

BIOASSAY OF TECO-BIG BEND POWER PLANT

SLAG POND OUTFALL #002

TAMPA, HILLSBOROUGH COUNTY, FLORIDA

NPDES #FL0000817

SAMPLED 11/6/84

FILE COPY
DO NOT REMOVE

January 21, 1985

Biology Section
Division of Environmental Programs

BIOASSAY OF TECO-BIG BEND POWER PLANT
SLAG POND OUTFALL #002
TAMPA, HILLSBOROUGH COUNTY, FLORIDA
NPDES #FL0000817

Biology Section
Bureau of Laboratories
January 21, 1985

EXECUTIVE SUMMARY

TECO-Big Bend Slag Pond, NPDES #FL0000817, Outfall #002, Tampa, on 7 to 9 November, 1984.

The sample of slag pond effluent collected from the TECO-Big Bend Power Plant Outfall #002 was not toxic to Mysidopsis bahia. Only random mortalities were noted during the 48 hour static test. Insignificant concentrations of total ammonia (maximum = .21 mg/l) and unionized ammonia (maximum = .007 mg/l) were detected in the sample. Chemical analyses were not performed since the sample was not toxic.

INTRODUCTION

The TECO-Big Bend Power Plant is located on Big Bend Road in south Hillsborough County, Florida (Fig. 1). It uses three generating units to produce approximately 1108 MW of electricity for residents of Hillsborough County. The plant discharges almost 8 million gallons per hour of once-through cooling water, as well as various amounts for boiler and ash blowdown. Water is discharged from various ponds through at least 13 outfalls into a canal adjacent to the plant. The canal then empties into Tampa Bay (NPDES Outfall #001). Water from Tampa Bay is also circulated through the canal to minimize thermal effects from the plant. Components of the discharge may include various heavy metals from the boiler and ash blowdown and from the ash and slag ponds. The specific ash and slag pond discharge is designated as NPDES Outfall #002. Chlorination is also used to prevent biological fouling of the various intake and discharge pipes.

In July, 1981, the Biology Section performed a static acute toxicity bioassay on a sample from Outfall #001, using Mysidopsis bahia as the test organism. The results of that test indicated that the sample was not acutely toxic (FDER 1981). To further evaluate the effects of specific components of TECO's discharge to the biota of the receiving waters, the Biology Section performed an additional static acute toxicity bioassay on a sample from Outfall #002 (slag pond) on 7 to 9 November, 1984. The results of this latest test are presented in this report. Those involved in performing these tests and in preparation of this report were: R. B. Frydenborg, M. L. Moultrie, and M. L. Roll.

