents effectively regulating the very types of large discharges that the regulation is supposed to regulate. Additionally, the stressor-response approach involves quantifying the relationship between nutrient concentrations and biological response measures related to the designated use of a waterbody. So if DEP plans to use this approach, then concentrations will be required anyhow.

Overall, water quality criteria are intended to measure the ambient quality of the waterbody, and thus would need to be a concentration. For most pollutants, the biological response of fish and aquatic life is triggered by the concentration of pollutants in the water. Therefore, the TAC should recognize that concentration criteria will be required per federal regulations, and proceed in developing concentration limits for all estuaries accordingly.

Translating Loads into Concentrations (page 40 – 42 FDEP ENNC document)

The FDEP ENNC document asserts that the best way to develop a concentration for an estuarine water body that already has been assigned a load-based TMDL is to determine a long-term average concentration based on model output. The ENNC recommends a 5-year average and claims that compliance could never be determined with a single sample. The rationale behind this is that the Department claims that it has never established a consistent relationship between nutrients and HABs. This statement defies decades of peer-reviewed science.

The concept of nutrient limitation is a keystone of eutrophication research. It implies that the observed algal growth in a given water body should be proportional to the supply of growth-limiting nutrients; *and* that the practical control of algal growth and of eutrophication should involve restricting the inputs of these key nutrients to the system being managed.

According to Hessen et al. 1992, in his generalized conceptual outline for marine eutrophication, nutrient concentrations in the system are directly related to the community and ecosystem-level responses. This relationship is dependent upon ecosystem characteristics (e.g., size and hydraulic residence time) and is moderated by physical, chemical, and biological characteristics (e.g., temperature, turbidity, flushing, & species composition).

Therefore, the assumption in the ENNC document that a relationship does not exist between nutrients and HAB is simply false, and needs to be abandoned if this effort is to move forward with credibility.

Criteria Should be Set to Effectively Prevent Algal Blooms

In section 1.1 of the FDEP's draft Estuarine Numeric Nutrient Criteria (ENNC) document, it is stated that aquatic life use support is generally considered to be more sensitive to anthropogenic nutrient enrichment than other designated uses. Strong effects of nutrient loading in marine coastal ecosystems, such as algal blooms (toxic and non-toxic), reduced water visibility, etc., directly impact human uses as well. As a practical issue, from the public's point of view, it is very important to predict extreme biomass conditions, meaning worst case bloom conditions, and then set the ENNC at levels that will prevent these conditions from occurring and/or reoccurring in Florida's coastal waters.

Criteria Should Be Set Using an Aggregation of Existing WBID Boundaries

At the September TAC meeting, the Conservancy of Southwest Florida's position on setting the spatial extent of units to which these criteria would be applied was not accurately relayed. We are advocating that existing FDEP Waterbody Identification Areas (WBIDs) be aggregated to create the segments for which these criteria would be applied (not WBID by WBID), but we oppose using non-conforming new boundaries that do not mesh with existing WBIDs as is being currently suggested.

We have spent approximately 11 years assessing water quality according to its current uses and corresponding water quality standards. After assessment and identification of water quality violations comes the implementation phase of the water quality regulatory process which sets waterbody-specific pollutant thresholds (i.e. TMDLs) and Basin Management Action Plans (BMAPs) outlining pollutant reduction strategies to meet those thresholds. TMDLs pollutant thresholds tease out and address any exceptional factors (ex. high phosphorus soil content) or natural contributions (ex. fecal coliform from bird rookeries). BMAPs provide flexibility, allowing water quality retrofitting and offset to occur anywhere within the impaired assessment area or its neighboring upstream assessment areas which will ultimately achieve the pollutant reduction goal.

Changing boundaries requires resorting and reassessing data for currently verified impaired waterbodies, further delaying TMDL and BMAP development. Most of Southwest Florida has already been redelineated once already (see attached map) and therefore, reflects the best available information on those basin boundaries. Unfortunately, we heard in the November TAC meeting that FDEP is pursuing non-conforming estuary criteria boundaries and would revise the WBIDS instead - with no real explanation, or response to the concerns we expressed with this in our previous comments.

