

5-1-2001

# Plan of Study for Annual Water Quality and Biological Indicator Report

City of Tampa Department of Sanitary Sewers

Follow this and additional works at: [http://scholarcommons.usf.edu/basgp\\_report](http://scholarcommons.usf.edu/basgp_report)



Part of the [Environmental Indicators and Impact Assessment Commons](#)

---

## Scholar Commons Citation

City of Tampa Department of Sanitary Sewers, "Plan of Study for Annual Water Quality and Biological Indicator Report" (2001).  
*Reports*. Paper 62.

[http://scholarcommons.usf.edu/basgp\\_report/62](http://scholarcommons.usf.edu/basgp_report/62)

This Statistical Report is brought to you for free and open access by the Tampa Bay Area Study Group Project at Scholar Commons. It has been accepted for inclusion in Reports by an authorized administrator of Scholar Commons. For more information, please contact [scholarcommons@usf.edu](mailto:scholarcommons@usf.edu).

**PLAN OF STUDY  
FOR  
ANNUAL WATER QUALITY AND BIOLOGICAL INDICATOR REPORT**

**SUBMITTED TO  
THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION  
SOUTHWEST DISTRICT**

**PREPARED BY  
THE CITY OF TAMPA  
DEPARTMENT OF SANITARY SEWERS  
BAY STUDY GROUP**

**AUGUST 14, 2000**

**REVISED  
MAY 1, 2001**

PLAN OF STUDY  
FOR  
ANNUAL WATER QUALITY AND BIOLOGICAL INDICATOR REPORT

## INTRODUCTION

This Plan of Study is submitted to the Florida Department of Environmental Protection (Department) for approval as specified in Condition #10 of Operation Permit FL0020940-001-DW1P issued by the Department on July 8, 1999.

The Plan of Study describes a water quality and biological indicator report that will be submitted to the Department annually. The report will primarily summarize information from an ongoing monthly City of Tampa (COT) water quality compliance monitoring program that evaluates potential impacts of the discharge from the Howard F. Curren WWTP on the receiving water of Hillsborough Bay. This compliance program was approved for implementation by the Department in December 1989 and field sampling was initiated in January 1990. It is the intent of the current Plan of Study to maintain and add to the long-term data base generated from this program with minor modifications to the study effort. In addition to the compliance water quality monitoring program, the annual report will also examine long-term and short-term trends in ambient water quality and biological indicators in Tampa Bay. This information will be obtained from other ongoing COT programs and from the Environmental Protection Commission of Hillsborough County (EPC) monthly water quality monitoring program.

The annual report will summarize information from the studies listed above in four major sections:

1. *Compliance Water Quality Monitoring in Hillsborough Bay by the COT.*

Results from the COT water quality compliance monitoring in Hillsborough Bay will describe data collected monthly at three stations in the upper portion of Hillsborough Bay (COT15, COT16 and COT17; Figure 1). Sampling of these stations started in January 1990. From these collections, subsamples will be delivered to the EPC laboratory for analyses of carbonaceous biological oxygen demand (CBOD5), total phosphorus (TP), ortho-phosphate (PO<sub>4</sub>-P), total nitrogen (TN), total Kjeldahl nitrogen (TKN), nitrite+nitrate nitrogen (NO<sub>2</sub>+NO<sub>3</sub>-N) and ammonia nitrogen (NH<sub>3</sub>-N). The COT Bay Study Group will measure chlorophyll-a (CHLA) and the field measured water quality parameters: dissolved oxygen (DO), salinity (SAL), temperature (TEMP) and Secchi depth (SD) at the three compliance stations and pH, DO, SAL and TEMP at a location approximately 70m south of the Howard F. Curren WWTP discharge location (COT151).

2. *Long-term Trends of Hillsborough Bay Water Quality Parameters Sampled by the EPC.*

Results from the long-term Hillsborough Bay water quality data base maintained by the EPC

will be discussed as trends of annual averages for the following parameters: CBOD5, TP, PO4-P, TN, TKN, DO and CHLA. Annual averages will be calculated for all 14 EPC stations in Hillsborough Bay (Figure 2) as a group and for a sub-group of EPC stations that are located near the Howard F. Curren WWTP discharge site (EPC2, EPC44, EPC6, EPC52 and EPC70; Figure 1).

