
# BIOASSAY OF TECO-GANNON POWER PLANT

TAMPA, HILLSBOROUGH COUNTY, FLORIDA

NPDES #FL0000809

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Biological Section
Bureau of Water Analysis
August 27, 1981

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## INTRODUCTION

The TECO-Gannon Power Plant is located on Port Sutton Road near Black Point on Hillsborough Bay, Tampa, Hillsborough County, Florida (Figures 1 and 2). It is a steam generating plant, using six boilers to produce 1200 MW of electricity. The plant uses approximately 981 MGD of once-through cooling water which is discharged into Hillsborough Bay via NPDES Outfalls #001 and #002. Components of this discharge may include screen washwater, boiler blowdown, and water from the ash handling system. An elaborate wastewater treatment system is employed to treat actual process wastewater and contaminated runoff. However, certain metals may be discharged as a result of overflow from the settling pond serving slag tanks and dewatering bins. A schematic water flow diagram of the TECO-Gannon Power Plant is presented in Figure 3.

To evaluate the effects of this discharge on the biota of the receiving waters, the Biological Section performed a static acute toxicity bioassay on a grab sample of effluent, on 4 to 6 August, 1981. The results of this test are presented in this report.

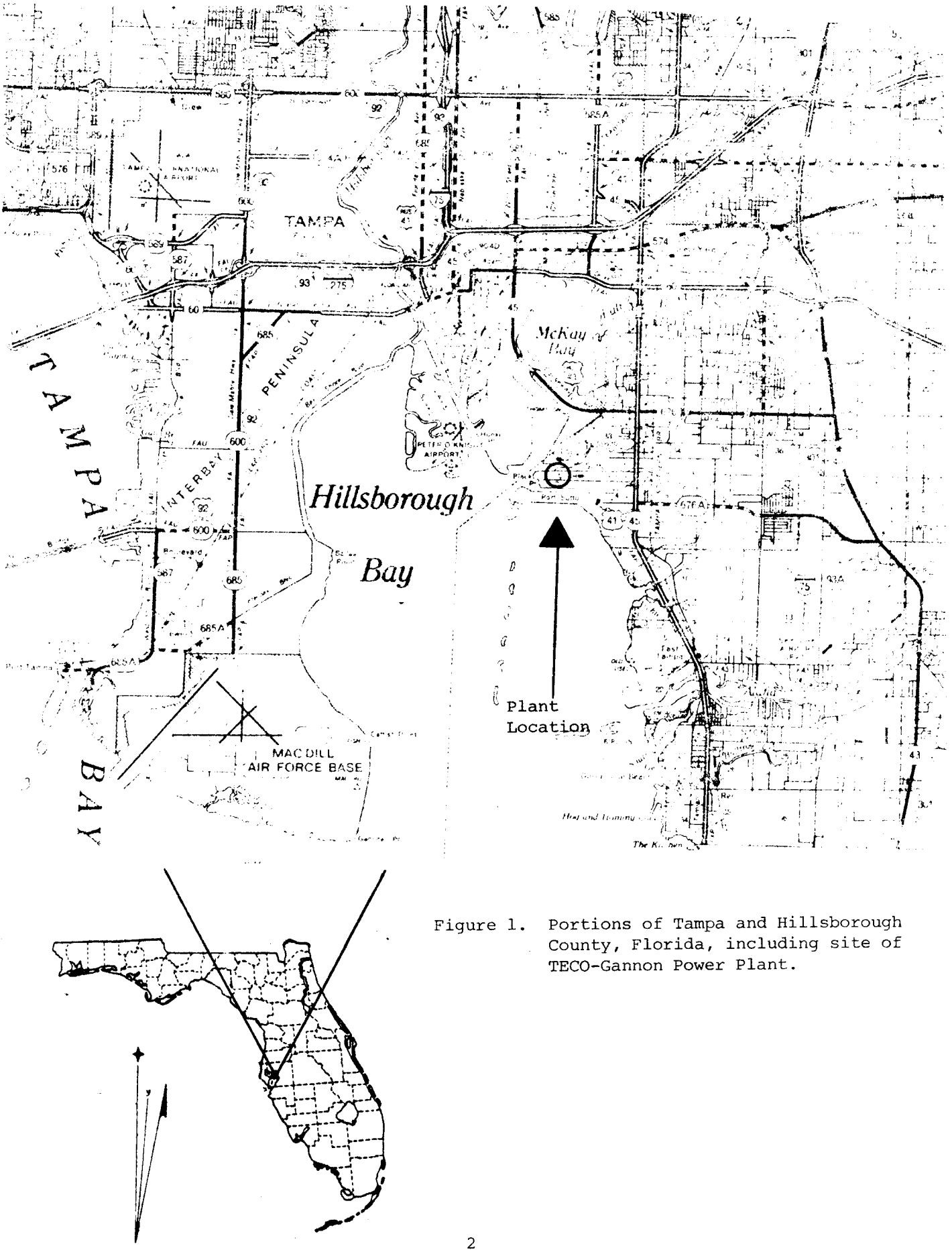


Figure 1. Portions of Tampa and Hillsborough County, Florida, including site of TECO-Gannon Power Plant.

