Tampa Bay Nitrogen Management Consortium Comments and Request Regarding the Development of Protective Loads for the Tampa Bay Estuary as It Relates to Establishing Numeric Nutrient Criteria for Lakes, Flowing Waters and Estuaries in Florida

March 4, 2010

Comments provided by the Tampa Bay Nitrogen Management Consortium. Participants include:

Tampa Bay Estuary Program
U.S. Environmental Protection Agency
MacDill Air Force Base
Florida Department of Environmental Protection
Fl. Dept. of Agriculture & Consumer Services
Florida Department of Transportation
Southwest Florida Water Management District
Tampa Bay Regional Planning Council
Tampa Port Authority
Hillsborough County
Manatee County
Pasco County
Pinellas County
Polk County
City of Bradenton
City of Clearwater
City of Gulfport
City of Lakeland
City of Largo
City of Mulberry
City of Oldsmar
City of Palmetto
City of Plant City
City of Safety Harbor
City of St. Petersburg
City of Tampa
Mosaic Company
Kinder Morgan Bulk Terminals, Inc.
Tampa Electric Company
CF Industries
CSX Transportation
Eastern Associated Terminals Co., LLC
Tropicana Products, Inc.
Kerry I&F Contracting
Tampa Bay Water
Trademark Nitrogen
Yara North America
Alafia Preserve, LLC
Eagle Ridge, LLC
LDC Donaldson Knoll Investments, LLC

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Summary

The Tampa Bay Nitrogen Management Consortium (NMC) asserts that the nutrient loads approved by EPA and FDEP as regulatory goals for Tampa Bay are more appropriate than EPA's draft protective loads for the Tampa Bay estuary and provide for the full aquatic life protection and support for all designated uses in the estuary. Furthermore, the Tampa Bay NMC requests that EPA finalize the Tampa Bay estuary's protective loads when establishing downstream protective values for flowing waters in the Tampa Bay watershed as part of the second phase of this rulemaking process in coordination with the proposal and finalization of numeric criteria for estuarine and coastal waters that is anticipated to occur in 2011.

1. Introduction

This paper provides comments from the Tampa Bay Nitrogen Management Consortium (NMC) on the protective loads proposed for the Tampa Bay estuary in EPA's draft numeric nutrient criteria for lakes and flowing waters in the State of Florida (Docket ID No. EPA-HQ-OW-2009-0596). And, as was requested by EPA in the draft rule, this document and supporting attachments serve to provide EPA with an **alternative, resource-based approach to address protection of downstream water quality that attains and maintains the State's designated uses in the Tampa Bay estuary**.

The Tampa Bay NMC approach that has established state and federally-approved nutrient loading targets for the estuary follows EPA's technical guidance that quantitative stressor-response relationships are the most preferred methodology in establishing numeric nutrient criteria. Multiple lines of empirical evidence justify maintaining existing total nitrogen (TN) and total phosphorus (TP) loads to the Tampa Bay estuary. Water quality and clarity in the Bay has improved tremendously since significant management actions were initiated starting in the 1980s, seagrass acreage has increased to the highest levels observed since the 1950s and continues to increase, and economically-important fish and wildlife populations have been maintained since routine monitoring programs began in the 1990s.

The Tampa Bay NMC thanks EPA for recognizing that, for particular estuaries, site-specific analyses should be used instead of EPA's general approach for establishing protective estuarine loads and downstream protective values in the final lakes, flowing waters, and estuaries rules. We believe the documentation provided in this public comment clearly shows that the analyses conducted by the Tampa Bay NMC provide a defensible and protective alternative for inclusion in the final numeric nutrient criteria for lakes, flowing waters and estuaries in the State of Florida.

Based on these findings, the Tampa Bay NMC requests that EPA acknowledge that existing TN and TP loads to the Tampa Bay estuary are appropriate and defensible protective loads. The Tampa Bay NMC recommends that EPA finalize the Tampa Bay estuary's protective loads when establishing downstream protective values for flowing waters in the Tampa Bay watershed as part of the second phase of this rulemaking process in coordination with the proposal and finalization of numeric criteria for estuarine and coastal waters that is anticipated to occur in 2011.

The Tampa Bay NMC is providing this technical feedback to EPA to:

1. describe the improvements in the Tampa Bay ecosystem in response to the development and implementation of an adaptive nutrient management strategy for the Tampa Bay estuary;
2. describe the adaptive nutrient management strategy developed by the stakeholder-driven process spearheaded by the Tampa Bay NMC and facilitated by the Tampa Bay Estuary Program (TBEP);
3. demonstrate that appropriate protective loads for the Tampa Bay estuary should be established to maintain TN and TP loads at existing levels consistent with Tampa Bay's adaptive nutrient management strategy; and,
4. provide EPA with the Tampa Bay NMC's recommended protective loads for the Tampa Bay estuary that should be promulgated into the final numeric nutrient criteria for lakes, flowing waters and estuaries in the State of Florida.

2. Tampa Bay's Road to Recovery

Water quality in Tampa Bay declined from the 1950s-1970s as population growth led to increased discharges of partially treated sewage with large amounts of nutrients directly to Tampa Bay. Algae blooms and fish kills were common throughout the latter part of this period and almost 50% of the seagrass in the bay died off as a result of insufficient light and poor water quality. Unregulated dredge and fill operations further contributed to the problem by clouding the water and physically removing portions of bay bottom from being re-colonized by seagrass.

A significant turning point for Tampa Bay occurred in the 1980s when implementation of state legislation known as the Grizzle-Figg Act (Florida Statute 403.086), which was first adopted in the early 1970s, came into effect requiring more stringent treatment standards for wastewater plants discharging to Tampa Bay and its watershed. Upgrades to the City of Tampa's Howard F. Curren Plant at Hookers Point during the late 1970s to advanced wastewater treatment increased nutrient removal and significantly reduced the amount of nitrogen being discharged into the bay. Also across the bay, the City of St. Petersburg pioneered the country's first large-scale reclaimed wastewater program, reusing treated wastewater for irrigation of lawns and golf courses rather than discharging it into the bay. The advanced treatment and reuse standards set forth in Grizzle-Figg legislation provided the bay with a kick start for its turnaround.

The quality of bay waters initially responded quickly to the reductions in nutrient loadings from point sources discharging to the bay in the early 1980s (Figure 1). Water quality in the bay has been further enhanced with the 1985 enactment of state legislation requiring more stringent stormwater treatment regulations (Florida Administrative Code: 40D-4; 40E-40), additional upgrades of sewage treatment plants in the watershed to advanced wastewater standards and/or to reuse disposal, and voluntary nutrient reduction projects implemented through the Tampa Bay NMC. The Tampa Bay NMC is an ad-hoc public-private partnership that includes federal and state regulators, local governments, and key-industry stakeholders focused on managing nutrient inputs to the Tampa Bay estuary. Currently, the NMC has proactively developed nutrient loading limits for all major nutrient sources discharging to Tampa Bay. **Collectively, both the voluntary actions of the Tampa Bay NMC and state regulatory actions adopted in the Tampa Bay watershed have served as the adaptive nutrient management strategy in the bay over the past quarter century.**

As a result of this adaptive nutrient management approach in Tampa Bay, **existing total nitrogen and phosphorus loadings are currently half the levels of what was discharged to the bay in the 1970s (Figure 2) despite an increase in population to about 2.5 million residents in the Tampa Bay region (Figure 3)**. Maintenance of existing nutrient loads to Tampa Bay has currently resulted in the bay meeting its designated uses and supporting full aquatic life protection. This includes the restoration and preservation of important seagrass resources, as well as maintaining and balancing the phytoplankton-based food web critical to the production of fish and wildlife populations in Tampa Bay.

For instance, concentrations of chlorophyll-*a* – a key indicator of eutrophication and a parameter used in assessing progress in managing nutrient inputs to Tampa Bay – dropped dramatically in all major segments of the bay during the early 1980s. In Hillsborough Bay alone, the **average chlorophyll-*a* concentrations decreased from 37 μg/L in 1982 to less than 15 μg/L (Figures 1.A. & 3). Since 1992, the major bay segments of Tampa Bay have met chlorophyll-*a* targets appropriate to support the expansion of seagrass nearly 80% of the time (Figure 4).** For those years when targets were not met, anomalous rainfall events (El Niño years) likely contributed to exceedences.