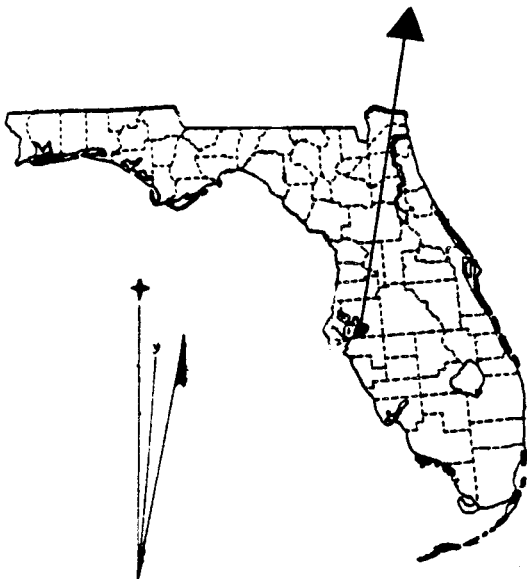
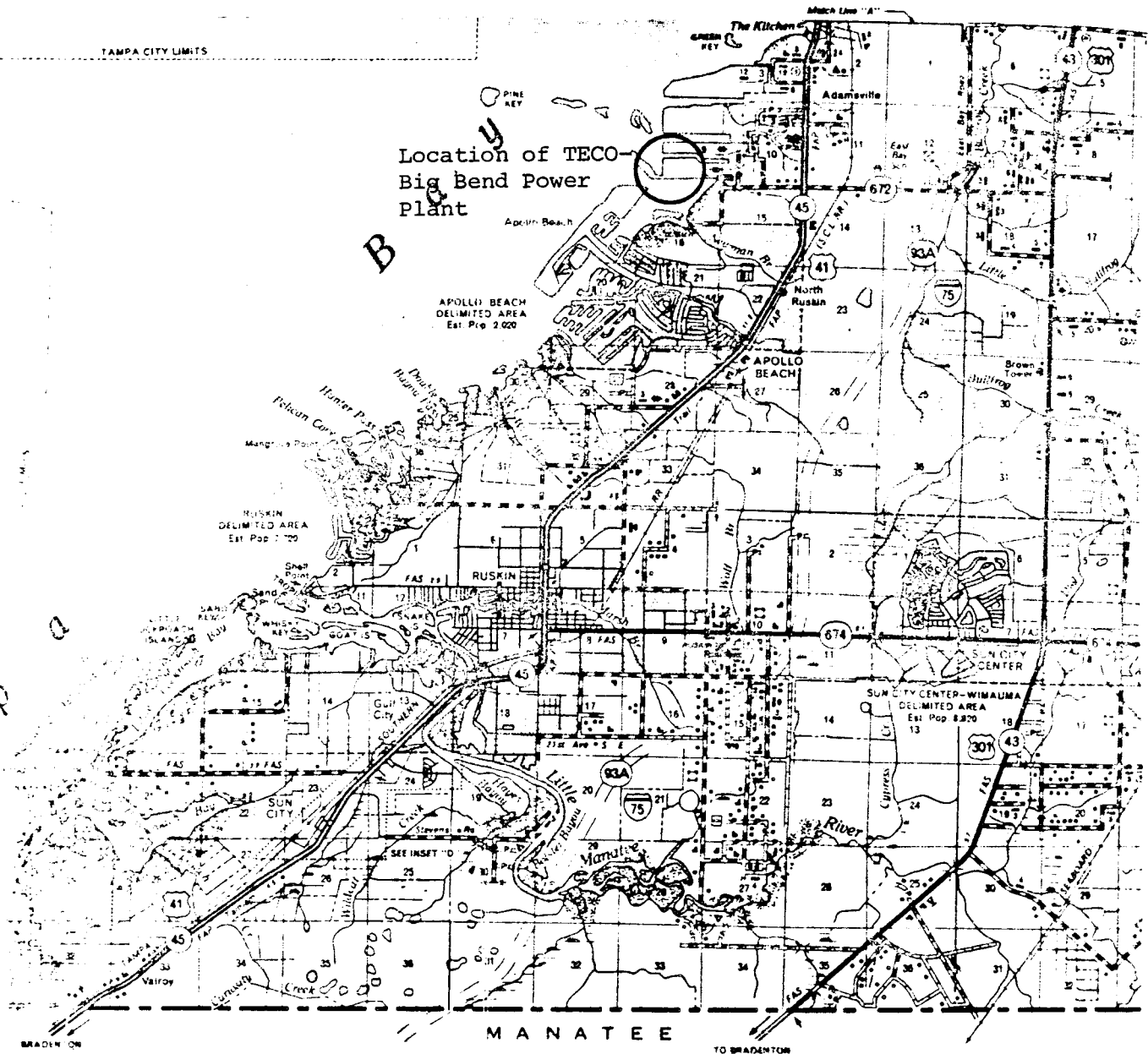


Figure 1. Portions of Hillsborough County, Florida, including site of TECO-Big Bend Power Plant.

METHODS AND MATERIALS

Test methods used to conduct this static bioassay are extensively described by Peltier (1978) and the FDER Biology Section (1983). The organism selected for this study is among those recommended by Peltier (1978), the U.S. EPA (1978), and the FDER Biology Section (1983). The life history and maintenance procedures used to culture the organism are detailed below.

Mysidopsis bahia (mysid shrimp) - In September, 1978, approximately 300 adult mysid shrimp were obtained from the EPA laboratory in Gulf Breeze, Florida. The mysids are cultured under a 16:8 hour light-dark cycle 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, used for culturing the test organisms and as diluent in the bioassays, is prepared by mixing artificial sea salts (Forty Fathoms®) and well water to obtain a final salinity of 20-30 ppt. Freshwater, for dilution of the seawater as necessary, is obtained from a deep well near the DER laboratory. The mysids are fed twice daily and once daily on weekends with freshly hatched Artemia (brine shrimp) and are kept at a constant temperature of 23° plus or minus 3°C. Adult or large juvenile mysids were used in this test.