*3. Comparison Between COT Compliance Monitoring Stations and Selected EPC Stations in Upper Hillsborough Bay.*

Water quality results from the three COT monitoring stations (COT15, COT16 and COT17; Figure 1) and the five EPC stations in the sub-group of stations that are located near the Howard F. Curren WWTP discharge site (EPC2, EPC44, EPC6, EPC52 and EPC70; Figure 1) will be compared statistically on an annual basis. The annual mean and the standard error of the mean will be calculated for each station for the following water quality parameters: CBOD5, TP, PO4-P, TN, TKN, DO and CHLA.

*4. Long-term Trends of Tampa Bay Water Quality and Biological Indicators Sampled by the COT.*

Information generated from the ongoing COT long-term water quality and biological indicator monitoring programs in Tampa Bay include trends of SD, DO, CHLA, phytoplankton production and phytoplankton community structure in Hillsborough Bay and Middle Tampa Bay and also trends of macro-algae biomass and seagrass growth in Hillsborough Bay.

It should be noted that results from the studies listed under Section 4 above are not intended to be directly linked to the discharge from the Howard F. Curren WWTP to Hillsborough Bay. Instead, the singular purpose to include these studies in the annual report is to report and document trends of important water quality and biological communities in Tampa Bay that may not be measured on a regular schedule by other organizations.

Further, it is with intent that field and laboratory procedures of the studies listed under Section 4 are described in a general manner in this Study Plan. Procedures, as well as parameters sampled, may be modified, reevaluated and/or discontinued during the 5 year life span of the Operation Permit at the discretion of the COT. However, it is the intent of the COT monitoring program to maintain, and provide to the Department, significant and current information on ambient trends of important water quality and biological communities in Tampa Bay derived from state-of-the-art procedures.

The first annual Water Quality and Biological Indicators Report will be submitted in paper and electronic format to the Department within sixteen months of permit issuance and every twelve months thereafter.

## METHODS

### COT Compliance Water Quality Monitoring

#### Station Locations and Sampling Frequency:

The three water quality stations (COT15, COT16 and COT17) that will be sampled monthly, are located, approximately 300m, 1400m and 3000m southwest, respectively, of the Howard F. Curren WWTP discharge location (Figure 1). The coordinates in latitude and longitude for the three stations are:

COT15: 27°54'31"N  
82°26'33"W

COT16: 27°54'15"N  
82°27'08"W

COT17: 27°53'27"N  
82°27'44"W

#### Field Sampling:

Water quality collections will commence near sunrise. Mid-depth water samples will be collected with a 5 liter teflon coated Niskin bottle. All nutrient sub-samples (except for PO<sub>4</sub>-P analysis) will be acidified (~1.7ml H<sub>2</sub>SO<sub>4</sub> per 1000ml sample) in the field and checked for appropriate pH. PO<sub>4</sub>-P samples will be filtered in the field through a 0.45um cellulose acetate filter. CHLA sub-samples will be stored in opaque bottles. All samples will be stored on ice following collection and during transport.

TEMP, SAL and DO will be measured at 1m increments from surface to near bottom with a Hydrolab DataSonde3™ probe, or a similar certified probe. Water transparency will be estimated from SD readings (SD readings will not be attempted at low incident light conditions). Tidal stage will be recorded.

In addition, pH, TEMP, SAL and DO will be measured at 1m increments from surface to the 3m depth at a location approximately 70m south of the Howard F. Curren WWTP discharge location (COT151).

#### Laboratory Analyses:

The EPC laboratory will analyze subsamples from the three COT compliance stations for TP, PO<sub>4</sub>-P, TN, TKN, NH<sub>3</sub>-N, NO<sub>3</sub>+NO<sub>2</sub>-N and CBOD<sub>5</sub>. The analytical methods for these determinations are described in the EPC 1995-1997 Surface Water Quality report (Boler 1999).

The agreement with EPC to analyze these samples is renewed on an annual basis and renewal is at the discretion of EPC.