Historically, events such as unseasonable heavy rains or unanticipated spills have occasionally resulted in the Bay not meeting water quality thresholds indicative of the maintenance of existing nutrient inputs for a short period of time. Most recently in 2009, anomalous May rainfall served as a catalyst for a nuisance algae bloom (*Pyrodinium bahamense*) in upper Tampa Bay. The bloom resulted in water discoloration and reduced clarity during June and July 2009 and excessive chlorophyll-*a* concentrations during these months in the Old Tampa Bay segment; however, fish kills and human-health impacts were not reported during this time.

As part of the adaptive nutrient management strategy employed in Tampa Bay, resource managers, scientists and researchers swiftly responded to the 2009 algae bloom event. In August 2009, the TBEP convened a special technical session to examine potential causes of the bloom, and more importantly, how best to address the causes in order to reduce the future possibility of nuisance algae blooms in Old Tampa Bay. Academic and agency scientists specializing in algae blooms in Florida hypothesized that the pulsed flow and associated nutrient flush from the heavy, unseasonal May rainfall resulted in conditions conducive to bloom formation, but that additional information was needed to determine the root causes of its initiation and persistence during the summer of 2009.

Additionally, several significant actions by local governments and the TBEP have occurred since the 2009 algae bloom to support the adaptive nutrient management strategy for Tampa Bay. In January 2010, Pinellas County (a highly urbanized county located in the watershed of Old Tampa Bay) approved a residential fertilizer management ordinance. This ordinance includes a ban on nitrogen residential fertilizer application during the rainy summer months (June 1- September 30) and also includes a ban on the retail sales of these products during the rainy season. The application ban will be in effect for 2010, followed by enforcement of the retail ban in 2011. In addition, at their February 2010 meeting, the elected officials of the TBEP Policy Board approved funding for additional studies as recommended by TBEP technical advisors to determine the causes of bloom formation. The studies will be used to identify appropriate, specific

and effective management actions to reduce the potential for future bloom formations in this portion of Tampa Bay.

Since 1982, with improved water clarity resulting from nutrient management actions, nearly 8,000 acres of seagrass have been naturally recovered in Tampa Bay. Recent estimates also indicate that the rate of seagrass expansion has increased over the past decade (Figure 5). From 1999-2008 seagrass have expanded at a rate of about 509 acres per year compared to approximately 428 acres per year for the 1988-1998 period.

Maintaining adequate conditions for seagrass growth and expansion has not been the only goal for the adaptive nutrient management strategy developed for Tampa Bay. As for other estuaries, Tampa Bay supports a phytoplankton-based food web critical for supporting the designated uses of maintaining and enhancing fish and wildlife production. Nutrient load reductions, as well as other restoration efforts have promoted the long-term maintenance of a balanced ichthyofaunal assemblage in Tampa Bay[1]. As for species that are directly dependent on phytoplankton production in the bay, young-of-the-year abundance of striped mullet, *Mugil cephalus,* has remained relatively constant over the recent period (Figure 6). Striped mullet are an algae-eating species that are economically important in Florida and serve as key trophic intermediates of balanced phytoplankton-based food webs in southeastern US estuaries[2]. Notably, peak indices of abundance for this species have occurred when chlorophyll-*a* concentrations in the bay have exceeded targets due to anomalous events.

Likewise, other trophic levels dependent upon a balanced phytoplankton-based food web show peaks in abundance during anomalous nutrient loading events. Baitfish-feeding bird species nesting in Tampa Bay, including the brown pelican (*Pelecanus occidentalis*) follow the patterns observed for striped mullet (Figure 7). Increases in nesting pairs were observed in the El Niño years when high nutrient loads and chlorophyll-*a* levels were observed in Tampa Bay.

Based on these lines of empirical evidence, the Tampa Bay NMC asserts that the existing adaptive nitrogen management strategy developed for Tampa Bay has been shown to support full aquatic life protection and designated uses in Tampa Bay. **The premise of this strategy is to maintain existing TN and TP loads at levels that will support a balanced ecosystem.** This balance has resulted in the recovery of seagrass resources by maintaining appropriate water clarity in the Bay while supporting and maintaining the Bay's fish and wildlife populations through an adequate phytoplankton-based food web. The evolution and justification of this strategy for Tampa Bay is described in the next section.

[1] Matheson, R.E., R.H. McMichael, T.C. MacDonald & G.E. McLaughlin. *In Press*. A Brief History of the Fish Fauna of Tampa Bay. Proceedings of the 5th Tampa Bay Area Scientific Information Symposium, St. Petersburg, FL. October 20-23, 2009. 18 pp.

[2] Wenner, C.A., W.A. Roumillat, J.E. Moran M.B. Maddox, L.B. Daniel and J.W. Smith. 1990. Investigations on the life history and population dynamics of marine recreational fishes in South Carolina, part 1. South Carolina Marine Resources Research Institute, Completion reports, Project F-37, Charleston and Project F-31, Brunswick.

3. Development of the Tampa Bay Nutrient Management Strategy

The Tampa Bay Estuary Program (TBEP) was established in 1991 to help local governments, agencies, and other stakeholders in the Tampa Bay area develop a plan to sustain the recovery of Tampa Bay. The TBEP partners adopted a Comprehensive Conservation and Management Plan in December 1996 (subsequently updated in 2006; Attachment A) that included measurable goals for the achievement of the Bay's designated uses and to support full aquatic life protection. Among these goals was the restoration of bay water quality to support the recovery of seagrass resources while maintaining and enhancing the Bay's fisheries production and other designated uses through bottom-up processes.

Significant resources, commitments, and investments have been made by TBEP partners to achieve these goals with measured success. Public and private parties that comprise the TBEP management and policy boards unanimously adopted a strategy that limits nutrient loading to the major bay segments of Tampa Bay. These limits ensure that adequate water clarity and light levels are maintained in the bay on an annual basis to promote seagrass recovery. These limits also provide a balance between the recovery of seagrass resources and maintaining and enhancing the phytoplankton-based food web and fisheries production long recognized in Tampa Bay. To further reinforce their commitment in maintaining these ecosystem-based restoration goals for Tampa Bay, local government and agency partners formally adopted an Interlocal Agreement in 1998 (Attachment B).

Simultaneously in August 1996, the Tampa Bay Estuary Program's governmental partners joined with key industries in the Tampa Bay region to create an ad-hoc public/private partnership known as the Tampa Bay Nitrogen Management Consortium. The Consortium's intent and mission was to implement an Action Plan to meet the protective nutrient load targets developed for Tampa Bay. During development of the targets, bioassay experiments, empirically-derived nutrient-response relationships, and water quality modeling simulations indicated that controlling nitrogen loads to the bay should be the primary watershed management focus to limit phytoplankton production and allow for improvements in bay water clarity (Attachment C). **These early studies clearly established that nitrogen loads were the limiting nutrient in the Tampa Bay estuary and that phosphorus loadings to the bay from the enriched Bone Valley region were not controlling estuarine production.**

The original Consortium Action Plan, entitled Partnership for Progress (Attachment D), consisted of more than 100 projects that collectively reduced or precluded nitrogen discharges to the bay by an estimated 134 tons each year between 1995 and 1999. Since 1999, an additional 138 projects have been implemented to reduce nitrogen loads to the bay by about 298 tons each year. In total, from 1992-present, **Consortium participants have invested over $430 million in projects and actions to reduce nutrient loads to Tampa Bay in order to adaptively manage for and meet the protective load targets for the bay (Attachment E).**

The commitments and projects implemented by Consortium participants have served as the core of a larger nutrient management strategy for Tampa Bay that includes:

1) achieving a resource-based management goal of restoring/preserving baywide seagrass resources and habitats while maintaining and enhancing fisheries production in the bay (Attachment F);
2) achieving chlorophyll-*a* and nutrient reduction targets **specific for each major bay segment** that support the recovery of seagrass resources (Attachment G);
3) identifying a general apportionment of responsibility for meeting the nutrient reduction targets within the major bay segments (Attachment D & H); and
4) tracking whether adequate water quality is being maintained and, as a result, seagrass resources are being restored (Attachment I) and full aquatic life support is protected (Attachment J).