These WBID changes are not going to result in addressing any real deficiency in the current system, but rather create an unjustified excuse for delaying the implementation of additional source control requirements and water quality restoration measures for years. As such, we emphatically reiterate our request that the criteria be applies to current estuarine Water Basin ID (WBID) areas, either aggregated to represent entire estuarine systems or individually, for the purposes of estuarine numeric nutrient criteria development.

Criteria Should Not Be Set Using Multi-year Averaging

At the last MTAC meeting, it was mentioned that hurricanes and other "natural events" could cause multi-year exceedences. It is important to note that it is not the hurricane that causes the exceedance in and of itself, but the runoff contribution resulting from the large amount of rainfall. Rain is natural, but anthropogenic nutrient pollution in runoff is not. That anthropogenic nutrient pollution is precisely what these criteria are supposed to control.

Furthermore, FDEP has indicated that it is considering allowing exceedance of proposed estuarine numeric nutrient criteria, so long as an assessment area does not exceed more than 2 out of 5 years. We strongly suggest not using such a broad averaging approach, because it would result in allowing much higher concentrations during critical conditions - such as low-flow periods. The use of average flows to derive permit limits compounds the effects of averaging the concentrations. Thus, both a criterion maximum *concentration* (CMC) to protect against acute (short-term) effects; and a criterion continuous *concentration* (CCC) to protect against chronic (long-term) effects should be developed and utilized.

Aquatic life can be wiped out with one extreme pollution event at low flow conditions. The record does not contain evidence showing that high concentrations of nitrogen or phosphorus are tolerable to many sensitive species in Florida waters long-term. For toxins, protective measures typically are based on low-flow conditions, because aquatic life killed by toxin concentrations when flows are low will not come back to life when flows are higher. Though nutrients themselves are not toxins, they should be regulated in a manner that prevents harmful algal blooms which produce toxins or generate conditions that are toxic to aquatic life. With long averaging periods for determining background flow conditions and permit compliance, such blooms will not be prevented. Beneficial aquatic life needs to be protected during critical periods of short-term high concentrations of nitrogen and phosphorus.

Use of the annual geometric mean to determine compliance with the criteria would also allow long periods of high levels of nutrients. Such periods of high nutrient pollutant levels could result in impairment of the waters for designated uses, and could also cause long-term impacts on the biological integrity of the impacted waterbody. It has been suggested that waters may receive modified standards if they have average geometric mean levels below the response criteria. Such modified standards could allow waterbodies to sustain serious impairment from unnatural, excessive growth of noxious and/or toxic algae during parts of the year. This potential problem would be compounded by the proposed allowance of exceeding the standard even once within a three-year period, much less, twice in five years time - if that exceedance was to occur in the summer (wet) season when Florida waters are most susceptible to nutrient overloading.

FDEP staff has indicated that this broad multi-year averaging proposal is partially in response to inclusion of faulty data and the need to attenuate such. However, the Impaired Waters Rule has created more stringent Quality Assurance/Quality Control standards than in federal water quality regulation, already eliminating "questionable" data prior to the assessment phase. Even after the QA/QC process, FDEP sometimes still discards QA/QCed data at its discretion that it believes to be an anomaly. For example, in Cycle 2 of the Group 3 verified lists, WBID 3235G in the Caloosahatchee watershed had 2 chlorophyll-a measurements omitted from 303(d) assessment based on what FDEP staff claimed to be "not representative of ambient data". If these chlorophyll-a had been included in the assessment this WBID would have been verified impaired for nutrients. Thus, one does not need broad multi-year averaging to address anomalies in the data.

Additionally, since the data is already averaged annually, with allowances for some exceedance within that timeframe, seasonal variability is already accounted for. Therefore, in allowing up to 2 years in 5 to exceed the annual averaged criteria regulation based on the notion of a portion of the data being faulty or to account for seasonal differences, there becomes an inappropriate layering of leniency that is unjustified and counterproductive to producing appropriately stringent regulatory standards. . A more simple and straightforward way to develop frequency and duration would be to require quarterly averaging (or even monthly would be better) and limit the number of quarters in a year that can exceed the criteria. Thus, we would ask for your support that the criteria developed not allow exceedance of annual criteria requirements, and support quarterly averaging (or even monthly would be better) to prevent the algal blooms likely to occur in summer/fall months.

