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City of Tampa Department of Sanitary Sewers

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**JUSTIFICATION FOR CONTINUED VARIANCE FROM THE HOOKERS POINT
AWWTP EFFLUENT LIMITATIONS FOR PHOSPHOROUS (1 mg/l)**

submitted to

**the Environmental Protection Commission
of Hillsborough County**

September 14, 1990

by

**City of Tampa
Department of Sanitary Sewers
Bay Study Group**

INTRODUCTION

The Environmental Protection Commission of Hillsborough County requested on August 29, 1990 that the City of Tampa, Department of Sanitary Sewers, supply information which would provide justification for continued variance from the 1 mg/l effluent limitations of phosphorous for the Hookers Point AWWTP. It was also requested that long-term water quality trends in Hillsborough Bay and Tampa Bay be documented in support of the phosphorous variance.

Justification for continued phosphorous variance will be demonstrated in this report by a discussion of the following topics:

1. The dominant primary producers (phytoplankton) in Hillsborough Bay and Tampa Bay are not growth limited by phosphorous.
2. Recent improvements of water quality and biological indicators in Hillsborough Bay and other areas of Tampa Bay, appear related to recent reductions of external nitrogen loading.

DISCUSSION

Lack of scientific support that phosphorous limits the dominant primary producers of Tampa Bay:

Natural leaching of phosphate deposits and losses from the extensive fertilizer industry located within the drainage basin of the Alafia River are the main sources of the unique phosphate enrichment found in Tampa Bay. Fanning and Bell (1985) reports " Compared to other estuaries and coastal waters, Tampa Bay is considerably enriched in phosphate. In fact, no other major estuarine or coastal area we know of even comes close to having as high a phosphate concentration."

Further, results of phytoplankton bioassay experiments conducted by the Florida Department of Environmental Regulation (DER 1983) and City of Tampa (COT 1983) never indicated that phosphorous was limiting phytoplankton growth. Instead, the results from the DER assay indicated a very strong nitrogen limitation for all areas sampled, including Hillsborough Bay and Old Tampa Bay (Palmer and McClelland 1988).

The high ambient concentrations of phosphorous in Tampa Bay and Hillsborough Bay has lead to a general consensus among Tampa Bay scientist that, if the bay is limited by any macro-nutrient, it must be nitrogen and not phosphorous. The results of the bioassay experiments support this theory. The hypothesis that the primary producers of

Tampa Bay may be limited by nitrogen and not phosphorous is not unexpected since it is now generally recognized that nitrogen is the nutrient most limiting to estuaries (see among others Boynton et al. 1982 and Spaulding et al. 1989).

Long-term trends of water quality and biological indicators in Tampa Bay:

Substantial ecological improvements have occurred in Hillsborough Bay and other areas of Tampa Bay since 1979, when the Hookers Point treatment plant converted from primary to advanced wastewater treatment. Several reports and publications are listed below which document these positive trends.

The extensive monitoring program by the Environmental Protection Commission of Hillsborough County (EPC) has documented consistently improved water quality conditions in Hillsborough Bay, and a general improvement in other areas of Tampa Bay, since 1981 (Boler 1988). The report also states that fishermen, boaters, environmental groups, and other researchers generally agree that the water quality is improving in Tampa Bay. Water quality improvements documented by EPC are also discussed by Gilbert (1988), Palmer and McClelland (1988), Estevez (1989), TBRPC (1989a), COT (1990a; 1990b), TBRPC (1990), and Johansson and Lewis (in press).

The long-term record (1952-89) of Tampa Bay chlorophyll concentrations has been examined by the Task Force on Resource-Based Water Quality Assessment (TBRPC 1989b). This group found that chlorophyll concentrations, after a period of elevation (1969-83), have now returned to pre-1969 levels.

The City of Tampa, Bay Study Group, has monitored water quality and biological indicators in Hillsborough Bay and Middle Tampa Bay since 1978. Recent improvements of water quality and phytoplankton species composition in both study areas have been documented in COT (1990a). A limited return of seagrasses to several shallow areas of Hillsborough Bay was first observed in 1985, and these seagrass areas have expanded consistently since first noticed. Detailed results of the Bay Study seagrass monitoring effort are documented in COT (1988; 1990b).

Johansson and Lewis (in press) also discuss the recent ecological improvements in Hillsborough Bay. They conclude: " Hillsborough Bay water quality has recently improved in response to reduced nitrogen loading primarily caused by the conversion of the Hookers Point Wastewater Facility from primary to advanced treatment. Less nitrogen

is now available for phytoplankton growth, and the reduced biomass has apparently allowed for improved water column light penetration. Seagrasses and the attached macroalgae *Caulerpa* have seemingly responded to the increased light penetration by colonizing shallow areas. The limited return of seagrass meadows to the shallow bottom is an important sign of improving water quality in Hillsborough Bay."

CONCLUSION

This report demonstrates the justification for continued variance from the 1 mg/l effluent limitations of phosphorous for the Hookers Point AWWTP for the following reasons:

1. The dominant primary producers (phytoplankton) in Hillsborough Bay and Tampa Bay are not growth limited by phosphorous.
2. Recent improvements of water quality and biological indicators in Hillsborough Bay and other areas of Tampa Bay, appear related to recent reductions of external nitrogen loading primarily caused by the conversion of the Hookers Point facility from primary to advanced wastewater treatment.