In November 2002, the Florida Department of Environmental Protection (FDEP) concluded that the Tampa Bay Nitrogen Management Consortium's nitrogen management strategy provided reasonable assurance that the state water quality criteria for nutrients would be met in Tampa Bay (Attachment K). Prior to this state determination, **the U.S. Environmental Protection Agency (EPA) recognized a 1998 action by FDEP that proposed a total maximum load ("federally-recognized TMDL") of nitrogen that could be discharged to the bay annually and still meet state water quality standards related to nutrients (Attachment L)**. Both FDEP's reasonable assurance determination and the total maximum nitrogen loading recognized by EPA are based on statistical modeling and data analyses peer-reviewed by the TBEP, its partners, and state and federal regulators (Attachment M). Thus, the Consortium's nutrient loading targets developed for the major bay segments of Tampa Bay (Figure 8) have been acknowledged by both FDEP and EPA as protective nutrient loads for this estuary.

In 2007, additional local governments, industries and agencies located within the Tampa Bay watershed were invited to: 1) become participants in the Consortium; 2) continue to develop and implement the collaborative watershed approach to nutrient management for Tampa Bay; and 3) help further meet the regulatory requirements of FDEP and EPA in maintaining protective nutrient loads for Tampa Bay. To date, more than 50 entities now actively participate in the Consortium. As a result of this renewed effort and interest in maintaining protective nutrient loads for the Tampa Bay estuary, Consortium participants submitted a 2007 Reasonable Assurance update to FDEP on January 28, 2008 (Attachment N) with the expressed intent to develop permit-specific nitrogen load allocations for all major dischargers to Tampa Bay by summer 2009. The FDEP accepted this updated nitrogen management strategy (Attachment O) with the acknowledgment that the Consortium would proactively develop an equitable process and define the suggested nitrogen load allocations to all major sources and permitted-dischargers within the Tampa Bay watershed that would meet the protective nutrient loads defined in the 1998 federally-recognized TMDL (Attachment L).

Most recently on September 11, 2009, the Consortium approved protective nitrogen load allocations for all major sources in the Tampa Bay watershed and later finalized the 2009 Reasonable Assurance Addendum: Allocation and Assessment Report (on January 22, 2010) for submittal to FDEP (Attachment P) to fulfill FDEP's 2007 reasonable assurance determination (Attachment O) and meet the protective estuarine nitrogen loads established in the 1998 federally-recognized TMDL (Attachment L). This accomplishment will ensure that nutrient loads will be managed to support the continued recovery of the Tampa Bay estuary. The successful nutrient management strategy that has evolved from the efforts of local

governments, agencies, and industry participants of the Tampa Bay NMC since the 1990's, has ensured that the designated uses of the Tampa Bay estuary are and will continue to be met in the future.

To date, this strategy has documented proven results (Attachment Q). The recovery of the Tampa Bay ecosystem after decades of decline is unprecedented among urban estuaries worldwide and has been cited in numerous peer-reviewed publications[3] as a successful nutrient management strategy that has produced desired results. The improved water quality and ecological health of the bay is even more remarkable in light of strong population growth that has occurred during the recovery period (Figure 3). Bay water quality initially responded quickly to reductions in nitrogen loading, and has since been maintained at levels that promote the recovery of seagrasses in the bay. From 1982 to 2008, nearly 8,000 acres of seagrasses have been naturally recovered in the bay (Attachment R). The reductions in nitrogen loads to Tampa Bay and resulting recovery of seagrasses has also led to overall improvements for other designated uses and the support of full aquatic life protection (Attachment H).

The overall variability in annual dissolved oxygen (DO) concentrations (the difference between the observed maximum and minimum values) appears to be declining over time, and median DO conditions in all major bay segments are protective of aquatic life support (Attachment H). These patterns are consistent with the observed response to the reductions in nutrient loadings and algal biomass that have occurred during the past quarter century in Tampa Bay. Likewise, fish and wildlife populations in Tampa Bay have either shown stable or increasing trends in abundance due to the overall ecosystem improvements that have occurred in response to nitrogen load reductions in Tampa Bay (Attachment J). The Tampa Bay ecosystem has indeed shown a balanced response to the nutrient management strategy employed by TBEP partners; however, it is recognized that anomalous events are still occasionally observed in the system and continuing adaptive management strategies will need to be employed (Attachment S).

Regardless of these temporary perturbations, Tampa Bay has seen consistent improvement in its water quality and associated designated uses largely through the efforts of this stakeholder-driven initiative and state legislation to improve wastewater and stormwater treatment. Given the three decades of cooperative and collaborative experience that has driven these improvements and understanding of nutrient

[3] Badylak, S. & E.J. Phlips 2008. Spatial and temporal distributions of zooplankton in Tampa Bay, Florida, including observations during a HAB event. J. of Plankton Resarch. 30(4):449-465.
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Paerl, H.W. 2009. Controlling eutrohpication along the freshwater-marine continuum: Dual nutrient (N and P) reductions are essential. Estuaries and Coasts. 32:593-601.
Rabalais, N.N. & 5 others. 2009. Dynamics and distribution of natural and human-caused coastal hypoxia. Biogeosciences Discussions. 6:9359–9453.
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management for the Tampa Bay estuary, the Tampa Bay Nitrogen Management Consortium requests that EPA utilize this adaptive nutrient management strategy for defining protective nutrient loads for the Tampa Bay estuary in its proposed rules for lakes, flowing waters and estuaries of the State of Florida. As demonstrated above, there is considerable evidence that existing loads to the major bay segments of Tampa Bay provide for the full aquatic life protection and support for all designated uses in the estuary and are therefore within the estuary's assimilative capacity.

4. Concerns with EPA's Draft Rule

The Tampa Bay NMC has concerns regarding the draft rule for numeric nutrient criteria for flowing waters within the Tampa Bay watershed. This rule is based on the initial premise that Tampa Bay nutrient loads are above its assimilative capacity. The Tampa Bay NMC's adaptive nutrient management approach in establishing the state and federally-approved loading targets for the Tampa Bay estuary followed EPA's technical guidance. The Tampa Bay NMC approach utilizes bay segment specific quantitative stressor-response relationships to establish nutrient loading targets for the Tampa estuary which, according to EPA guidance, is considered the most preferred method for establishing numeric nutrient criteria. Specifically, the Tampa Bay NMC has defined the quantitative relationship between nutrient loads and chlorophyll-*a* levels in each of the major bay segments of the Tampa Bay estuary. As demonstrated above, there is considerable evidence that existing loads to the major bay segments of Tampa Bay provide for the full aquatic life protection and support for all designated uses in the estuary.

The Tampa Bay NMC has other concerns specifically with the application of the USGS Spatially Referenced Regression on Watershed Attributes (SPARROW) model for the Southeastern US in the Tampa Bay watershed. This model was used to calculate both existing and baseline loads for the Tampa Bay watershed and these values were then used to estimate the protective loads for the Tampa Bay estuary. While the SPARROW model may be appropriate for its expressed purpose (i.e., to examine landscape characteristics that influence delivery of nitrogen from sources within the watersheds in the Southeastern US), its application to the Tampa Bay watershed is questionable. While the peer-reviewed load estimates developed by the Tampa Bay NMC are driven by local data sources (e.g., particularly point sources, atmospheric deposition, and product handling; Attachment T) the SPARROW coefficients are based on regional (southeastern US) data. Thus, the scaling of SPARROW to much smaller basins needs to be validated.

Lastly, the SPARROW estimates do not fully reflect the time-varying loads to an estuary and its resulting ecosystem response to nutrient loads derived from the watershed. The protective loads for the Tampa Bay estuary, as defined by EPA's application of the SPARROW model, are normalized to hydrologic conditions of a single year (2002), and are thus inappropriate for accounting for variations in the Tampa Bay estuary's ecosystem response to nutrient loads and hydrologic residence times. This is particularly evident in EPA's development of a single protective load for the Tampa Bay estuary, when the Tampa Bay NMC and other federal and state regulators have recognized the need to establish protective nutrient loads for each of the major bay segments of the Tampa Bay estuary. These significant concerns, as well as the successful demonstration of the approved nutrient management strategy employed in Tampa Bay, were repeatedly voiced at EPA's February 2010 listening sessions in Florida (e.g., Attachment U).