<u>Need for Appropriate Approach in Selecting Criteria</u>

We understand FDEP proposes that it can use any one of the following four approaches to develop these estuarine numeric nutrient criteria, including:

- TMDL approach – dose response
- Historic conditions – biological health
- Reference site comparison

Healthy existing conditions if you can demonstrate the system is currently healthy. It should be noted that in all public meetings that our organizations have participated in, FDEP has primarily suggested using the "maintaining healthy conditions" approach. This is inherently inaccurate considering that the purpose for numeric nutrient criteria is to solve the state's rampant nutrient problem. At the 8/26/10 estuarine numeric nutrient criteria public workshop, FDEP proposed the "maintain healthy existing conditions if you can demonstrate the system is currently healthy" approach for the Southwest Coastal Area (Ten Thousand Islands, Rookery Bay and Naples Bay), as well as the other estuaries in Southwest Florida (Estero Bay and Charlotte Harbor). We would object to such an approach in regions like Southwest Florida, where the watershed areas and estuaries are heavily influenced by anthropogenic stormwater runoff and pollutant loading - as evidenced by FDEP's own impairment determinations, which exclude impairments believed to be the result of natural pollution (see table below).

TABLE: PERCENTAGE OF EACH SOUTHWEST FLORIDA WATERSHED
NOT CURRENTLY MEETING STATE WATER QUALITY STANDARDS

Watershed	Percentage of Impairment 2010
Greater Charlotte Harbor	36%
Pine Island Sound	95%
Caloosahatchee	63%
Estero Bay	96%
Wiggins Pass Cocohatchee	80%
Naples Bay	100%
Rookery Bay	85%
Ten Thousand Islands	100%

Moreover, the same watersheds exhibit nutrient impairment by FDEP's current standards, exceeding chlorophyll-a criteria or DO criteria with TN or TP being the causative pollutant (see table below)

TABLE: PERCENTAGE OF EACH SOUTHWEST FLORIDA WATERSHED
NOT CURRENTLY MEETING STATE WATER QUALITY STANDARDS
FOR NUTRIENTS OR DISSOLVED OXYGEN WITH TN AND/OR TP BEING THE CAUSATIVE POLLUTANT

Watershed	2010	Percentage of Impairment
Greater Charlotte Harbor		18%
Pine Island Sound		19%
Caloosahatchee		44%
Estero Bay		78%
Wiggins Pass Cocohatchee		67%
Naples Bay		95%
Rookery Bay		30%
Ten Thousand Islands		18%

Russ Frydenborg from FDEP stated that existing conditions method could be employed where there were "no anthropogenic influences and each sampling station was meeting the designated use."

We would also oppose using Reference Site comparisons as there are no unadulterated natural systems in Southwest Florida that would be appropriate for use according to federal regulations, which clearly state that no anthropogenic pollution can be plausible or identifiable in such areas for them to be considered adequate reference sites. The Caloosahatchee TMDL for example, relied on reference site waterbodies that were different in size, and not even located in the same watershed to infer the natural condition of Caloosahatchee River - including water quality stations in the Tamiami Canal and the Rookery Bay basins to infer the natural conditions of the Caloosahatchee River. In reality, impaired waters are flowing into this subbasin from agricultural areas, which have the potential to be causing low DO levels. Indeed, there are anthropogenic activities documented within the subbasin as well, as outlined in the FDEP memo to EPA[1] where it calculates that land uses within the subbasin include rangeland, agriculture and urban or built-up land uses. Though the FDEP emphasizes that these areas are small proportions of the total, those human sources are present and would negate this subbasin being characterized as unaltered according to federal regulations. Therefore, this illustrates the flaw in trying to use a reference site approach anywhere in this region, when none of the watersheds in Southwest Florida represent a completely natural system uninfluenced by human-induced drainage and pollution.