CHLA will be determined using a modification of the Strickland and Parsons (1972) spectrophotometric method. Samples will be shaded from direct sunlight during transportation to the laboratory and filtered within four hours after the return to the laboratory through Whatman GF/F glass fiber filters. Precaution will be taken during all laboratory procedures not to expose the samples to bright light. To further prevent degradation of pigments, approximately 1ml of magnesium carbonate suspension will be added to the filter surface. Filters will be wrapped in aluminum foil and stored frozen for up to three weeks. After storage, the filters will be homogenized for about 30s in 90% acetone using a tissue grinder with a teflon pestle. The tissue grinder will be chilled in an ice bath during the grinding procedure. The ground slurry will be transferred to 15ml centrifuge tubes and stored overnight in a refrigerator. After being inverted several times, the tubes will be centrifuged for 30min and the supernatant will be decanted into a 1 cm pathlength spectrophotometer cell. The absorbance of the liquid will be measured in a Perkin-Elmer Lambda 20 spectrophotometer at the wavelengths 750, 665, 645, and 630nm and also at 750 and 665nm after acidification with 1 drop of 6N HCL. CHLA concentrations will be calculated using the equation of Parsons and Strickland (Strickland and Parsons 1972).

#### Quality Assurance/Quality Control:

All quality assurance aspects of nutrient analyses will abide by the EPC Quality Assurance Plan documented in Chapter 12 of the 1995-1977 Surface Water Quality report (Boler 1999). Additional quality assurance procedures will follow the City of Tampa Department of Sanitary Sewers Generic Quality Assurance Plan (COMQAP) as revised in June 1999.

#### Tampa Bay Water Quality and Biological Indicators Monitoring Programs

Listed below are parameters and station locations of water quality and biological indicators that currently are sampled by the COT in Tampa Bay. However, for reasons noted earlier, field and laboratory procedures for these monitoring programs are described in a general manner in this Study Plan.

#### Tampa Bay Phytoplankton Production:

Phytoplankton production and several other supportive parameters are currently monitored monthly at two stations located in Hillsborough Bay (COT4 and COT12) and at one station located in Middle Tampa Bay (COT13; Figure 3). Field and laboratory results which include TEMP, SAL, DO, PH, turbidity, SD depth, alkalinity and attenuation coefficient (Kd) will be reported. The Kd values are calculated from the average photosynthetic active radiation (PAR) values at depths of 1m, 2m and 3m, or less if the water column was not 3m deep.

Water samples are collected at 1m increments from surface to 3m at COT4 and COT12, and from surface to 5m at COT13. Water from each discrete depth is subsampled for determinations of phytoplankton productivity (*in situ* <sup>14</sup>C incubations) and CHLA. Water from the surface is also subsampled for phytoplankton taxonomy.

#### Hillsborough Bay Macro-Algae Biomass:

Drift macro-algae biomass is currently surveyed monthly at five transects in Hillsborough Bay (Figure 4). Macro-algae is collected by pulling a trawl with a 4m opening along each transect. The macro-algae catch at each transect is weighed and recorded.

#### Hillsborough Bay Seagrass Monitoring Program:

Trends of seagrass growth in Hillsborough Bay are currently estimated from seasonal examination of seagrass study sites (Figure 5) and an annual examination of seagrass transects (Figure 6). Further, an annual estimate of Hillsborough Bay seagrass areal coverage is currently determined from photographs and ground field surveys.

#### Hillsborough Bay Water Quality Parameters Sampled by the EPC:

The ongoing monitoring program of the EPC provides a comprehensive long-term record of several important water quality parameters that will be used by the COT, as available, to evaluate annual water quality conditions in Hillsborough Bay. Parameters of interest will be: TN, TKN, TP, PO4-P, DO and CBOD5 (see Boler 1999).

#### REFERENCES

Boler, R. 1999. Surface water quality: 1995-1997. Environmental Protection Commission of Hillsborough County, Tampa, FL.

Strickland, J.D.H., and T.R. Parsons. 1972. A practical handbook of seawater analysis. Bull. Fish. Res. Bd. Canada, 167: 311 p.