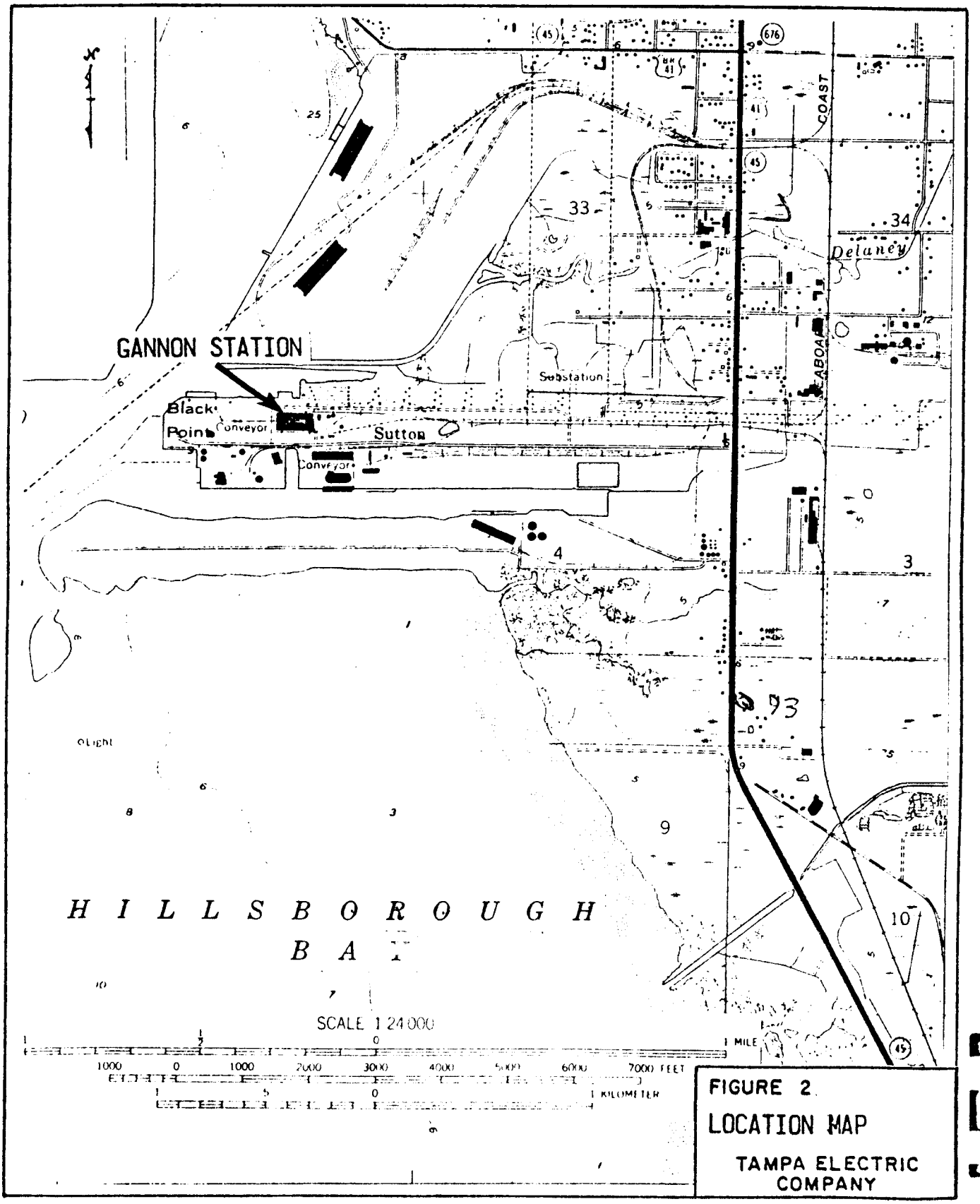


FIGURE 2
LOCATION MAP
TAMPA ELECTRIC COMPANY

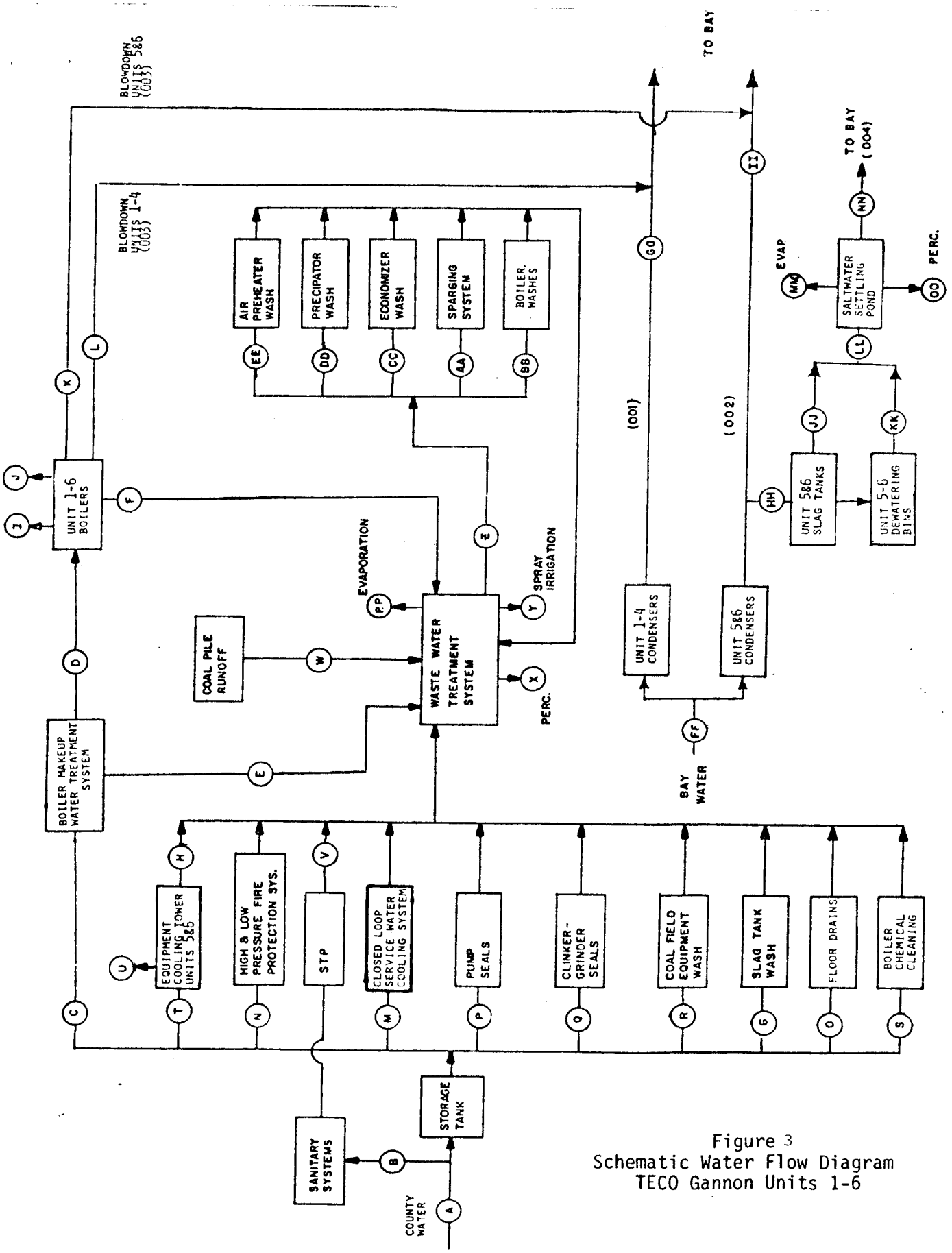


Figure 3
Schematic Water Flow Diagram
TECO Gannon Units 1-6

## METHODS AND MATERIALS

Test methods used to conduct this static bioassay are extensively described by Peltier (1978). The organism selected for this study is among those recommended by Peltier (1978) and the U.S.EPA (1978). The life history and maintenance procedures used to culture them are detailed below.