We would instead recommend that a TMDL Dose Response approach be used where a dose response can be determined – given that the TMDL nutrient reduction target not be based on analysis where wetlands are considered pollutant sources in pre-development conditions, nor unsubstantiated current BMPs or future restoration actions be prospectively given credit in post-development/existing conditions. Where the dose relationship cannot be isolated or determined, we would recommend relying on historic data to reflect concentrations during periods where the system was most minimally impacted and biologically intact.

Need for Downstream Protective Values for Flowing Waters

Both the Conservancy of Southwest Florida and the Clean Water Network of Florida strongly supports the development and implementation of downstream protective values for all flowing waterbodies (including South Florida canals), to ensure adequate source control and upstream tributaries/canals being regulated in alignment with attaining estuarine criteria. We request the MTAC and the FDEP provide support in the form soliciting and supplying scientific data to support EPA's development of strong downstream protective values for all flowing waters to estuaries, which adequately promote source control and pollution containment on land.

No Prospective Credit for Restoration in the Form of Less Stringent Criteria

While restoration is important, there should not be presumptive credit awarded in the form of less stringent estuarine numeric nutrient criteria for it, based on an anticipated water quality benefit. Setting estuarine numeric nutrient criteria should be about developing appropriate criteria to restore the biological health in addressing existing conditions – not speculative future conditions.

If criteria are not met and the waterbody is determined to be impaired, a Total Maximum Daily Load (TMDL) should be set. Then the Basin Management Action Plan developed to meet the TMDL can take into account restoration activities, and provide credit for those activities - if they are legally assured to occur and scientifically proven to provide such a benefit. In the setting of appropriate estuarine numeric nutrient criteria however, we urge FDEP to not utilize

[1] Bailey, Nathan. July 24, 2008. Memorandum from FDEP to EPA regarding *The Tamiami Canal (Dissolved Oxygen) WBID 3261B, Documentation to Support a TMDL Not Needed.* Florida Department of Environmental Protection.

ongoing (such as the Picayune restoration project in Collier County) or planned restoration projects as the basis for less stringent criteria.

Giving Consideration to Multiple Stressors

On page 6 of FDEP's November 2010 Estuarine NNC draft, the Department states:

"Note that some systems may have factors other than nutrients (e.g., inappropriate freshwater delivery) causing stress, which complicates the assessment. However, these other factors need to be identified because reducing nutrients may not result in any beneficial improvements in some systems."

The Conservancy and CWN-FL request that the Department provide added protection for estuarine waters that suffer from multiple stressors, such as sediment toxicity, suspended solids, highly colored water (both natural and man-induced) and/or low light penetration. Scientific studies show that light reduction along with inorganic nutrient pollution, even moderate light reduction along with relatively low levels of inorganic nitrogen, have been shown to increase loss of sensitive seagrasses in comparison to losses sustained by seagrass populations that were exposed to light reduction alone (Burkholder, et al. 2007).

The interaction of all stressors in any estuarine system need to be accounted for rather than focusing solely on the various forms of nutrients, as if the other stressors did not exist. For estuaries where there are two or more known and regular stressors present in the system, nutrient concentrations should be adjusted to more protective levels, in order for sensitive indicators to survive or get reestablished in the estuary.

"Confounding Issues"

On page 7, FDEP refers to Appendix B for the Department's perspective on "Confounding Issues." We did not find an Appendix B attached to the Overview. If this is a typographical error and the actual reference should read, "Appendix A", then we will provide further comments on these issues. Please clarify so we may comment appropriately.

1.5 Main Approaches . . .

On page 9 of the Overview document, it states that:

"During the data-gathering phase of this project, many Florida expert marine scientists provided information that most Florida estuaries were currently healthy, or did not suffer from nutrient-related issues. Because of this, alternate approaches for criteria development were necessary for most systems."