5. Recommended Protective Nutrient Loads for the Tampa Bay Estuary

In order to maintain consistency in the adaptive resource-based nutrient management approach utilized in Tampa Bay that ensures:

1) the protection of the estuary from degradation associated with excessive nutrient loadings;
2) a balance of full aquatic life support being sustained and enhanced; and,
3) the attainment of all designated uses,

the Tampa Bay NMC requests that EPA establish the nitrogen and phosphorus loading (Table 1), recognized by both FDEP and EPA as being protective of the Tampa Bay estuary through separate administrative actions, as the protective nutrient loads for the Tampa Bay estuary. As such, the Tampa Bay NMC requests that EPA finalize the existing TN and TP loads (specified for each major bay segment in Table 1), as the protective loads used in determining downstream protective values for flowing waters and as the protective Estuarine Nutrient Criteria for the Tampa Bay estuary. Furthermore, the Tampa Bay NMC requests that EPA finalize the protective estuarine loads established in Table 1 for nutrients in flowing waters as part of the second phase of this rulemaking process in coordination with the proposal and finalization of numeric criteria for estuarine and coastal waters that is anticipated to occur in 2011.

Table 1: Protective nutrient loads for the Tampa Bay estuary established by the Tampa Bay Nitrogen Management Consortium, and accepted through separate administrative action by FDEP (acceptance of the 2002 RA, 2007 RA Update & 2009 RA Addendum) and EPA (establishment of the 1998 federally-recognized TMDL for Tampa Bay).

Bay Segment	EPA's Protective Load to the Tampa Bay Estuary Defined in the Jan. 14th, 2010 Draft Rule for Total Nitrogen Load expressed as tons/year (kilograms/year)	Tampa Bay NMC Proposed Alternative Total Nitrogen Load expressed as tons/year (kilograms/year)	Tampa Bay NMC Proposed Total Phosphorus Load (Attachment V) expressed as tons/year (kilograms/year)
Old Tampa Bay	None specified	486 (440,892)	104 (94,127)
Hillsborough Bay	None specified	1,451 (1,316,325)	1,093 (993,755)
Middle Tampa Bay	None specified	799 (724,841)	140 (127,673)
Lower Tampa Bay	None specified	349 (316,607)	52 (47,564)
Remainder of Lower Tampa Bay	None specified	629 (570,619)	112 (101,464)

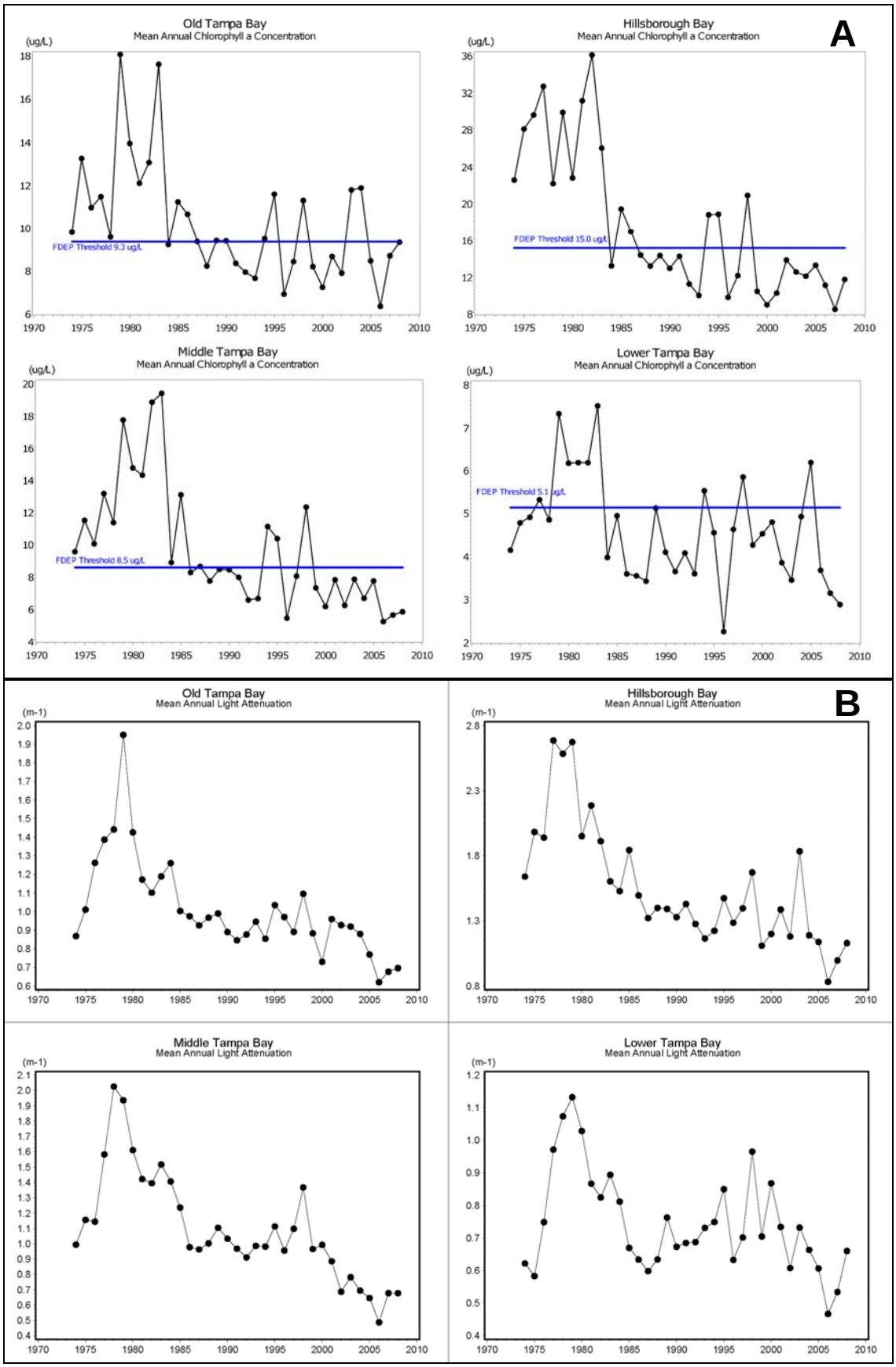

Figure 1: Observed improvements in annual average chlorophyll-*a* (μg/L; A) and light attenuation (m^{-1}; B) for the four main bay segments of Tampa Bay (1974-2008).