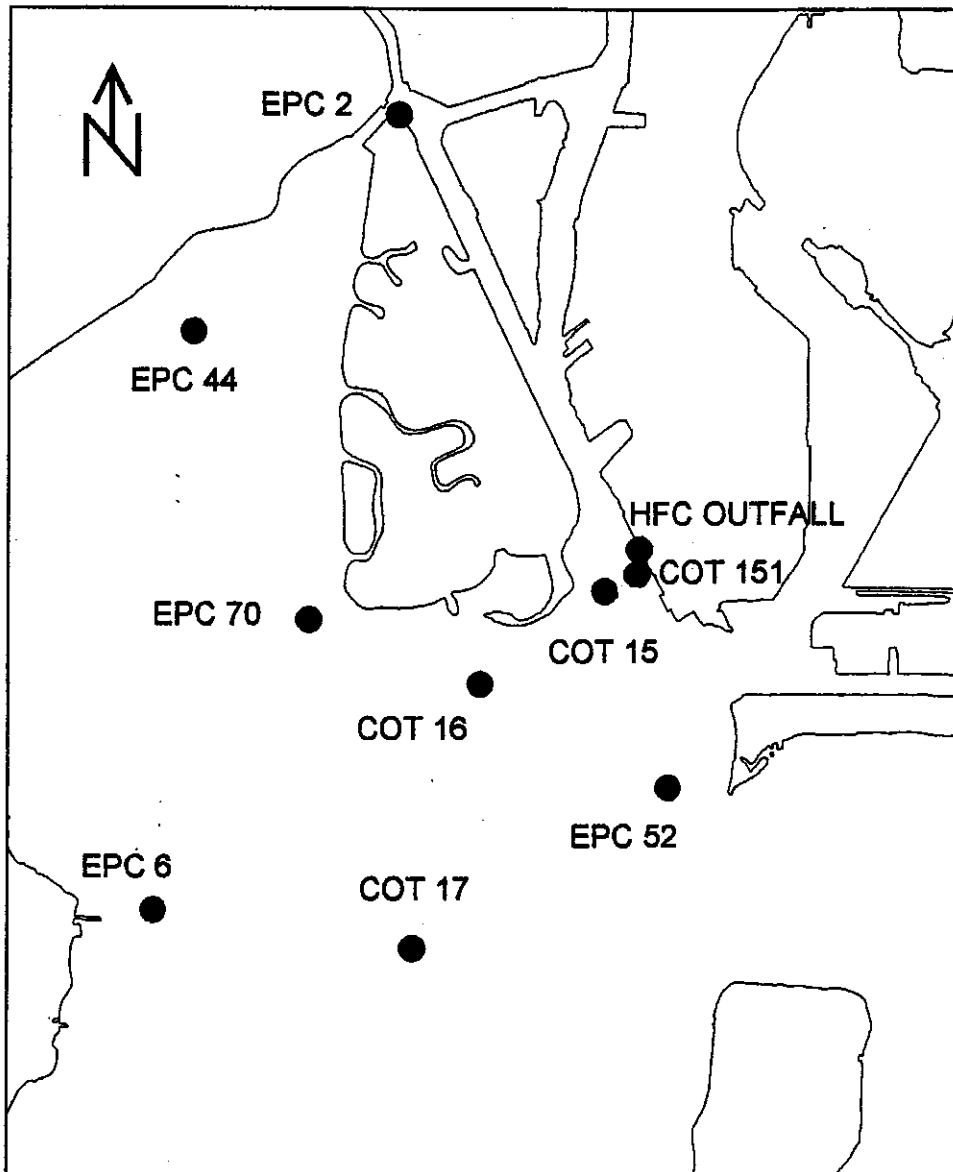


Figure 1. The Howard F. Curren WWTP discharge site, COT compliance monitoring stations and selected EPC stations in upper Hillsborough Bay.