### History and Maintenance of Bioassay Organisms

Mysidopsis bahia (mysid shrimp) - In September, 1978, approximately 300 adult mysid shrimp were obtained from the Gulf Breeze EPA Laboratory in Pensacola, Florida. The mysids have been cultured under continuous lighting in 10 and 15 gallon all glass aquaria equipped with undergravel filtration and aeration. The mysid shrimp are cultured over a wide range of salinities (10-30 ppt) to minimize acclimation periods to low or high salinity effluents. Seawater is obtained from the FSU Marine Laboratory located at Turkey Point, Florida (salinity range 17-31 ppt) and partial water changes are performed weekly. Freshwater, for dilutuion of the seawater as necessary, is obtained from a deep well near the DER laboratory. The mysids are fed twice daily with freshly hatched Artemia (brine shrimp) and are kept at a constant temperature of $22^{\circ} \pm 1^{\circ}C$. Immediately prior to the bioassay, a suitable number of mysids were transferred by net to a culture dish for observation and selection of individuals for the test. Fifteen day old (three-quarter adult size) mysids were used in this test. Organisms selected for testing were transferred individually by glass tube and randomly placed in the test chambers.

To ensure the uniform sensitivity of these test organisms to toxic substances, the Biological Section conducts monthly Standard Reference Toxicant Bioassays using sodium lauryl sulfate as the reference toxicant.

### Test Methods

A 48-hour static bioassay was conducted from 0900 hours on 4 August, 1981, to 0900 hours on 6 August, 1981, on a grab sample of effluent from the mixing flume prior to Outfalls #001 and #002. The grab sample was collected by Mr. Matt McCann of DER's Southwest District at 0930 hours on 3 August, 1981. The sample was iced and transported to DER's Tallahassee Laboratory within 24 hours of collection. Saltwater for dilution of the effluent sample was obtained from the FSU Marine Laboratory at Turkey Point (salinity = 30.5 ppt). This saltwater diluent was then adjusted to the salinity of the effluent sample (26.0 ppt) by adding an appropriate amount of DER well water. This adjusted diluent was mixed directly with the effluent, achieving a final salinity in each test concentration and the control of 25 to 26 ppt.

Two replicates of each test concentration and the control were used in this static test. Immediately prior to the bioassay, a suitable number of mysids were transferred by net from the 25 ppt salinity aquarium to a culture dish for observation and selection of individuals for the test. Individual mysid shrimp were siphoned via glass tube, carefully examined for injury, and transferred to wide mouth quart jars, each containing 500ml of the appropriate concentration. The concentration series selected for this study (Table 1) are those recommended by the APHA (1976).

Five organisms were loaded per test chamber, giving ten per concentration. Temperature, pH, dissolved oxygen, and the number of live organisms were recorded at 0, 24, and 48 hours for each test chamber (Table 2). Additionally, ammonia concentrations, including total (expressed in mg/l as N) and unionized (expressed in mg/l as $NH_3$) fractions, were determined for the control and the 100% test concentration at the beginning of the bioassay. Total ammonia measurements were performed with an Orion specific ion probe. The unionized fraction was then calculated based on pH, temperature and salinity. According to EPA (1978), "Although it is generally undesirable to feed most fish and macroinvertebrates during static toxicity tests, an exception is necessary for M. bahia". Therefore, the mysids were fed brine shrimp (Artemia) nauplii at the rate of approximately 10 to 20 per mysid shrimp to minimize cannibalism.