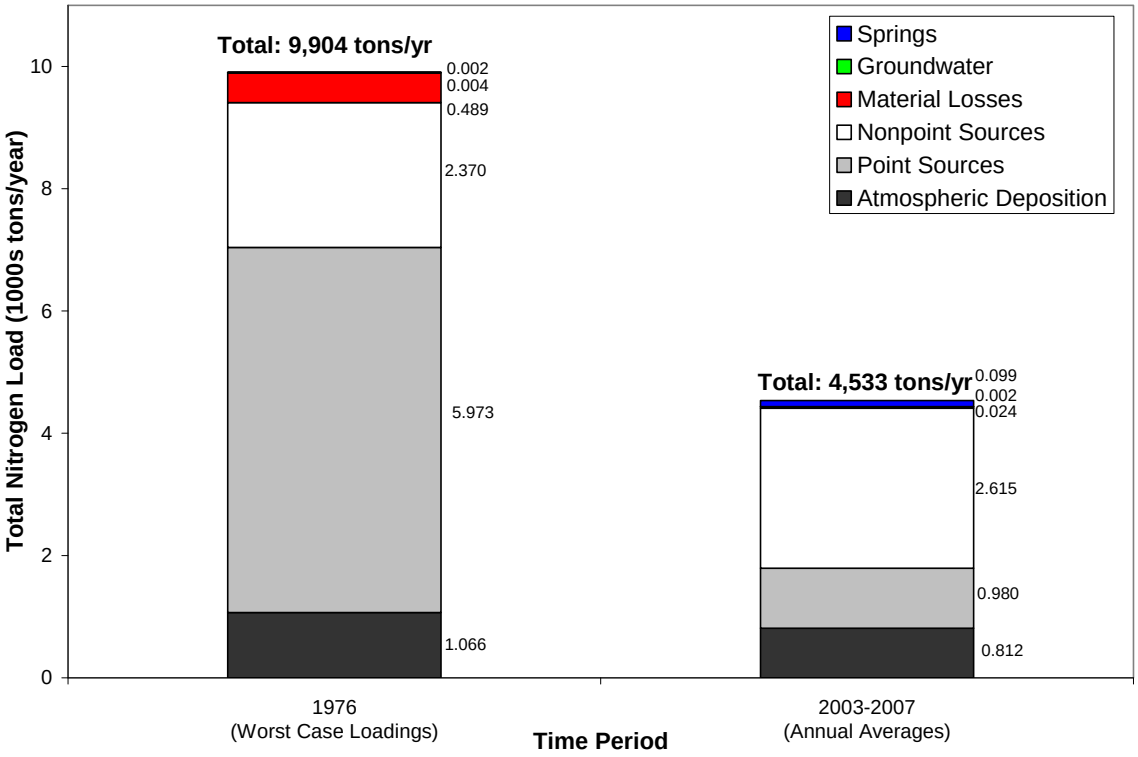

Figure 2: Contributions of the various sources of nitrogen loads to Tampa Bay in the 1970s compared to the most recent estimates available for the 2003-2007 period (Source: TBEP 1994; Janicki Environmental, Inc. 2008).

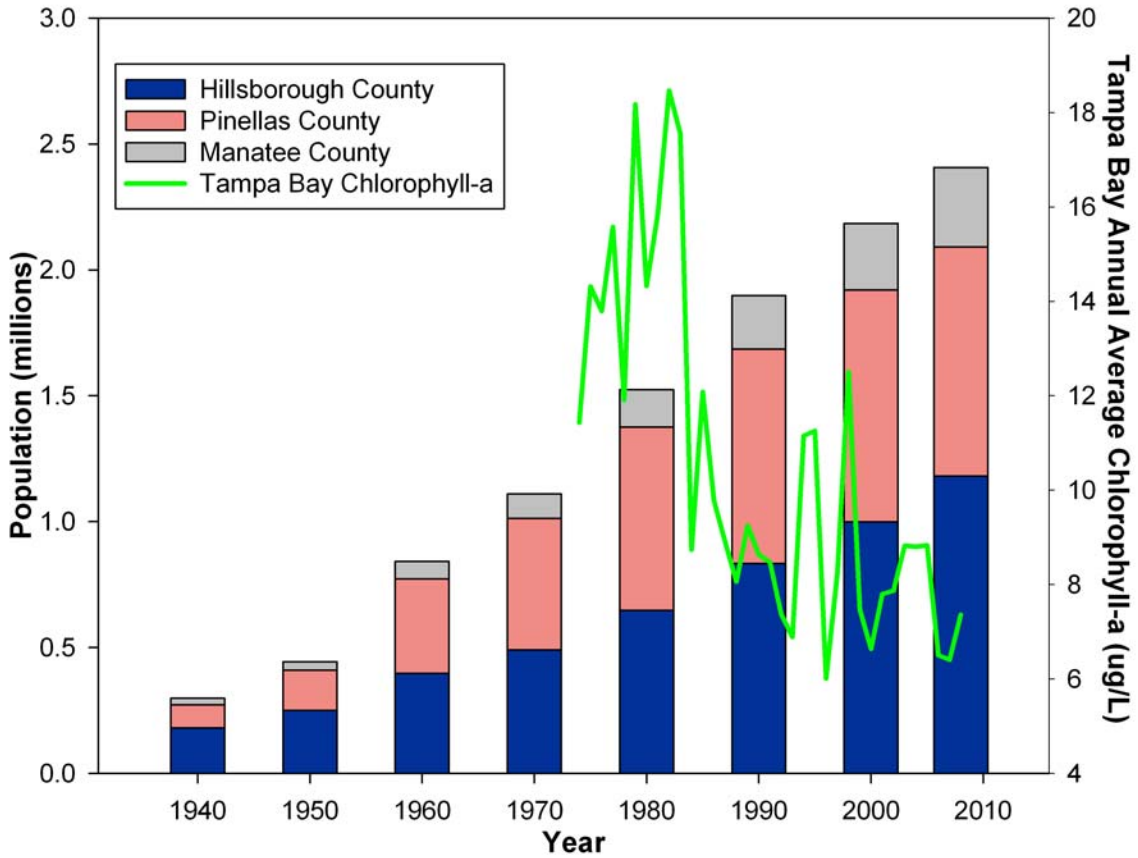

Figure 3: Comparison of population growth in the three counties bordering Tampa Bay and an indicator of bay eutrophication (annual average chlorophyll-*a* concentrations).

Advanced Wastewater Treatment & Reuse Standards Implemented in Tampa Bay according to Grizzle-Figg Legislation (F.S. 309.086)

Enhanced Stormwater Regulations required through the Southwest Florida Water Management District's Permitting Process (F.A.C. 40D-4, 40E-40)

Tampa Bay Nitrogen Management Consortium formed to manage nutrient loads at 1992-1994 levels in Tampa Bay through implementation of reduction/preclusion projects in the watershed.

Year	Old Tampa Bay	Hills. Bay	Mid. Tampa Bay	Lower Tampa Bay
1974	No	No	No	Yes
1975	No	No	No	Yes
1976	No	No	No	Yes
1977	No	No	No	No
1978	No	No	No	Yes
1979	No	No	No	No
1980	No	No	No	No
1981	No	No	No	No
1982	No	No	No	No
1983	No	No	No	No
1984	Yes	Yes	No	Yes
1985	No	No	No	Yes
1986	No	No	Yes	Yes
1987	No	Yes	No	Yes
1988	Yes	Yes	Yes	Yes
1989	No	Yes	Yes	Yes
1990	No	Yes	Yes	Yes
1991	Yes	Yes	Yes	Yes
1992	Yes	Yes	Yes	Yes
1993	Yes	Yes	Yes	Yes
1994	No	No	No	No
1995	No	No	No	Yes
1996	Yes	Yes	Yes	Yes
1997	Yes	Yes	Yes	Yes
1998	No	No	No	No
1999	Yes	Yes	Yes	Yes
2000	Yes	Yes	Yes	Yes
2001	Yes	Yes	Yes	Yes
2002	Yes	Yes	Yes	Yes
2003	No	Yes	Yes	Yes
2004	No	Yes	Yes	Yes
2005	Yes	Yes	Yes	No
2006	Yes	Yes	Yes	Yes
2007	Yes	Yes	Yes	Yes
2008	Yes	Yes	Yes	Yes
2009	No	Yes	Yes	Yes

Figure 4: Historic attainment of Florida Department of Environmental Protection chlorophyll-*a* thresholds (μg/L) for the main bay segments of Tampa Bay in comparison to key adaptive nutrient management strategy milestones. Annual average chlorophyll-*a* threshold concentrations for each of the bay segments based on long-term monitoring stations maintained by the Environmental Protection Commission of Hillsborough County are: Old Tampa Bay = 9.3 μg/L; Hillsborough Bay = 15 μg/L; Middle Tampa Bay = 8.5 μg/L; and Lower Tampa Bay = 5.1 μg/L.