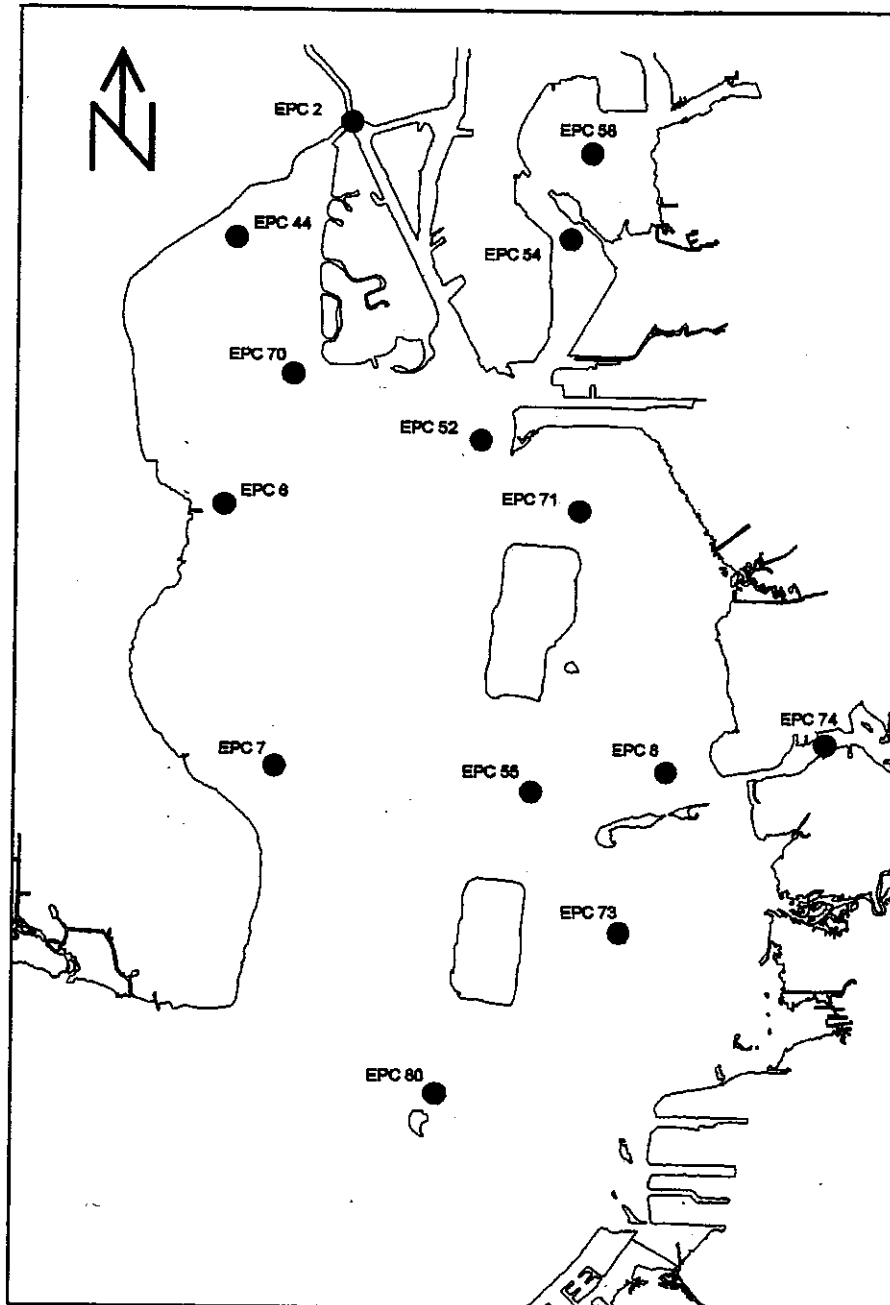


Figure 2. Water quality monitoring stations in Hillsborough Bay sampled by the EPC (modified from Boler 1999).