We respectfully disagree with this statement. There are several problems with the statement and some assumptions that have been relied on as a basis for this statement:

1. Several of the scientists that have provided expertise to the Department are or have worked for industries who stand to benefit from a false determination that "most" Florida estuaries are currently healthy – therefore, have a conflict of interests. Alternatively, other scientists are either employees of FDEP or they are funded by FDEP from time to time, and are biased by their economic ties to the agency.

2. The definition of "healthy" is debatable. There are numerous examples of bays and estuaries that the Department calls currently "healthy" that are far from healthy, as explained

in detail above.

3. The Department's reasoning that the unhealthy estuaries' issues are not related to nutrients has not been well reasoned or documented.

Also on page 9, bullet #2, the Overview states:

"Historical conditions approach: This method identifies a protective nutrient regime based on a historical period associated with biologically healthy conditions. The healthy conditions typically occurred prior to subsequent nutrient enrichment and biological imbalances."

A major problem with this approach is the Department is very subjective about what is considered a "healthy" condition. For instance, this approach is suggested for Perdido Bay which has been identified by this effort as the most polluted (dead is the word used by Dr. Robert Livingston in your meeting) estuary in Florida. The Department has selected nutrient levels from the early 1990's as the prior nutrient levels in the Bay that could purportedly support a healthy system. It is well documented and widely known that Perdido Bay was not healthy in the early 1990's and nutrient levels were extremely high. By the mid 1990's the system began to fully crash and in 1998 millions of clams died in the Bay, never to return.

We request that the Department not use this approach to setting NNC for Florida estuaries. It is unreliable, and on its face is easily demonstrated to be unscientific or protective.

Binomial Distribution

Using a binomial distribution methodology for estuarine numeric nutrient criteria has limited or no value for protecting Florida's waters. It makes the criteria unnecessarily complicated to the public/taxpayers and is easily manipulated by anyone wishing to bias the data. We request that the Department refrain from including any usage of a Binomial Distribution in the development (estimation of frequency of exceedances) of the NNC. A more simple and straightforward way to develop frequency and duration would be to require quarterly averaging (or even monthly would be better) and limit the number of quarters in a year that can exceed the criteria.

4.3 Response-based approach

The SAB states in their draft report that:

> "Considerable unexplained variation can be encountered when attempting to use empirical stressor-response approaches to develop nutrient criteria. The final Guidance should clearly indicate that such unexplained variation presents significant problems in the use of this approach. Further, the final document should clearly state that statistical associations may not be biologically relevant and do not prove cause and effect. However, when properly developed, biologically relevant statistical associations can be useful arguments as part of a weight of evidence approach to criteria derivation. . . ."

We agree with this statement, especially the segment making the point that statistical associations may not be biologically relevant. We would ask that you establish numerical values based on Section 304(a) Guidance, which has been published in the EPA Water Quality Standards Handbook which states that criteria be: "a criterion maximum *concentration* (CMC) to protect against acute (short-term) effects; and a criterion continuous *concentration* (CCC) to protect against chronic (long-term) effects (emphasis added)."

4.4 Modeling Pensacola Bay to Predict a Natural Conditions Scenario

This section is fraught with bad assumptions and unscientific rationale. The Pensacola Bay system, especially Escambia and Pensacola Bays, is plagued with multiple stressors. The Department is correct when it says that there is toxicity in the sediments due to the agency allowing decades of toxic point source discharges into these bays. These discharges are ongoing from several point sources such as a paper mill just across the Alabama state line, several chemical plants located on Escambia Bay and the Gulf Power Crist plant on Escambia River. There are also several sewage treatment plants that discharge directly and indirectly into the Pensacola Bay system as well as hundreds of stormwater discharges. To claim that the current nutrient loading into the Pensacola Bay system is not a problem defies science and reality. The Pensacola Bay system is known for eutrophication-related issues which include significant seasonal hypoxia in bottom waters (~25% of bottom area) and ~95% loss of seagrass habitat. To say that this is a scenario that should be maintained is unacceptable.