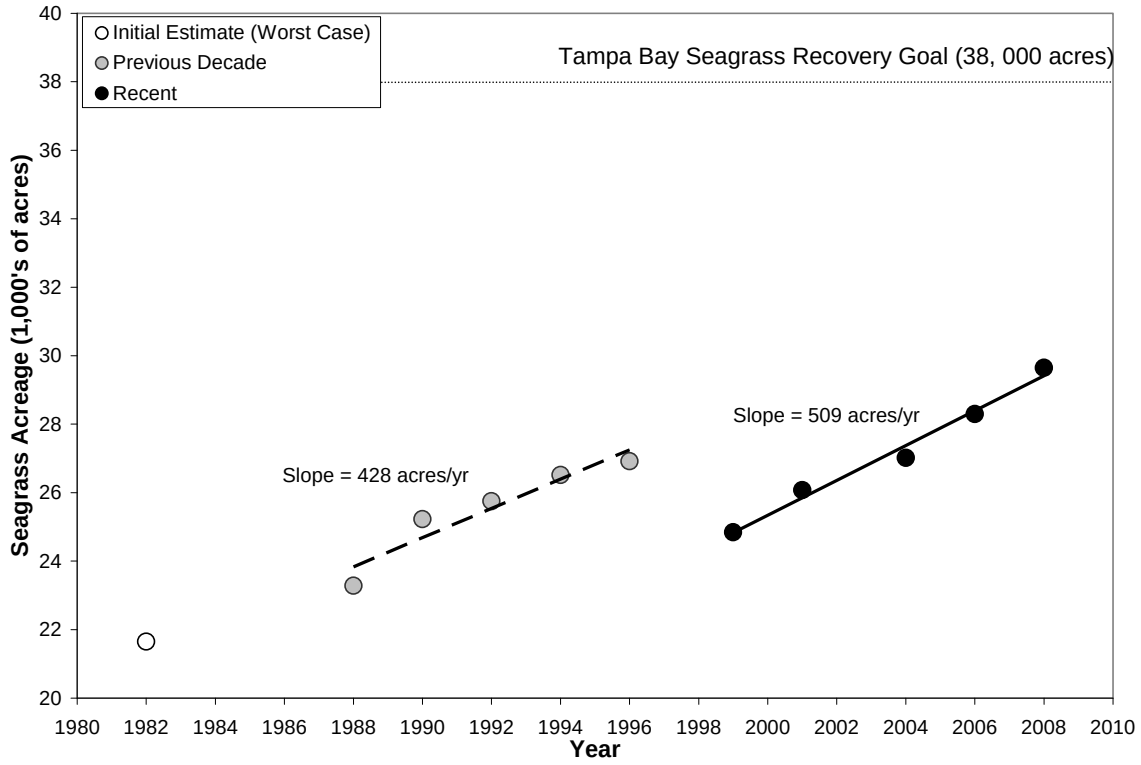

Figure 5: Seagrass acreage estimates for Tampa Bay from 1982 – 2008. An increase in the rate of seagrass expansion was seen for the 1999-2008 period in comparison to the previous decade's estimates (1988-1996) (Source: SWFWMD).

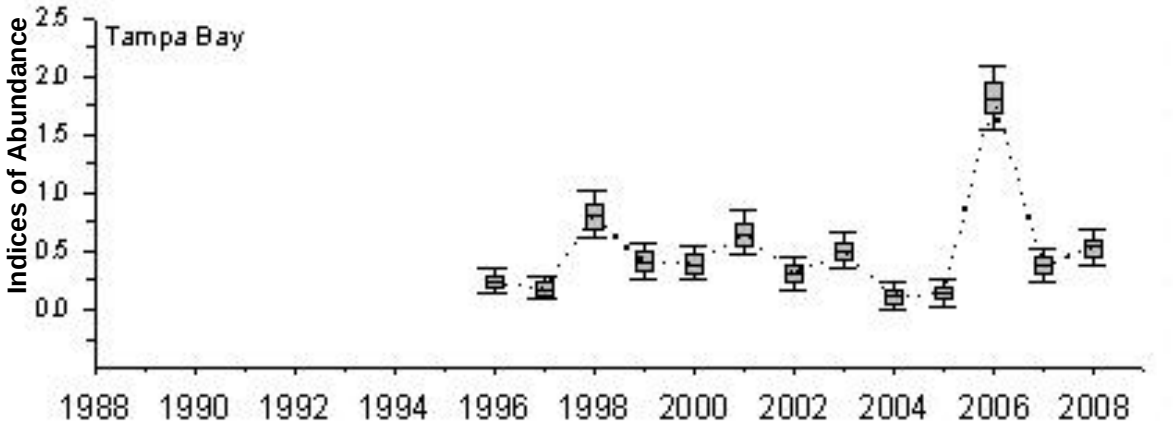

Figure 6: Variation in young of the year striped mullet, *Mugil cephalus*, abundance in the Tampa Bay estuary. Peak indices of abundance were observed in 1998 and 2006 (Source: FWRI).

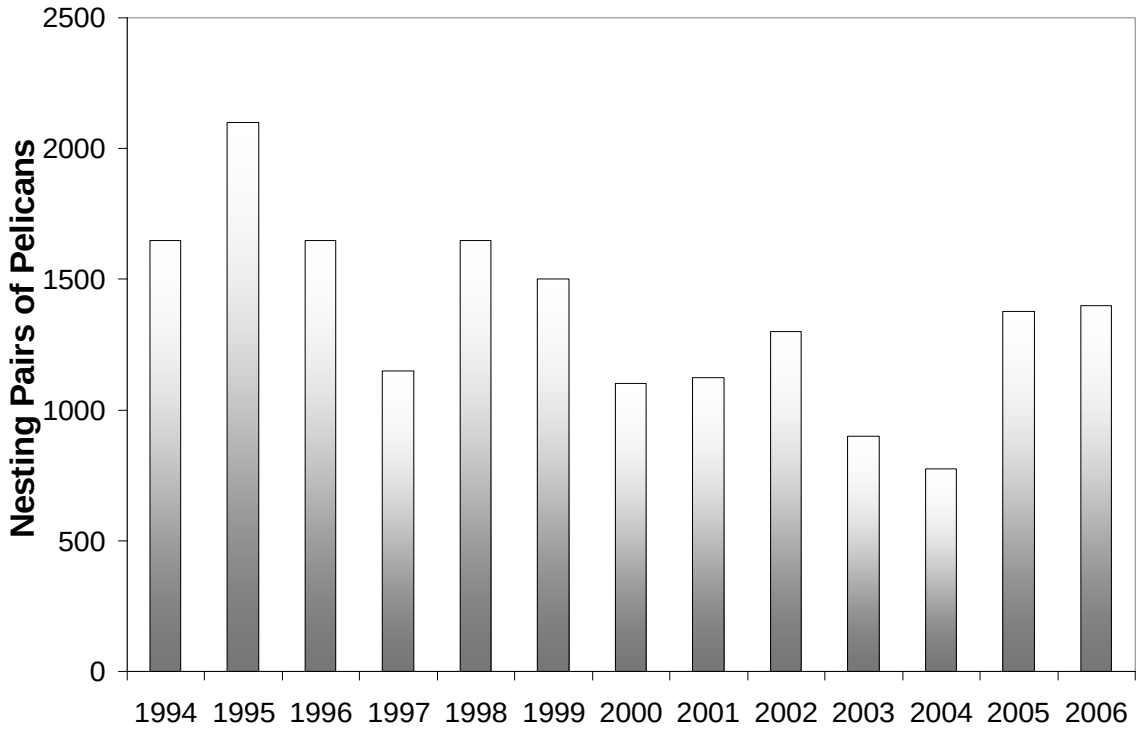

Figure 7: Observed number of brown pelican, *Pelecanus occidentalis*, nesting pairs in the Tampa Bay estuary. Minimal counts observed in 2003 and 2004 were attributed to interactions with mammalian predators (Source: Hodgson et al 2006).