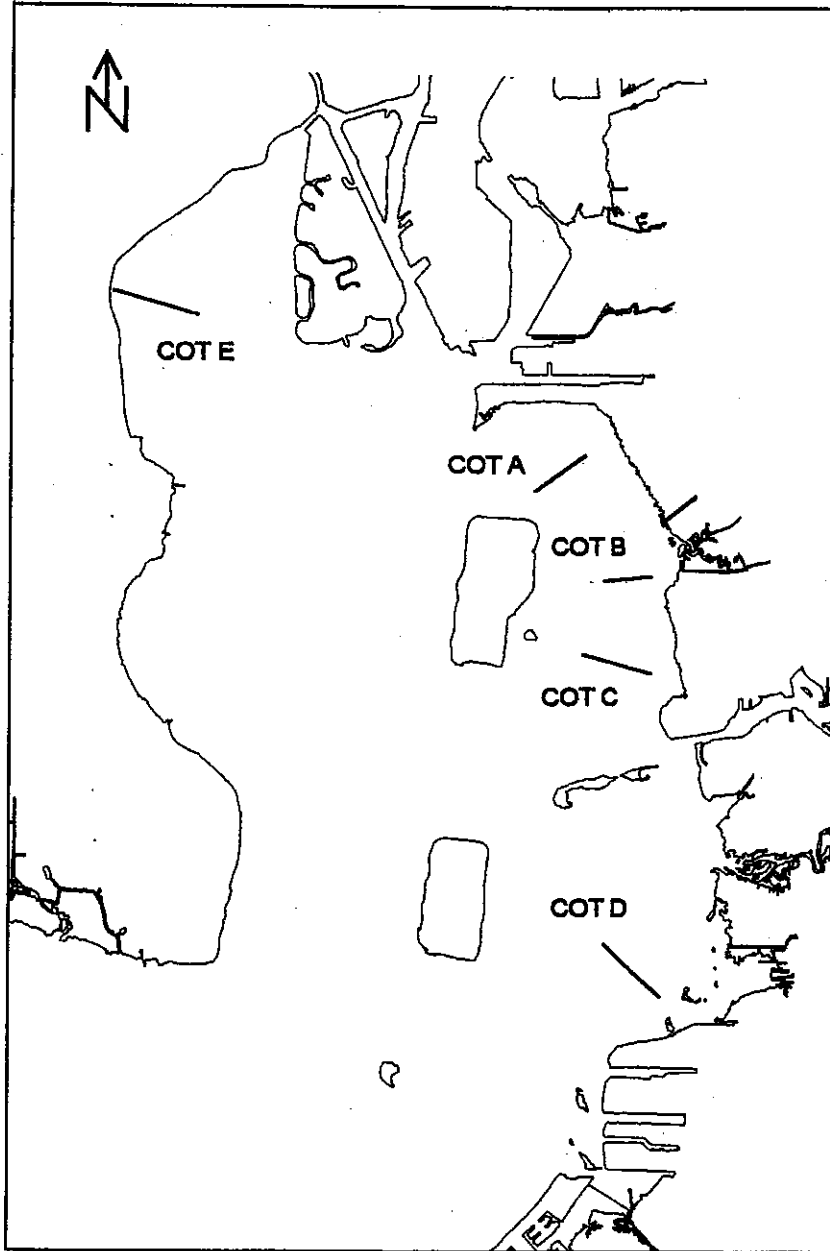


Figure 4. Macro-algae monitoring transects in Hillsborough Bay sampled by the COT.

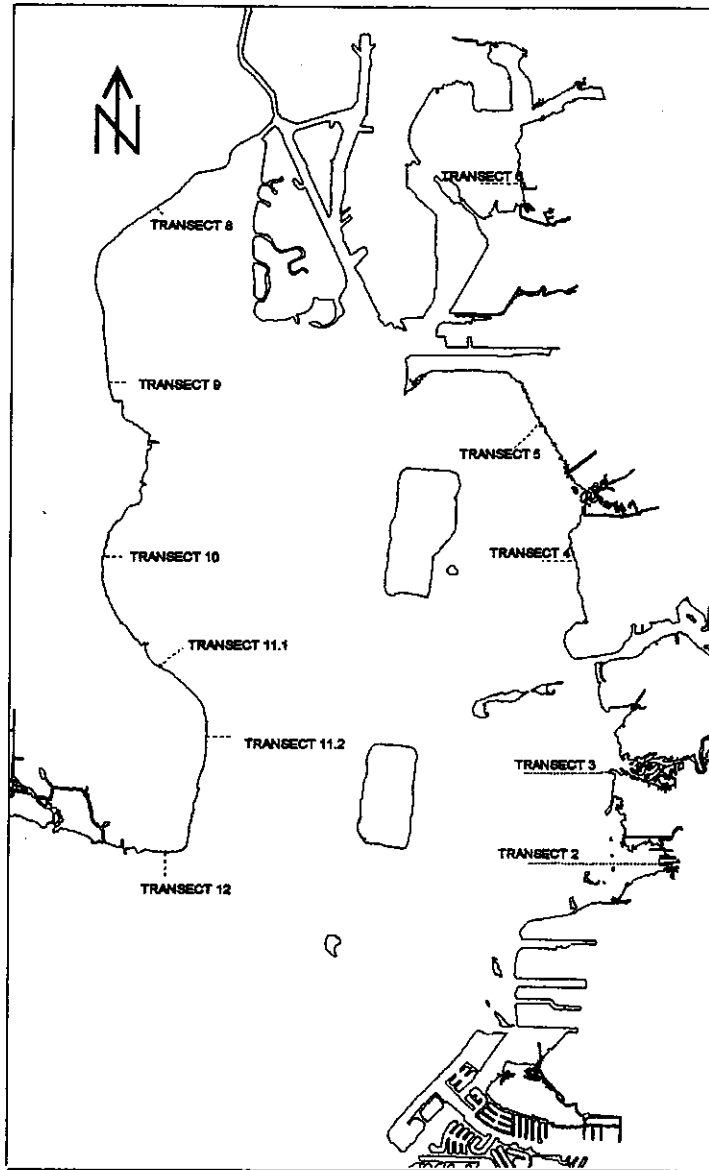


Figure 6. Seagrass transects in Hillsborough Bay currently sampled by the COT.