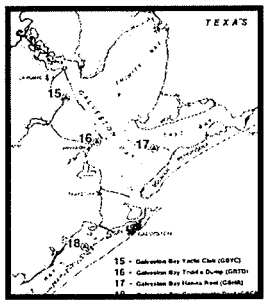
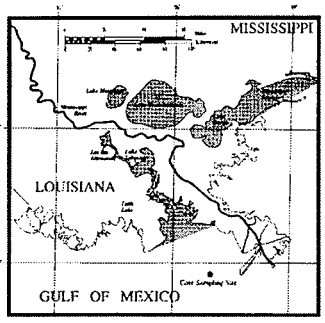
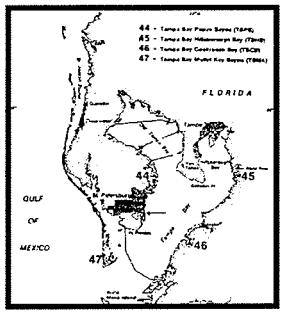
NOAA Technical Memorandum NOS ORCA 127

National Status and Trends Program
for Marine Environmental Quality

Historical Contamination of Mississippi River Delta, Tampa Bay, and Galveston Bay Sediments







Silver Spring, Maryland
March 1998

US Department of Commerce

noaa National Oceanic and Atmospheric Administration

Coastal Monitoring and Bioeffects Assessment Division
Office of Ocean Resources Conservation and Assessment
National Ocean Service

Coastal Monitoring and Bioeffects Assessment Division
Office of Ocean Resources Conservation and Assessment
National Ocean Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
N/ORCA2, SSMC4
1305 East-West Highway
Silver Spring, MD 20910

Notice

NOAA Technical Memorandum NOS ORCA 127

Historical Contamination of Mississippi River Delta, Tampa Bay and Galveston Bay Sediments

B.J. Presley, T.L. Wade, P. Santschi, and M. Baskaran
Trace Element Research Laboratory, Oceanography Department, Texas A&M University, College Station, Texas 77845-3146

Silver Spring, Maryland
March 1998

The National Oceanic and Atmospheric Administration
National Status and Trends Program
Core Project Report Series

Foreword
by Nathalie Valette-Silver

Historical trends in contamination of estuarine and coastal sediments:

The composition of surface waters in rivers, lakes, and coastal areas has changed over time. In particular, changes due to the Industrial Revolution, dating from the middle of the last century, are very well known. These changes are expressed by increased levels of natural components, such as trace metals and nutrients, but also by the increase of anthropogenic compounds, such as polychlorinated biphenyls (PCBs) and pesticides.

Since the early 1960's, regulatory measures have been taken to decrease the amount of pollutants entering our waterways, but the bulk of these environmental measures were not enacted until the 1970's. Because of the scarcity of accurate data, due to the lack of sensitive techniques or of regular data collection in the past, the extent of the past pollution and the effect of the recent legislative limitations is often difficult to assess.

The analysis of sediment cores presents a way out of this dilemma. Most pollutants have an affinity for and adsorb easily onto sediments and fine particles. Therefore, by analyzing cores of undisturbed sediments it is possible to assess the historic pollution of a given system. Sediment cores reflect not only the history of pollutant concentrations but also register the changes in the ecology of a water body. For example, changes in estuarine eutrophication are reflected in the concentration of organic matter, nitrogen, and phosphorous, while lake acidification is translated into changes in diatom assemblages.

The use of cored sediments to reconstruct the chronology of coastal and estuarine contamination is not, however, devoid of problems and caution must be exercised. Sediment mixing by physical or biological processes can obscure the results obtained by such studies, and sophisticated methods must be used in these cases to tease out the desired information.