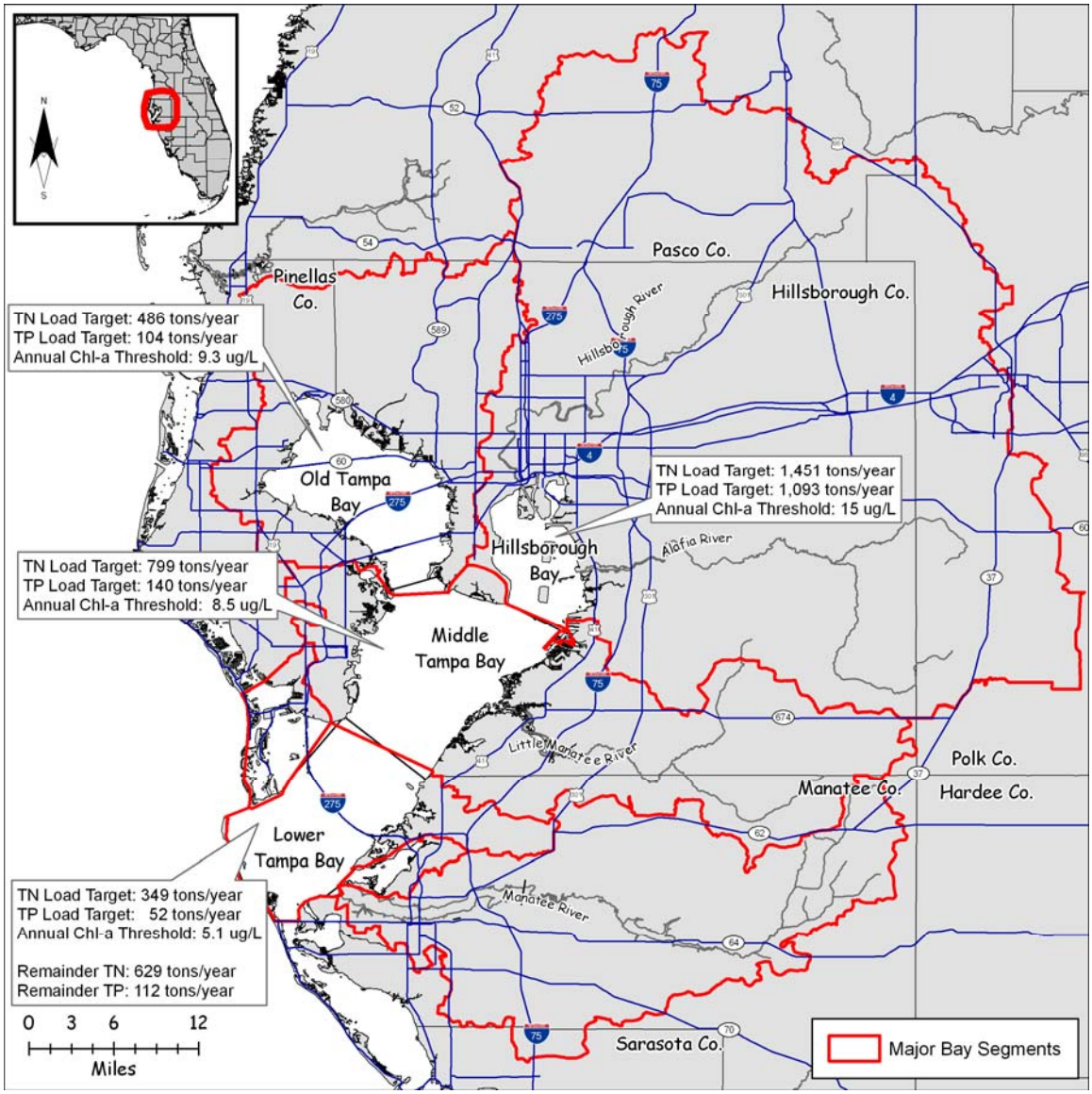

Figure 8: Watershed boundaries draining to the major bay segments of Tampa Bay. The nutrient loading (TN=total nitrogen; TP=total phosphorus) and chlorophyll-a concentration targets are listed for each bay segment. For Lower Tampa Bay, the remainder nutrient loads are for the combined subwatersheds of the Lower Boca Ciega Bay, Terra Ceia Bay, and Manatee River bay segments.

LIST OF ATTACHMENTS

ATTACH-MENT	TITLE	DIGITAL FILE NAME
A	Holland, N., M. Kelley Hoppe & L. Cross. 2006. **Charting the Course: The Comprehensive Conservation and Management Plan for Tampa Bay.** Prepared by the Tampa Bay Estuary Program, May 2006. 151pp.	ATTACHMENT_A_Final_2006_TBEP_CCMP.pdf
B	Tampa Bay Estuary Program. 1998. **Tampa Bay National Estuary Program: Interlocal Agreement.** Prepared by the Tampa Bay Estuary Program, February 1998. 54pp.	ATTACHMENT_B_TBEP_Interlocal_Agreement.pdf
C	**C.1.:** Johansson, J.O.R. 1991**. Long-term trends of nitrogen loading, water quality and biological indicators in Hillsborough Bay, Florida** *in* Treat, S.F. and P. Clark, eds. Proceedings, Tampa Bay Area Scientific Information Symposium 2. Feb. 27 – Mar. 1, 1992, Tampa, FL. 528pp.	ATTACHMENT_C1_Johansson_N_Loads_BASIS2.pdf
	C.2.: Johansson, J.O.R. and R.R. Lewis. 1992. **Recent improvements of water quality and biological indicators in Hillsborough Bay, a highly impacted subdivision of Tampa Bay, Florida, USA** pp. 1199-1215 *in* R.A. Vollenwedier et al., eds. Marine Coastal Eutrophication: The Response of Marine Transitional Systems to Human Impact: Problems and Perspectives for Restoration. Proceedings of an International Conference, Bologna, Italy, 21-24 March 1990.	ATTACHMENT_C2_Johansson_Lewis_1992.pdf
	C.3. Zarbock, H., A. Janicki, D. Wade, D. Heimbuch & H. Wilson. 1994. **Estimates of Total Nitrogen, Total Phosphorus, and Total Suspended Solids Loadings to Tampa Bay, Florida.** Prepared by Coastal Environmental, Inc. for the Tampa Bay Estuary Program. TBEP Technical Publication #04-94. 388pp.	ATTACHMENT_C3_TBEP_04_94_TNEstimates.pdf
	C.4. Wang, P.F., J. Martin & G. Morrison. 1999**. Water quality and eutrophication in Tampa Bay, Florida.** Estuarine, Coastal and Shelf Science. 49:1-20.	ATTACHMENT_C4_Tampa_Bay_WASP_Model_1999.pdf
	C.5. Dixon, L.K. & 4 others. 2009. **Trends and explanatory variables for the major phytoplankton groups of two southwestern Florida estuaries, U.S.A.** Journal of Sea Research. 61:95–102.	ATTACHMENT_C5_Dixon_Vargo_Johansson_2009.pdf
	C.6. Johansson. J.O.R. 2009. **Nutrient Enrichment Studies of Natural Phytoplankton Populations in Tampa Bay: A Summary of Results, June 1993-August 2009.** City of Tampa, Bay Study Group. November 16, 2009.	ATTACHMENT_C6_Johansson_Bioassay_1993-2009.pdf
D	Tampa Bay Nitrogen Management Consortium. 1999. **Partnership for Progress: The Tampa Bay Nitrogen Management Consortium Action Plan, 1995-1999.** Prepared by the Tampa Bay Estuary Program, October 1999. 104pp.	ATTACHMENT_D_TBEP_Partnership_for_Progress.pdf
E	Tampa Bay Action Plan Database. 2010. Maintained by the Tampa Bay Estuary Program.	ATTACHMENT_E_TBEP_Action_Plan_02192010.mdb
F	Janicki, A.J., D.L. Wade & D.E. Robison. 1995. **Habitat Protection and Restoration Targets for Tampa Bay.** Prepared by Coastal Environmental, Inc. for the Tampa Bay Estuary Program. TBEP Technical Publication #07-93. 163pp.	ATTACHMENT_F_TBEP_07_93HabitatRestoreTargets.pdf
G	**F.1.: Final Action** taken by TBNEP Management and Policy Committees, June 14, 1996, adopting goals for seagrass acreage, targets for segment specific chlorophyll-a concentrations, and a five-year nitrogen management strategy to “hold the line” on nitrogen loadings for each bay segment.	ATTACHMENT_G1_RA_F1_FinalAction_June141996.pdf
	F.2.: Final Action taken by TBEP Management and Policy Boards, May 11, 2001, extending through 2005 the previously adopted chlorophyll a concentrations for each bay segment, and the nitrogen management strategy to “hold the line”.	ATTACHMENT_G2_RA_F2_FinalAction_May112001.pdf
H	Janicki Environmental, Inc. 2003. **Nitrogen Loadings to Tampa Bay: Model Based Estimates of 1998 and 2010 Loads to Major Basins, and TN Load Reduction/Preclusion Apportionment.** TBEP Technical Publication #04-03. 27pp.	ATTACHMENT_H_TBEP_04_03LoadApportionment.pdf

