

Galveston Bay, Texas
Water Quality
Houston Ship Channel, Texas

WA (175)

Water Quality Report
Galveston Bay Complex
State of Texas

Prepared for

Public Meeting, Galveston Bay Enforcement Conference
Houston, Texas
December 5, 1972

by

Texas Water Quality Board

TABLE OF CONTENTS

- I. INTRODUCTION
- II. CHANGES IN POLLUTION LOADS
 - A. Galveston Island
 - B. Texas City Area
 - C. Houston Ship Channel
- III. IMPROVEMENTS IN THE HOUSTON SHIP CHANNEL WATER QUALITY
 - A. Biochemical Oxygen Demand
 - B. Dissolved Oxygen
 - C. Bacteriological Quality
 - D. Biological Quality
 - E. Summary
- IV. JOINT TWQB-EPA WASTE SOURCE SURVEY
- V. SUMMARY

WATER QUALITY REPORT
GALVESTON BAY COMPLEX
STATE OF TEXAS

I. INTRODUCTION

One result of the Galveston Bay Enforcement Conference was the formation of the Galveston Bay Technical Committee - a committee composed of personnel from the staffs of the Texas Water Quality Board and the EPA. This committee has prepared a formal report of the progress being made in Water Quality Management in the Galveston Bay area pursuant to the recommendation of the conferees and it has been presented to this public meeting. In addition to this formal report, it was felt that an informal presentation relative to the progress being made in reducing pollutant loads and in improving the water quality of the Galveston Bay complex would be relevant and timely. This is such a report.