A study conducted in 2003 by Drs. Michael Murrell and Emile Lores (http://plankt.oxfordjournals.org/content/26/3/371.full) and published in the Journal of Plankton Research states:

> "A seasonal study of phytoplankton and zooplankton was conducted from 1999 to 2001 in Pensacola Bay, Florida, USA, to further the understanding of pelagic food webs in sub-tropical estuaries. Monthly measurements included size-fractionated chlorophyll (whole water, <5 μm, <20 μm), net- and picophytoplankton composition analyzed using microscopy, flow cytometry, and HPLC pigment analysis. Additionally, zooplankton abundance and dry weight were determined from net tows. The results show a phytoplankton community dominated by the small size fraction (<5 μm), especially during the warm periods. The <5 μm chlorophyll fraction was strongly correlated with cyanobacterial abundance and zeaxanthin. Cyanobacteria (cf. Synechococcus) abundance peaked during summer in the upper estuary, typically exceeding 3×10^9 L^{-1}, and was strongly correlated with temperature. Cyanobacteria abundance at the freshwater end of the Bay (in the Escambia River) was very low, suggesting that cyanobacteria were not delivered via freshwater. Two pigmentation types of cyanobacteria were observed. Phycoerythrin-containing cells (PE-rich) were more abundant at the marine end, while phycocyanin-containing cells (PC-rich) were more abundant in the upper estuary. The larger algae (>5–10 μm) were predominantly composed of diatoms, followed by chlorophytes, cryptophytes and dinoflagellates. The three most abundant genera of diatoms were Thalassiosira, Pennales and Cyclotella. Zooplankton biomass averaged 12.2 μg C L^{-1}, with peak biomass occurring during May (□30 μg C L^{-1}). Zooplankton abundance averaged 16.7 ind. L^{-1}, peaking at 30 ind. L^{-1} during May. During the summer, the zooplankton community shifted from the ubiquitous Acartia tonsa towards Oithona sp. The increase in Oithona coincided with increases in picophytoplankton and may reflect the changing food resources available to zooplankton. Thus, the trophic implications of cyanobacterial dominance in sub-tropical estuaries need to be more fully assessed."
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> "This study described the phytoplankton and zooplankton composition in Pensacola Bay, Florida, a sub-tropical estuary in the northern Gulf of Mexico. We observed remarkably high abundances of cyanobacteria in Pensacola Bay during three summer periods from 1999 to 2001 (Figure 3A), and that cyanobacteria appeared to dominate the chlorophyll biomass during these periods (Figures 2 and 3B). The HPLC data supported this interpretation, showing high relative concentrations of the diagnostic pigment zeaxanthin (Figure 5) and a strong coherence between zeaxanthin and cyanobacterial abundance (Figure 6). The zooplankton were dominated by Acartia tonsa, typical of temperate estuaries, and may become food-limited during periods of cyanobacterial dominance."

"While cyanobacteria abundance has been reported from many estuaries, their contribution to total phytoplankton biomass is less frequently quantified. Averaged over this time series (excluding station 1), cyanobacteria in Pensacola Bay represented 43% of total chlorophyll, and this fraction was usually well over 90% during summer (Figure 2). In other estuaries where this estimate has been made, their contribution appears to be much smaller. For example, in San Francisco Bay cyanobacteria were a relatively small component of total chlorophyll (Ning et al., 2000), averaging 15% (maximum 38%). In the Neuse River estuary, cyanobacteria represented 18% of total chlorophyll based on HPLC pigment analysis (Pinckney et al., 1998). In the York River estuary, picophytoplankton comprised 7% of chlorophyll over an annual cycle, peaking at 14% during summer (Ray et al., 1989). In Kiel Bight, Jochem (Jochem, 1988) reported that cyanobacteria contributed up to 52% of the total chlorophyll during summer, but presented no data during other seasons. In Southampton estuary, Iriarte and Purdie (Iriarte and Purdie, 1994) found that cyanobacteria contributed 10% or less to bulk chlorophyll. Based on a survey of the available literature, they further argued that the picoplankton contribution to bulk chlorophyll is only dominant in oligotrophic environments with chlorophyll levels from 0.5 to 1 μg L^{-1}, and that their importance diminishes with increasing trophic state, ultimately contributing <5% when chlorophyll concentrations exceed 5 μg L^{-1}. While this pattern may hold for temperate estuaries, Pensacola Bay and similar sub-tropical systems such as Florida Bay (Phlips et al., 1999) do not fit this pattern.