Table 1. Concentration Series and Volumes Used for This Static Bioassay

Mysidopsis bahia

| Concentration | Dilution Water | Effluent | Total Vol. |
|---|---|---|---|
| Control | 500 ml | --- | 500 ml |
| 5.6% | 472 ml | 28 ml | 500 ml |
| 10.0% | 450 ml | 50 ml | 500 ml |
| 18.0% | 410 ml | 90 ml | 500 ml |
| 32.0% | 340 ml | 160 ml | 500 ml |
| 56.0% | 220 ml | 280 ml | 500 ml |
| 100% | --- | 500 ml | 500 ml |

Table 2. Data recorded during 48 hour, Mysidopsis bahia, static acute toxicity bioassay of TECO-Gannon Power Plant, Tampa, Hillsborough County, Florida, NPDES #FL0000809, Mixing flume prior to Outfalls #001 and #002 on 4 to 6 August, 1981.

| Concentration or % | Number of Live Organisms | | | Dissolved Oxygen (mg/ℓ) | | | pH | | | Temperature (°C) | | | $NH_3/NH_3+NH_4$ (mg/ℓ) | | Salinity ppt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 48 | 0 |
| Control | 5 | 5 | 5 | 7.0 | 6.3 | 5.9 | 7.8 | 7.8 | 7.7 | 20.5 | 20.6 | 20.4 | .01/.47 | --- | 25.5 |
| Control | 5 | 5 | 5 | 7.0 | 6.2 | 6.1 | 7.8 | 7.8 | 7.7 | | | | | | |
| 5.6% | 5 | 5 | 5 | 7.0 | 6.3 | 6.1 | 7.9 | 7.8 | 7.7 | 20.5 | 20.5 | 20.3 | | | 25.5 |
| 5.6% | 5 | 5 | 5 | 7.0 | 6.3 | 6.1 | 7.9 | 7.8 | 7.7 | | | | | | |
| 10% | 5 | 5 | 5 | 6.9 | 6.4 | 6.1 | 7.9 | 7.8 | 7.7 | 20.8 | 20.4 | 20.2 | | | 25.5 |
| 10% | 5 | 5 | 5 | 6.9 | 6.4 | 6.2 | 7.9 | 7.8 | 7.7 | | | | | | |
| 18% | 5 | 5 | 5 | 6.7 | 6.2 | 6.1 | 7.9 | 7.8 | 7.7 | 20.9 | 20.3 | 20.1 | | | 25.5 |
| 18% | 5 | 5 | 5 | 6.7 | 6.3 | 6.2 | 7.9 | 7.8 | 7.7 | | | | | | |
| 32% | 5 | 5 | 5 | 6.4 | 6.4 | 6.4 | 8.0 | 7.8 | 7.7 | 20.9 | 20.4 | 20.3 | | | 25.5 |
| 32% | 5 | 5 | 5 | 6.4 | 6.2 | 6.1 | 8.0 | 7.8 | 7.7 | | | | | | |
| 56% | 5 | 5 | 5 | 6.0 | 6.5 | 5.9 | 8.0 | 7.9 | 7.7 | 21.0 | 20.5 | 20.4 | | | 25.5 |
| 56% | 5 | 5 | 5 | 6.0 | 6.4 | 6.2 | 8.1 | 7.9 | 7.7 | | | | | | |
| 100% | 5 | 5 | 5 | 5.0 | 7.3 | 8.1 | 8.2 | 8.0 | 8.0 | 20.9 | 20.7 | 20.6 | .03/.53 | --- | 26.5 |
| 100% | 5 | 5 | 5 | 5.0 | 6.9 | 7.8 | 8.2 | 8.0 | 8.0 | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Remarks:

Total residual chlorine (HACH DPD Method): None detected.

## RESULTS AND DISCUSSION

This particular grab sample of effluent from the TECO-Gannon Power Plant was not acutely toxic to Mysidopsis bahia. In fact, not a single organism died during the test.

## LITERATURE CITED

American Public Health Association. 1976. Standard Methods for the Examination of Water and Wastewater. 14th ed. 1193pp.

Peltier, William. 1978. Methods for measuring the acute toxicity of effluents to aquatic organisms. Environmental Research Laboratory. Athens, Georgia. EPA-600/4-78-012 (Revised July 1978). 51pp.

U.S. Environmental Protection Agency. 1978. Bioassay procedures for the Ocean Disposal Permit Program. Environmental Research Laboratory. Gulf Breeze, Florida. EPA-600/9-78-010.