The NS&T Core Project

Between 1989 and 1996, the National Status and Trends Program sponsored research that gathered information on long term trends in contamination of US coastal and estuarine sediments. In this project, ten areas have been targeted. They include:

1) On the East coast:
   - •Hudson/ Raritan estuary
   - •Long Island Sound marshes
   - •Chesapeake Bay
   - •Savannah Estuary

2) On the Gulf coast:
   - •Tampa Bay
   - •Mississippi River Delta
   - •Galveston Bay

3) On the West coast:
   - •Southern California Bight
   - •San Francisco Bay
   - •Puget Sound

Presently, all the studies are completed and reports are, or will soon be, directly available from the cooperators. One of the most important results of the NS&T studies and of other similar studies reported in the literature, is the observed decline in recent years of many organic and inorganic contaminants in the sediments. It is very encouraging to know that mitigating measures taken in the 1970's have been effective. This has shed a hopeful light on the potential success of future efforts to curb even more coastal and estuarine pollution.

In an effort to widely disseminate the results of these studies, the NS&T Prgram, in collaboration with the authors, is publishing some of the reports as NOAA Technical Memoranda. This study covering Tampa Bay, Mississippi River Delta and Galveston Bay is the fourth one to be published in this series.

TRACE ELEMENT RESEARCH LABORATORY

TEXAS A&M UNIVERSITY

Department of Oceanography
College Station, TX 77843-3146
Phone (409) 845-1568
Fax (409) 845-7191

FINAL REPORT

"Historical Contamination of Mississippi River Delta, Tampa Bay and Galveston Bay Sediments"

A Project Funded by DOC/NOAA/NOS/ORCA

award number NA47OA245

Submitted by the
Trace Element Research Laboratory
Oceanography Department
Texas A&M University
College Station, Texas 77845-3146

to

Dr. Nathalie J. Valette-Silver
NOAA/NOS, SSMCIV, ORCA2
1305 East-West Highway
Silver Spring, MD 20910

by

Principal Investigator:	Dr. B. J. Presley TAMU College Station
Co-Principal Investigator:	Dr. Terry L. Wade TAMU College Station
Co-Principal Investigator:	Dr. Peter Santschi TAMU Galveston
Co-Principal Investigator	Dr. M. Baskaran TAMU Galveston

TABLE OF CONTENTS

ABSTRACT

In order to obtain sediment which has accumulated over the past 100 years or so, 50-80 cm long sediment cores were collected from the submarine Mississippi River Delta, Galveston Bay, Texas and Tampa Bay, Florida. The cores were extruded and sliced into 1 cm thick sections which were then radiometrically age dated and analyzed for those organic compounds and trace metals suspected of being contaminants in the sampling areas.

The Mississippi Delta core was collected about 24 Km due west of the mouth of Southwest Pass. Radiometric dating showed the sediment accumulated at a relatively constant 0.8 cm/yr with no evidence of physical or biological disturbance. Concentrations of total polycyclic aromatic hydrocarbons (PAH's) in these sediments increased sharply from about 200 ng/g in the early 1940's to near 800 ng/g in the 1970's. The relative importance of individual PAH's to the total PAH concentration varied through time and suggested both petroleum and combustion sources. The depth distribution of total polychlorinated biphenyl (PCB) concentrations was similar to that of the PAH's, with a peak of 20 ng/g (10 times background) in sediment deposited in the 1970's. Organochlorine pesticides were low throughout this core but increased near the core top.

Several metals showed concentration gradients in the Mississippi core similar to those of PAH's and PCB's, i.e., peaks in sediment deposited in the 1970's. For Pb, the peak concentration of about 35 ug/g is about 40% above background and corresponds to a peak in leaded gasoline use. Silver and cadmium concentrations are more than twice background in the 1970's sediment, and like Pb have decreased in recent times.

The Galveston Bay core sediment had low concentrations of all organic contaminants. Total PCB and DDT concentrations ranged from near zero to 13.8 ng/g and 0.44 ng/g respectively, while total PAH's ranged from 89 to 479 ng/g. The highest concentrations were found at 10-12 cm, corresponding to about 1970. Most metal concentrations in this core were near background and showed little variation with depth (time). Silver and cadmium, however, showed a small increase in recent times and barium showed a 5-fold increase, starting in the 1940's when barium sulfate-rich oil well drilling muds began to be used in this area.