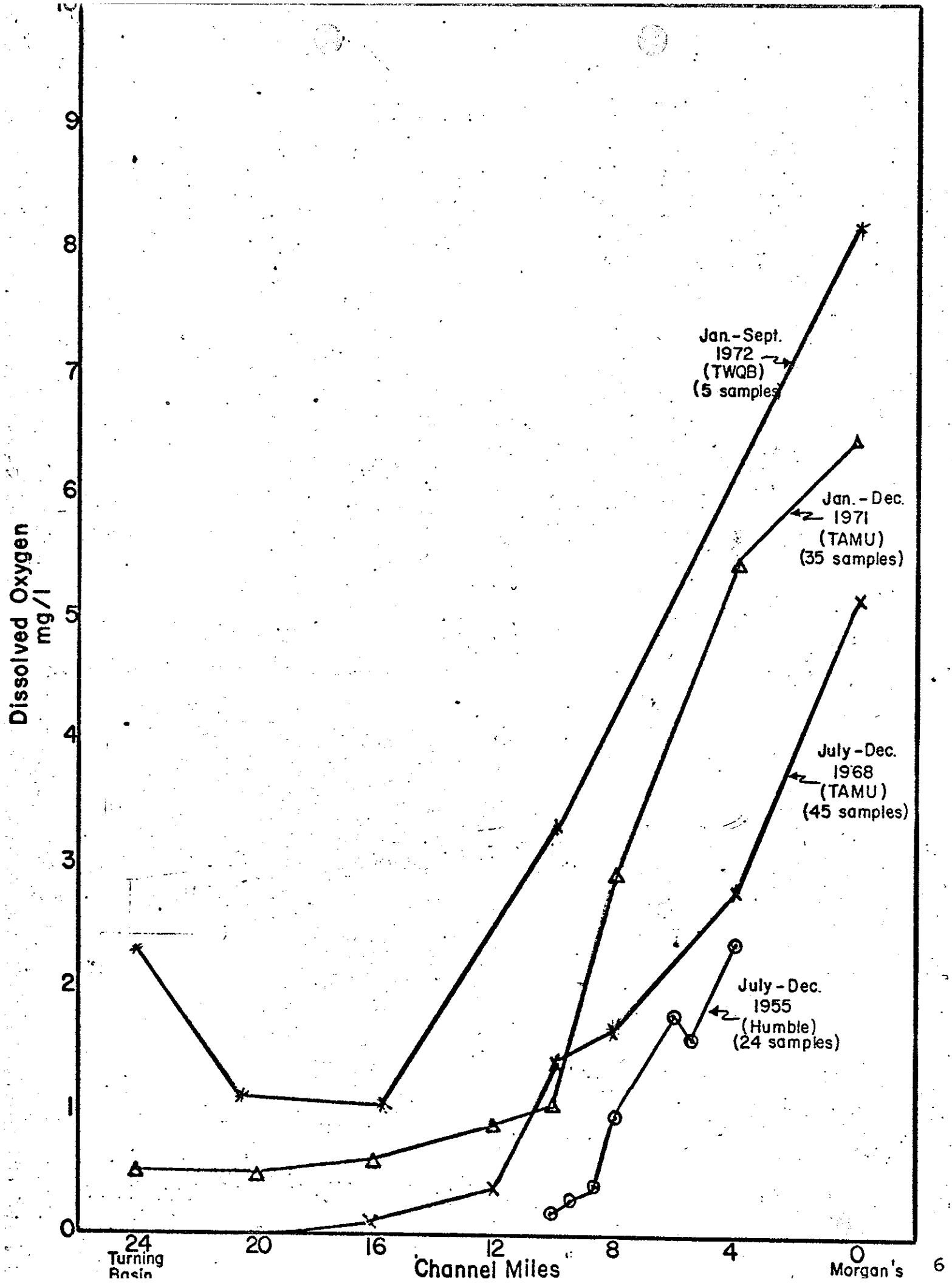
II. CHANGES IN POLLUTION LOADS

Three geographic areas account for the majority of waste loads discharged into the Galveston Bay complex; these are the Houston Ship Channel, the Texas City area, and Galveston Island. They will be discussed separately.

A. Galveston Island. The largest waste discharger on Galveston Island is the City of Galveston. The City is committed to a number of improvements to its sewerage system, including modifications and expansion of the Main Plant. When these modifications are complete, the BOD contribution to the Bay from this plant is expected to be reduced from a 1972 average of about 4,000 pounds/day to about 1,100 pounds/day. This represents a BOD reduction of 72%. The contract for the construction of these facilities was executed in October 1972, with completion scheduled in 1973.

B. Texas City Area. In January 1972, the BOD load emanating from the Texas City area amounted in the aggregate to approximately 95,000 pounds/day of BOD. This load has been reduced to approximately 82,000 pounds/day by the installation of waste treatment facilities by the Monsanto Company.

It is anticipated that the waste treatment facilities presently under construction by the Gulf Coast Waste Disposal Authority and scheduled for completion in 1973 will lower the aggregate



Texas City area daily BOD load to about 50,000 pounds, a decrease of approximately 30,000 lbs/day. A waste control order issued by the Texas Water Quality Board on November 29, 1972, requires the American Oil Company to construct waste treatment facilities to be completed in mid-1974 which will lower the aggregate Texas City area load to approximately 40,000 lbs/day. Further scheduled waste treatment facilities are expected to lower the aggregate BOD load to about 10,000 pounds per day by 1975. This is a 90% reduction from the BOD load of 95,000 pounds/day in early 1972 (see Figure 1).

C. Houston Ship Channel. As reported at the original meeting of the Shellfish Enforcement Conference in June 1971, the BOD load imposed on the Houston Ship Channel at that time was approximately 130,000 pounds/day. The load had been decreased to that value from the 1968 load of 430,000 pounds/day, a reduction of about 70%. In September 1972, the aggregate BOD load on the Houston Ship Channel was 117,000 pounds/day.

It was anticipated that the startup of the expanded City of Houston Northside Plant would result in a further decrease in the BOD load. Contrary to expectations, when this plant was placed into operation, difficulties encountered with the sludge handling facilities, compounded by the increased biological sludges generated, resulted in a BOD load increase from this facility. Additional sludge handling facilities, expected to correct the problem, are under construction. They are scheduled for completion in March 1973. Should these facilities perform as expected, the aggregate BOD load on the Houston Ship Channel should be decreased to approximately 70,000 pounds/day in early 1973. Further waste treatment improvements presently under construction by Rohm & Haas, Ethyl Corporation, and others, should decrease the aggregate BOD load to approximately 60,000 pounds/day during 1973. These improvements should result in a 50% reduction in the 1971 BOD loads.

III. IMPROVEMENTS IN THE HOUSTON SHIP CHANNEL WATER QUALITY

At the outset, the water quality in the Houston Ship Channel remains unsatisfactory. Nevertheless, improvements are becoming apparent.

A. Biochemical Oxygen Demand. Figure 1 shows the average BOD concentrations at various locations along the Houston Ship Channel. The BOD concentration represented by the solid bars are averages

from the Galveston Bay Water Quality Survey for the period 1963-1967.⁽¹⁾ The patterned bars represent 1971-1972 Texas Water Quality Board stream monitoring data.⁽²⁾ This figure indicates that the BOD concentrations at all stations along the Channel except Morgan's Point during the period 1971-1972 are approximately one half those measured from 1963-1967. The Morgan's Point sampling station is influenced more heavily than the others by the better quality bay water. Figure 2 is positive proof of an improvement over the past five years in the quality of water in the Houston Ship Channel.

B. Dissolved Oxygen. At the original meeting of the Enforcement Conference held in Houston in June 1971, the Texas Water Quality Board reported that the dissolved oxygen concentration at Morgan's Point appeared to be responding to the decreasing waste loads being imposed upon the Channel, but that there had been no significant response at that time in the upper reaches of the Channel. It was indicated, however, that a response was anticipated. It was encouraging to note that this response has become manifest.