ATTACH-MENT	TITLE	DIGITAL FILE NAME
I	Janicki, A.J., D.L. Wade & R.J. Pribble. 2000. **Developing and Establishing a Process to Track the Status of Chlorophyll-a Concentrations and Light Attenuation to Support Seagrass Restoration Goals in Tampa Bay.** TBEP Technical Publication #04-00. 70pp.	ATTACHMENT_I_TBEP_04_00Chlor-A.pdf
J	Poe, A., ed. 2006. **Baywide Environmental Monitoring Report, 2002-2005.** TBEP Technical Publication #06-06. 202pp.	ATTACHMENT_J_TBEP_06_06_BEMRFinal.pdf
K	**K.1.** D. Joyner (FDEP) letter to H. Greening (TBEP). November 5, 2002. Acceptance of the Tampa Bay nitrogen management plan and the scientific basis for key plan elements to meet state reasonable assurance guidelines.	ATTACHMENT_K1_RA2002_FDEPLetter.pdf
	K.2. Tampa Bay Estuary Program. 2002. **2002 Reasonable Assurance Submittal to the Florida Department of Environmental Protection: Tampa Bay Watershed Management Summary.** Prepared by the Tampa Bay Estuary Program. 17pp.+attachments.	ATTACHMENT_K2_2002_RA_Submittal_w_Attachments.pdf
L	US Environmental Protection Agency. 1998. **Federally-recognized TMDL for Tampa Bay.**	ATTACHMENT_L_EPA_TMDL_Tampa_Bay_1998.pdf
M	**M.1.** Janicki, A.J. and D.L. Wade. 1996. **Estimating Critical External Nitrogen Loads for the Tampa Bay Estuary: An Empirically Based Approach for Setting Management Targets.** TBEP Technical Publication #06-96. 200pp.	ATTACHMENT_M1_TBEP_06_96ExternalTNLoads.pdf
	M.2. Morrison, G., and 5 others. 1996. **Estimated nitrogen fluxes and nitrogen-chlorophyll relationships in Tampa Bay, 1985-1994** pp. 249- 268 *in* Treat, S.F., ed. Proceedings of the 3rd Tampa Bay Area Scientific Information Symposium, October 21-23, 1996, Clearwater, FL.	ATTACHMENT_M2_Morrison_BASIS3_Nitrogen_Flux.pdf
	M.3. Janicki Environmental, Inc. 2001. **Tampa Bay Estuary Program Model Evaluation and Update: Chlorophyll a – Light Attenuation Relationship.** TBEP Technical Publication #06-01. 35pp.	ATTACHMENT_M3_TBEP_06_01-CHL-LIGHT.pdf
	M.4. Janicki Environmental, Inc. 2001. **Tampa Bay Estuary Program Model Evaluation and Update: Nitrogen Load – Chlorophyll a Relationship.** TBEP Technical Publication #07-01. 21pp.	ATTACHMENT_M4_TBEP_07_01-TN-CHL.pdf
N	Tampa Bay Nitrogen Management Consortium. 2008. **2007 Reasonable Assurance Update Submittal to the Florida Department of Environmental Protection: Tampa Bay Watershed Management Summary.** Prepared by the Tampa Bay Estuary Program. 45pp.+attachments.	ATTACHMENT_N_2007_RA_Update_Submittal_w_Attachments.pdf
O	D. Joyner (FDEP) letter to H. Greening (TBEP). May 28, 2008. Acceptance that adequate progress has been maintained in achieving the Tampa Bay nitrogen management plan and the scientific basis for key plan elements to meet state reasonable assurance guidelines.	ATTACHMENT_O_FDEP_RA_Approval_Letter_528082.pdf
P	Tampa Bay Nitrogen Management Consortium. 2009. **2009 Reasonable Assurance Addendum: Allocation and Assessment Report.** Prepared by the Tampa Bay Estuary Program. 89pp.+appendices.	ATTACHMENT_P_2009_RA_Addednum_Submittal_w_Appendices.pdf
Q	Greening, H. and A. Janicki. 2006. **Toward reversal of eutrophic conditions in a subtropical estuary: Water quality and seagrass response to nitrogen loading reductions in Tampa Bay, Florida, USA.** Environmental Management. 38(2):163-178.	ATTACHMENT_Q_Greening&Janicki-Env_Man_2006-Toward_Reversal_of_Eutrophic_Conditions.pdf
R	Greening, H., L. Cross, and E. Sherwood. 2010. **A multi-scale approach to seagrass recovery in Tampa Bay, Florida, USA.** *In* K.A. McGraw and R. M. Thom, (eds). Restoration and Protection: Are We Having An Effect? Ecological Restoration, forthcoming.	ATTACHMENT_R_Greening,Cross,Sherwood-Env_Res_2010-Tampa_Bay_Seagrass_Recovery.pdf
S	Greening, H. 2010. **Memo to E. King, D. Keehner, J. Keating and J. Giatinna (US EPA) regarding the 2010 Algae bloom in Tampa Bay.** February 23, 2010, Washington, D.C.	ATTACHMENT_S_Greening_2010_Memorandum_Regarding_TB_Bloom.pdf

ATTACH-MENT	TITLE	DIGITAL FILE NAME
T	**T.1.** Zarbock, H., A. Janicki and S. Janicki. 1996. **Estimates of Total Nitrogen, Total Phosphorus, and Total Suspended Solids Loadings to Tampa, Bay, Florida. Technical Appendix: 1992-94 Total Nitrogen Loads to Tampa Bay.** TBEP Technical Publication #19-96. 50pp.	ATTACHMENT_T1_TBEP_19_96_Load_Estimates_TBay.pdf
	T.2. Pribble, J.R., A. Janicki, K. Hackett, and S. Janicki. 2001. **Estimates of Total Nitrogen, Total Phosphorus, and Total Suspended Solids Loadings to Tampa, Bay, Florida. Technical Appendix: 1995-1998 Total Nitrogen Loads to Tampa Bay.** TBEP Technical Publication #05-01. 227pp.	ATTACHMENT_T2_TBEP_05_01-95-98_LOADS.pdf
	T.3. Poe, A., Hackett, K., Janicki, S., Pribble, R., and A. Janicki. 2005. **Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 1999-2003.** TBEP Technical Publication #02-05. 374pp.	ATTACHMENT_T3_TBEP_02_05_Loadings99_03.pdf
	T.4. Janicki Environmental, Inc. 2008. **Estimates of Total Nitrogen, Total Phosphorus, Total Suspended Solids, and Biochemical Oxygen Demand Loadings to Tampa Bay, Florida: 2004-2007.** Prepared for: Florida Department of Environmental Protection. 86pp.	ATTACHMENT_T4_TB_Loads_2004-2007_Final.pdf
U	**U.1.** Greening, H. 2010. **Presentation to US EPA Public Listening Sessions entitled "Downstream Protective Loads to Tampa Bay: Public comment from the Tampa Bay Nitrogen Management Consortium."** February 17, 2010, Orlando, FL.	ATTACHMENT_U1_Greening-Public_Comments_to_EPA_Orlando_Feb172010.pdf
	U.2. Janicki, T. 2010. **Presentation to US EPA Public Listening Sessions entitled "Downstream Protective Loads to Tampa Bay: Public comment from the Tampa Bay Nitrogen Management Consortium."** February 16, 2010, Tallahassee, FL.	ATTACHMENT_U2_Janicki-Public_Comments_to_EPA_Tallahassee_Feb162010.pdf
V	Janicki Environmental, Inc. 2010. **Development of Proposed Tampa Bay Protective Total Phosphorus Loads.** TBEP Technical Publication #04-10. 4pp.	ATTACHMENT_V_TBEP_04_10_Final_Development_of_Protective_TP_Loads.pdf