The Tampa Bay core used for this study was from very shallow water and was coarse grained and carbonate rich. The Al and Fe concentration varied with depth, which is an indication of variation in grain size and mineralogy. Such variations affected all metals and thus metals ratios were examined for evidence of human influence. Little clear evidence of metal contamination was found. Organic contaminants, however, were in higher concentration in the Tampa core than in either the Galveston or the Mississippi core. Organic contaminants were higher at the core top but showed peaks at various depths complicating interpretation.

INTRODUCTION

One way to reconstruct the geochemical history of environmental contamination is through the use of sediment cores. Because most pollutants are particle reactive, particles are the primary transport mode for pollutants introduced into surface waters of coastal areas. These particles commonly settle to the bottom near their point of entry into the marine environment. Therefore, records of inputs of anthropogenic compounds and of the natural fluxes of elements may be found in coastal sediments which accumulate in a manner that preserves this historical record. Several past studies have used sediment cores to reconstruct historical contamination inputs. These have proven to be useful in examining contamination histories (recently reviewed by Valette-Silver, 1992) on the East Coast (e.g., Narragansett Bay, Chesapeake Bay, Savannah River Estuary), West Coast (e.g., Southern California Bight) and Gulf Coast (Mississippi Delta) of the United States. The research team preparing this report participated in some of these studies (e.g. Presley et al., 1980; Boothe and Presley, 1989; Wade and Quinn, 1979) and has conducted numerous similar studies that were less specifically aimed at reconstruction of historical pollution trends (e. g. Presley et al., 1990; Wade et al., 1988; Rotter, 1985; Santschi et al., 1984).

The most important factor in successfully using the sedimentary record to reconstruct contamination history is obtaining a sediment core that provides an undisturbed record of sediment input at a location. This is not an easy task in a dynamic area such as the Gulf Coast where shallow water sediments can be disturbed by physical and biological mixing processes occurring almost continuously and by catostrophic major storm and slumping events. Major river deltas are one obvious area with high enough sedimentation rates to prevent infauna from mixing the sediment, but unfortunately these areas are subject to slumping and physical disturbance. In estuaries, sediments undisturbed by macro organisms can be found where anoxic conditions exist at or just below the sediment-water interface. Unfortunately, on the Gulf Coast these areas are in very shallow water and are subject to disturbance by man (dredging, trawling) and by nature (storms, etc.). Another problem is that much of the Gulf Coast continental shelf has been an area of non-deposition for several hundred years. Obviously, finding an area with continuous sedimentation over the past 200 years or so is not a trivial matter. We have, however, identified such areas in our previous work and have shown that sediments from them

can be dated by ^{210}Pb and ^{137}Cs techniques (e. g. Shokes, 1976; Pflaum, 1982; Presley et al., 1980; Santschi et al.,1980, 1883, 1984).

The goal of this project was to obtain new undisturbed cores from the Mississippi River Delta and Galveston Bay and if possible from Tampa Bay, to age date the cores by radiometric techniques to insure that they provide an undisturbed historical contaminant record, and to use them to provide high quality analytical data necessary to reconstruct the contamination history of these regions. The dating was done by Dr. Peter Santschi and his colleagues at Texas A&M University, Galveston. The dated core sections were analyzed for organic compounds by Dr. Terry Wade, and for trace metals by Dr. B. J. Presley at Texas A&M University, College Station. Thus, the analytical data acquired during this project were produced by the same personnel who have produced the existing ten-year data set for the Gulf of Mexico NS&T Mussel Watch Program and two-years of sediment data from EPA Environmental Monitoring and Assessment Program-Near Coastal.