Figure 3 portrays the dissolved oxygen profile for the Houston Ship Channel from Morgan's Point to the turning basin at various periods of time. It will be noted that the average dissolved oxygen has steadily improved over the years. The lower line shows the dissolved oxygen concentrations which existed in the lower Channel during the period July through December of 1955. These data are included in an article entitled "An Ecological Survey of the Houston Ship Channel and Adjacent Bays" published in the Publications of the Institute of Marine Science.⁽³⁾

The green line portrays the dissolved oxygen profile which existed in the Channel during the period July through December of 1968. These data were collected by Texas A&M University and are available from the Environmental Engineering Division.⁽⁴⁾

It will be noted that the dissolved oxygen concentrations in the Channel increased slightly between 1955 and 1968.

The red line portrays the dissolved oxygen profile which existed in the Channel during 1971. These data were also collected by Texas A&M University.⁽⁴⁾

The blue line represents the dissolved oxygen profile which existed in the Channel during the period January through September 1972. These data were collected by Texas Water Quality Board District 7

representatives and are available from Texas Water Quality Board, Austin, Texas. (2)

It will be noted that a substantial improvement in the dissolved oxygen profile occurred during 1972. We would hasten to point out that even with this improvement, the dissolved oxygen is from time to time zero, and we do not consider the Channel to be in acceptable condition. Further improvements are needed, and will be made.

C. Bacteriological Quality. Bacteriological quality of the Houston Ship Channel is still unsatisfactory. This is largely due to the lack of chlorination at the City of Houston's Sims Bayou Plant. Chlorination facilities are currently under construction, with completion expected by March 1, 1973.

Nevertheless, some progress has been made in improving the bacteriological quality in the lower reaches of the Houston Ship Channel. For example, at the San Jacinto Monument (See Figure 4), the geometric mean of the coliform most probable number data show an MPN of 2,044 for the 1972 data, (2) as opposed to a geometric mean of 25,000 for the period 1963 through 1967 inclusive. (1) It will be noted that the 1972 value is only 8% of the 1963-1967 value. Similar data for Morgan's Point shows an MPN reduction from 500 to 80 (See Figure 5).

D. Biological Quality. Commencing in February 1972, the District 7 office of the Texas Water Quality Board has conducted a biological monitoring program of the Houston Ship Channel. This program was commenced on October 19, 1971, following the appearance of shrimp, crabs and fin fish in the Channel approximately 2 miles upstream from the San Jacinto Monument. This was the first occurrence of this type of aquatic life at this point in the Channel for many years. Since that time, fin fish, shrimp, and crabs have been present in the water at this location on every occasion that the district office has sampled.

During the 1972 regular sampling runs made under this program until November, no fin fish, crabs, or shrimp have been recovered at the sample station located 11 miles upstream from the San Jacinto Monument. On the most recent sampling run (November 28, 1972) the best water quality conditions, to date, were measured and marine fin fish and crabs were recovered at this station -- to our knowledge, the farthest point upstream that this type of aquatic life

has been noted in recent years. These migrations are indicative of a general improvement of the water quality in the Houston Ship Channel.

In addition to shrimp, crabs and fin fish, the district office has sampled plankton populations at five stations on the Houston Ship Channel in February, March, May, June, August, and September, 1972. The species diversities of the plankton population at the various stations are shown in Figure 6. It will be noted that species diversity increased from 0.4 at the turning basin to 1.4 at Morgan's Point.⁽⁵⁾ A species diversity of around 2.0 is generally indicative of unpolluted or natural conditions. These data indicate that the biological conditions of the upper portion of the Houston Ship Channel are generally poor; however, the areas around the Monument and Morgan's Point have shown a marked increase in both number of species and total individuals.

E. Summary. Based on physicochemical, bacteriological, and biological data, it has been demonstrated by the foregoing discussion that the water quality in the Houston Ship Channel has been improved by the pollution abatement efforts made. Even though progress has been made, additional improvement is required and will be forthcoming.

IV. JOINT TWQB-EPA WASTE SOURCE SURVEY

Recommendation number 7 of the Galveston Bay Enforcement Conference dictates that the Texas Water Quality Board and the Environmental Protection Agency cooperate in an intensive waste source survey of the waste dischargers to the Galveston Bay complex for the purpose of determining the various waste dischargers implementation schedules for meeting Federal-State water quality standards. This joint effort commenced April 1972 and has progressed in a satisfactory manner (See Figure 7). A complete field survey consists of a preliminary conference followed by a three-day composite sampling program. The preliminary conference is held with a company's technical representatives to orient the sampling team and to gather background data. After a thorough evaluation of the background data, the sample team selects appropriate sampling points and returns to the plant site for the intensive sampling effort. When analytical data from the sampling program is available, a draft of a final report is made. These drafts are jointly prepared by the TWQB and EPA field offices. After review by the joint TWQB/EPA technical committee, the report is finalized, and discussions are held with the discharging industry or municipality relative to the findings and recommendations of the final report.