"At present, we do not have comprehensive estimates of cyanobacterial productivity in Pensacola Bay, but results from dilution experiments show that the maximum specific growth rate of cyanobacteria is 1–1.5 day^{-1} during summer and is strongly linked to temperature (Juhl and Murrell, in review).

"Based on these observations, it is clear that estuarine cyanobacteria actively grow during warm periods, and thus significantly contribute to bulk productivity, probably in proportion to their relative biomass.

"A central finding of this study was the striking summertime peak in cyanobacteria abundance, reaching 3×10^9 L^{-1} (Figure 3), which strongly covaried with the small chlorophyll size fraction (Figure 3B) and with zeaxanthin concentration (Figure 6). The cyanobacteria were small (1–2 μm) and typically were observed as single cells, but occasionally occurred in small clumps of 10–20 cells."

This study and the data presented in the ENNC document raise several questions and make several relevant points:

1. Is the Dept. relying only on chlorophyll a data? Does it include chlorophyll a in cyanobacteria? If up to 90% of the chlorophyll a in the summer time is in cyanobacteria, so the Department take that into account? The fact that there is such a predominance of toxic bacteria must be factored into the total picture. What size is the filter that is used and is it small enough to capture all of the plankton that is in the water?

2. The Hydroqual model for the Pensacola Bay System averages the chlorophyll a levels of the four different bays in the system which masks the higher chlor a levels (up to 8 mg/l) in some areas of the system and ignores the lower levels in the less impacted areas. The less impacted areas have an average chlor a level of 1 to 2 mg/l which would indicate a more representative condition. Even these are annual averages and are probably higher than should be allowed on a single sample basis. The four bays in this system, plus Santa Rosa Sound should either each have their own criteria that reflects their true natural condition or you should use the most protective criteria found in any of the bays, for the entire system. An

average of the entire system will result in degradation of the higher quality waters.

3. This modeling effort was done for a company that was trying to increase discharges to the Pensacola Bay System and is clearly designed to justify the discharge. There are other studies and data available that should be used.

The SWIM plan for the Pensacola Bay system makes some important points that should be factored into the development of ENNC for this system:

One of the principal products of the Escambia Bay Recovery Program was the work of Olinger et al. (1975). This work characterized conditions in portions of the system as of 1975 and remains the most comprehensive analysis of the system that has been conducted to date. Of the numerous conclusions of this report, two are quoted below.

> "Because of poor circulation and flushing characteristics, the assimilative capacity of the Pensacola Bay system is extremely limited, and the bay is barely able to assimilate natural inputs of nutrients and oxidizing materials. Most of the particulate material entering the Pensacola Bay system from point and nonpoint waste sources and tributary rivers are retained in the system."
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> "Although conditions may have changed since 1975, the basic physical processes which control circulation and flushing in the system are unchanged. Thus, much of the system continues to be impacted by both point and nonpoint source pollutant loading. Such pollutant loading includes suspended sediments contributed by nonpoint sources throughout the basin, chronically-elevated nutrient levels, resuspension by wind events of previously deposited nutrients, and high turbidity."

Data from Escambia and Pensacola bays, in particular, indicate that water quality problems persist. Urban bayous continue to have obvious, substantial problems with water and sediment quality, fish kills, etc. These result from urban stormwater runoff and, in Bayou Chico's case, a long history of waste disposal. Habitat loss and degradation continues and is accelerating in areas. Seagrasses have not significantly recovered, and increasing development pressure on estuarine shorelines causes additional habitat loss and nonpoint source pollutant loading.