To ensure the uniform sensitivity of this test organism to toxic substances, the Biology Section conducts monthly standard reference toxicant bioassays using sodium lauryl sulfate as the reference toxicant.

Test Methods

A 48 hour static bioassay was performed on a sample of slag pond discharge from Outfall #002. The test was performed from 0945 hours on 7 November to 0950 hours on 9 November, 1984.

The sample was collected by Ms. Phyllis Giwer of DER's Southwest District at 1356 on 6 November, 1984, using standard wastewater sampling procedures. Separate samples were obtained for chemical and biological testing. Samples for metal analyses were preserved with HNO₃. Samples for organic chemical analyses and for the bioassay were unpreserved. The samples were iced and transported to the DER laboratory in Tallahassee for analyses within 24 hours of collection.

Saltwater for dilution of the effluent sample was prepared from artificial sea salts (salinity = 22.1 ppt). For test concentrations of 56% and below, this diluent was mixed directly with the effluent, achieving a range of final salinities (23.2 ppt to 22.2 ppt).

The concentration series selected for this study (Table 1) is that recommended by APHA (1980). Two replicates of each test concentration and of the control were used to test with Mysidopsis bahia. Immediately prior to the bioassay, a suitable number of mysids were transferred by net from the 20 to 25 ppt salinity aquaria to culture dishes for observation and selection of individuals for the tests. Individual mysid shrimp were siphoned using a glass tube, carefully examined for injury, and transferred to wide mouth quart jars, each containing 500 ml of the appropriate concentration. For each concentration, the mysid shrimp were pre-acclimated to within 4 ppt salinity. Five organisms were loaded per test chamber, giving ten per concentration. Based on the recommendations of EPA (1978), the mysids were fed brine shrimp (Artemia) nauplii at the rate of approximately 10 to 20 nauplii per mysid per day to minimize cannibalism.

Dissolved oxygen (YSI Model 57 oxygen meter), pH (Corning Model 7 pH meter with Orion Ross® combination electrode), temperature (NBS calibrated glass thermometer), and the number of live organisms were recorded for each test concentration at 0 hours, 24 hours, and 48 hours. The salinity (YSI Model 33 S-C-T meter) of each test concentration was recorded at the beginning and end of the test. All instruments were calibrated daily according to manufacturer's recommendations. Ammonia concentrations, including the total and unionized fraction (expressed in mg/l as N and as NH₃, respectively), were recorded in the control and the 100% effluent test concentration at the beginning of the test. Total ammonia concentrations were determined using an Orion® specific ion probe and an Orion Ionalyzer®. The unionized fraction was then calculated based on the total ammonia concentration, and the pH, temperature, and salinity of the sample. These values were recorded on the bioassay data form and are presented in Table 2.

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

Mysidopsis bahia (mysid shrimp)

<u>Concentration</u>	<u>Dilution Water</u>	<u>Effluent</u>	<u>Total Volume</u>
Control	500 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
100.0%	-----	500 ml	500 ml

Table 2. Data recorded during 48 hour, Mysidopsis bahia, static acute toxicity bioassay of TEO-Big Bend Power Plant, Tampa, Hillsborough County, Florida, NPDES #FD000817, Outfall #002, on 7 to 9 November, 1984.

[illegible]

RESULTS AND DISCUSSION

The sample of slag pond effluent collected from the TECO-Big Bend Power Plant Outfall #002 was not toxic to Mysidopsis bahia. Only random mortalities were noted during the 48 hour static test (Table 2). Insignificant concentrations of total ammonia (maximum = .21 mg/l) and unionized ammonia (maximum = .007 mg/l) were detected in the sample. Chemical analyses were not performed since the sample was not toxic.

LITERATURE CITED

- American Public Health Association. 1980. Standard Methods for the Examination of Water and Wastewater. 15th ed. 1134 p.
- Florida Department of Environmental Regulation, Biology Section. 1981. Bioassay of TECO-Big Bend Power Plant. Tampa, Hillsborough County, Florida. NPDES #FL0000817. FDER. 7 p.
- _____. 1983. Quality Assurance Manual for Performing Acute Toxicity Tests. FDER. 22 p.
- Peltier, W. 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). 51 p.
- 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. 121 p.