JOINT TWQB-EPA INTENSIVE WASTE SOURCE SURVEY
 FIGURE 7

ENTITY	SCHEDULE			
	CONFERENCE	SAMPLING	DATA COMPLETION	COMPLETE REPORT
Ethyl Corporation DuPont Crown Central Pet.	4/12/72 4/14/72 4/26/72	4/17/72 4/25/72 5/4/72 & 6/7/72	6/17/72 6/14/72 5/17/72	8/14/72 9/20/72
Sinclair-Koppers Humble Petro-Tex, Inc. Shell Chemical Arco Refining Champion Papers	5/3/72 5/4/72 5/8/72 5/9/72 5/10/72 5/24/72	7/10/72 6/19/72 5/15/72 5/30/72 5/23/72 6/26/72 & 8/15/72	8/2/72 8/11/72 6/8/72 8/2/72 8/2/72 8/14/72	10/20/72
Southland Paper City of Houston (Northside & Sims STP) Goodyear Synthetic (Rubber) Olin Corp.	5/25/72 5/31/72 & 8/28/72 6/1/72 6/8/72	7/24/72 9/5/72 & 9/11/72 6/13/72 8/21/72 & 8/28/72 10/10/72	8/14/72 11/72 8/2/72 10/30/72	
Shell Oil Diamond Shamrock (Deer Park) Diamond Shamrock (Greens Bayou) Tenneco Premier Petro Chem. Phillips Co. Rollins-Purle	7/13/72 7/19/72 7/26/72 8/2/72 10/2/72 & 10/12/72 10/19/72 10/26/72 10/31/72	9/25/72 10/16/72		
Charter Oil Reichhold Chemical Union Carbide Union Carbide American Oil Monsanto Armco	11/7/72 11/14/72 11/21/72	10/24/72 12/72 12/72 12/72		

The effort to date has been directed to industries and municipalities discharging into the Houston Ship Channel. As of October 1, 1972, a total of nineteen preliminary conferences with industries and municipalities has been held. Fourteen waste sources have been sampled and two final reports have been completed. The waste sources already surveyed represent approximately 83% of the BOD load on the Houston Ship Channel.

In the interest of reviewing the major waste dischargers first, the intensive waste source survey effort is now being directed to the Texas City area. Preliminary conferences have already been held with the major industries in the Texas City area and sampling is scheduled to commence in December. It is anticipated that the sampling work in the Texas City area will be concluded sometime in January 1973.

With the advent of the 1972 amendments to the Federal Water Pollution Control Act, the National Pollutant Discharge Elimination System was inaugurated. This system is to be administered by the EPA. Provisions are made in the Act for the administration of this program to be transferred to the States if the State program conforms to the provisions of the Act and guidelines to be promulgated by the Administrator of EPA. The Act envisions the EPA providing continued supervision of the program. The status of the transfer of this program to the State of Texas is as yet unresolved.

Regardless of who actually issues the permits regulating the various waste dischargers to the Galveston Bay complex, it is expected that the intensive waste source survey findings will be utilized in the continuing effort of deriving appropriate effluent limitations and implementation schedules.

V. SUMMARY

In summary, programs presently under way are expected to reduce the pollutant load from Galveston Island 72% during 1973, from the Texas City area 90% by the end of 1975, and from the Houston Ship Channel 50% by the end of 1973. It is recognized that this reduction may not be adequate, and joint efforts by the Texas Water Quality Board and the EPA are continuing which will result in continued reductions.

We are encouraged to note that the water quality in the Houston Ship Channel continues to improve. Improvements have been noted in physicochemical measurements, bacteriological measurements, and most significantly by the migrations of marine fin fish, crabs and shrimp into areas of the Channel where they have not been seen for many years.

REFERENCES

- (1) Galveston Bay Water Quality Survey (1963-1967). May, 1968. Texas State Department of Health, Austin, Texas.
- (2) Stream Monitoring Program Computer Print-Out. 1971-1972. Texas Water Quality Board, Field Operations Division, Surveillance Section, Austin, Texas. Unpublished.
- (3) Chambers, Gilbert V. and Albert K. Sparks. 1959. An Ecological Survey of the Houston Ship Channel and Adjacent Bays. Publ. Institute of Marine Sci., Vol. 6, p. 213-250.
- (4) Houston Ship Channel Water Quality Data. 1968 and 1971. Texas A&M University, Environmental Engineering Division. Unpublished.
- (5) Water Quality Related Trends and Conditions of the Confined Houston Ship Channel. 1972. Texas Water Quality Board, Field Operations Division, Austin, Texas. Unpublished Report by District 7 Office.