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ATTACHMENT 1

Water Quality Monitoring

In the letter of October 26, 1990 EPC expresses the need to identify the extent of adverse water quality impacts due to phosphorous on areas outside Hillsborough Bay. First, there are no data which indicate that phosphorous may have caused adverse water quality impacts in Hillsborough Bay or any other area of Tampa Bay. Second, at the meeting on November 15, 1990, EPC staff presented graphs of chlorophyll concentrations in the four major subsections of Tampa Bay for the period 1981-1990. EPC staff expressed concern that all areas except Lower Tampa Bay have shown recent improvements in chlorophyll concentrations. However, the Lower Tampa Bay graph shows that chlorophyll levels have decreased from an average of 6 ug/l during the period 1981-83 to an average of 3.5 ug/l during the period 1984-90. In our opinion this is a substantial improvement of chlorophyll levels. In fact, Lower Tampa Bay is not different from the other areas of Tampa Bay in terms of relative reduction of chlorophyll. This is clearly illustrated by examining the long-term Tampa Bay record of chlorophyll as was done by TBRPC in the "Chlorophyll-a Target" report of 1989. Figure 1 of his report is included for your reference.

Another concern expressed in the letter of October 26, 1990 addresses the biological availability of phosphorous discharged to Hillsborough Bay as compared to ambient forms of phosphorous in Hillsborough Bay. In response to this concern we submit Table 1. The table shows that approximately 83 percent of the phosphorous in Tampa Bay is in the biologically available form of ortho-phosphorous. Similarly, 87 percent of phosphorous discharged to Hillsborough Bay, from the sources listed, is in the form of ortho-phosphorous. Further, the composition of phosphorous discharged from Hookers Point is very similar to the composition found in the North Prong of the Alafia River. Based on these comparisons we see little evidence in support of the concern regarding the biological availability of phosphorous discharged.

The letter of October 26, 1990 also states that DER and EPC will require the City of Tampa to evaluate the potential for water quality impacts caused by the proposed phosphorous discharge to areas of Tampa Bay outside Hillsborough Bay. To satisfy this requirement we have compiled Table 2 which shows loadings of phosphorous to Hillsborough Bay from major sources and the relative importance of each source to the total loading. These calculations indicate that Hookers Point currently supplies approximately 11 percent of the phosphorous entering Hillsborough Bay. Phosphorous which enters Tampa Bay at other locations,

further decreases the relative importance of Hookers Point loadings to areas outside Hillsborough Bay. Therefore, the potential for water quality impacts caused by the proposed phosphorous discharge to areas of Tampa Bay outside Hillsborough Bay is in our opinion minimal.

Finally, in the letter of October 26, 1990 EPC requests that we "substantiate the notion of natural high background phosphorous". We assume that EPC refers to the unique phosphate enrichment found in Tampa Bay as compared to other estuaries. It is unclear, however, why we are asked to substantiate this "notion" since our letter of September 27, 1990 does not discuss "natural high background phosphorous". Instead our letter states that natural leaching of phosphate deposits and losses from the extensive fertilizer industry located within the drainage basin of the Alafia River are the main sources of the unique phosphate enrichment found in Tampa Bay. This conclusion is shared with many authors discussing the unusual Tampa Bay phosphorous concentrations. For example in 1974 Turner and Hopkins wrote: "phosphate, at least, is in part added through drainage of the rich Hawthorne phosphatic deposits east of Tampa Bay. This natural source of phosphorus undoubtedly strongly affects the N:P ratio in the bay system."

The City of Tampa, Department of Sanitary Sewers, presently conducts a very extensive monitoring program of water quality and various biological indicator organisms in Hillsborough Bay and Middle Tampa Bay. We are the only organization working with Tampa Bay which maintains a long-term record of primary production and detailed phytoplankton taxonomic composition. Understanding the long-term trends of these parameters is critical for proper estuarine management and our records for these important parameters go back to 1978. We are also the only agency which maintains a long-term record of macroalgae distribution and species composition in Tampa Bay. Further, as seagrasses started to recolonize Hillsborough Bay in 1985 we initiated an extensive monitoring program to document these important changes. To our knowledge, no other agency studies seagrasses in Hillsborough Bay, or Tampa Bay, in as great detail as we do.

Our extensive and long-term database has recently become an important asset to Tampa Bay researchers and managers. Specifically SWIM and SWIM related projects have used our data extensively. With the start of NEP we anticipate additional utilization of our data and manpower. Further, results from our

studies are shared regularly, both in written and oral form, with Tampa Bay scientists, managers and regulatory agencies.

To conclude, in this letter we have presented information which indicate that Hookers Point only supplies a small fraction of the phosphorous entering Hillsborough Bay. Therefore, the potential for detrimental water quality impacts caused by the proposed phosphorous discharge to Hillsborough Bay, or areas of Tampa Bay outside Hillsborough Bay, is in our opinion minimal. Consequently, we truly believe that the resources available to us for environmental monitoring will be best utilized to maintain our unique and important environmental monitoring program of Hillsborough Bay and Middle Tampa Bay.