Although limited aspects of these issues have been the focus of past research, the overall dynamics and functioning of this highly stratified, poorly flushed system are not understood such that the fate of an introduced contaminant may be accurately predicted. Although discharge limits for various contaminants have been in use for some time, the overall capacity of the system to assimilate waste and still function in a healthy manner remains unknown. More recent research has tended to be more site-specific and less comprehensive than that of the 1970s, and has generally failed to address the status of the system as a whole and its ability to cope with current loadings.

Although this plan is intended to achieve the protection and restoration specifically of the Pensacola Bay riverine and estuarine system, it should be noted that protecting this resource, as well as other Gulf coastal plain rivers and estuaries, is essential to the protection of the Gulf of Mexico. Coastal waters in general and estuaries in particular are convergences of productivity within the Gulf of Mexico, and estuaries and associated salt marshes are among the most productive of all ecosystems. The Pensacola Bay system exports nutrients into the Gulf via a narrow pass at the mouth.

Escambia Bay is the most highly stressed bay of the system. It receives the most significant permitted industrial discharges as well as pollutant load from the Escambia-Conecuh River System. Circulation is extremely limited, especially in the upper bays, and a large portion of pollutants adhere to suspended sediments and are deposited on the bottom. Escambia Bay sediments have the highest total organic carbon, TN and TP levels, as well as the greatest potential for toxic compound accumulations. Suspension of these sediments is, therefore, a serious concern. The upper portion of Escambia Bay has been described as being in a state of eutrophication. (U.S. Department of the Interior, 1970).

Blackwater and East bays remain the most unaffected from anthropogenic degradation. Growth in Santa Rosa County, however, is beginning to threaten these systems with increased stormwater runoff, gray water and septic tank effluent, and anticipated increases from STP discharges. Blackwater and East bays are lower energy systems than Pensacola and Escambia bays because of the lower river inputs and lower tidal exchange. This contributes to the potential of even greater water and sediment quality degradation in this part of the system. East Bay appears particularly vulnerable to the effects of growth and NPS pollution (Collard, 1991a).

Pensacola Bay benefits from the upper bays acting as sinks for those pollutants which originate in the upper watershed. Pensacola Bay also has a higher energy level and exchange rate with the Gulf. The watershed of this bay, however, is the most intensively developed portion of the system, and it is the source of a considerable amount of urban stormwater runoff.

While steps have been taken to improve some aspects of the water quality in the system since the 1960s, the level of degradation remains high, and the system continues to exhibit signs of deterioration. Point source discharges and increased inputs of sediments, nutrients and other pollutants from nonpoint discharges continue to impair the system. This situation led to the establishment of the Escambia-Santa Rosa Coast Resource Planning and Management Committee in 1984 under the auspices of Chapter 380, Florida Statutes (F.S.). This Committee developed a plan for extensive studies of the system over a ten year period with the goal of establishing current ecological conditions and predicting growth pressures and future trends. The plan, known as the Bay Area Resource Inventory Program (BARIP), was finalized in 1986 by the University of West Florida in conjunction with the West Florida Regional Planning Council, University of Florida, and the NWFWMD. To date, BARIP has not been implemented. The Committee also developed and *Pensacola Bay System SWIM Plan 15* adopted a Resource Management Plan which includes zoning and has been implemented to protect water quality."

The full SWIM plan provides a wealth of history, documentation of impacts and reasons why accepting the status quo in the Pensacola Bay System is not an option. We ask that the Department and the MTAC start anew in developing an appropriate approach to adopting nutrient criteria for this system.

<u>Conclusion</u>

In conclusion, the Conservancy of Southwest Florida and Clean Water Network respectfully request the FDEP MTAC and EPA SAB members consider all of the aforementioned comments and recommendations, as well as provide us with a written response to them. We also respectfully request that one of the MTAC meetings be held in the Southwest Florida region, to allow those regional stakeholders to directly participate and provide input as other regions have been allowed to do so.

We sincerely thank you for your consideration of our input on this matter, and please do not hesitate to contact Jennifer Hecker at (239) 262-0304 x250 or Linda Young at (850) 322-7978 to discuss further.

Sincerely,

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MAP OF MODIFIED WBID BOUNDARIES WITH YEAR THEY WERE REDELINEATED