TECHNICAL APPROACH

Two primary sampling areas were investigated for this project: the Mississippi River Delta and Galveston Bay. Additionally, as an area of secondary interest, a core was collected in Tampa Bay, Florida. These areas contrast sharply in geology, biology, chemistry, hydrology, proximity to industry, and many other ways, yet each is important to the Gulf Coast and the entire U.S. Furthermore, pollution concerns have been expressed for each. The Mississippi is the dominant U. S. river. It drains more than 40% of the conterminous (lower 48) U.S. states, including numerous cities and scores of industrial facilities. The river is estimated to carry 60% of the dissolved salts and 66% of the suspended solids transported to the ocean from the U.S. (Leifeste, 1974; Curtis et al., 1973). In its lower reaches the river winds through extensive farmlands, marshlands and population centers before entering the Gulf through the famous birdfoot delta . The stretch of the river between Baton Rouge and New Orleans is lined with dozens of chemical and petrochemical plants. There is, then, the potential for large inputs of pollutants by the river.

An Army Corps of Engineers diversion dam, which sends about one third of the Mississippi water down the Atchafalaya River, is located just above Baton Rouge. Thus, samples from the mouths of these two rivers would separate the effect of these lower river plants and the City of New Orleans from up-river pollutant inputs. We had

plans to take cores at the mouth of the Atchafalaya to compare to cores from the main stem Mississippi but were not able to do so with the resources available for this project.

Sedimentation rates decrease rapidly with distance from the mouth of the Mississippi River (e.g., the mouth of Southwest Pass) as has been well documented by Shokes, 1976. The success of the work described here depended on sampling in an area with optimum sedimentation rates, that is, a rate of about 0.5 to 1.5 cm/yr. These rates effectively stop bioturbation by burying infauna faster than they can mix the sediment, yet allow 100 year-old sediment to be easily sampled by gravity or box coring. Faster sedimentation spreads the input signal over greater depths making sampling of 100+ year old sediment more difficult and slower sedimentation both compresses the signal making it hard to sample at small time intervals (1-2 years) and allows organisms to destroy the record by bioturbation. Cores in areas known to have more rapid (> 2 cm/yr) sedimentation rates could be used to refine the most recent 10-20 yr history obtained from nearby slower accumulating sediment but resources were not available to do that for this project.

Areas near the mouth of Southwest Pass which are receiving sediment at the rates needed for this project have been well documented by work in Dr. Presley's laboratory (Shokes, 1976; Presley et al., 1980) and later work by Trefry, et al. (1985) and Eadie, et al. (1992). All of these studies found areas showing smooth decreases in excess of ^{210}Pb with depth in the sediment allowing accurate age determination to be made. For example, Trefry et al. (1985) show Pb-210 dates and stable Pb concentrations in a core collected in 1982 about 20 km southwest of the mouth of Southwest Pass of the Mississippi River. The exact location is 28°49.4' N, 89°40.6' W. This core showed a smooth increase in stable Pb concentration up to about 1970, then a smooth decrease to 1982. The 1970 to 1982 decrease was attributed to a decrease in the use of leaded gasoline. Changes which have occurred in Pb and other pollutants since 1982 were obtained in the work reported here.

The Galveston Bay drainage basin is small compared to that of the Mississippi River but it is one of the largest in Texas. It includes both the Dallas-Ft. Worth and the Houston metropolitan regions which have over 7 million people and the industrial, transportation, medical, etc. facilities needed to support them. Furthermore, the bay shoreline itself is, in places, lined with chemical and petrochemical plants.

Nearly half of the total chemical production in the U.S. takes place here and more than half of all wastewater permits issued in Texas are for the Galveston Bay area (NOAA, 1988). The Houston Ship Channel is often cited as one of the most polluted water bodies in the United States. A Ralph Nader Task Force, for example, stated " The Houston Ship Channel is the most poisioned and potentially the most explosive body of water in the U.S." (EPA, 1980). Massive fish kills and other visible signs of pollution were common in the 1960's and 70's. Because of these concerns, serious efforts to clean up the ship channel began in the 1970's. By 1976 the EPA was able to report that several Texas waterways were getting cleaner and the Houston Ship Channel was singled out as showing "the most notable improvement, a truly remarkable feat" (EPA, 1980). There is general agreement that industrial discharges of pollutants to the ship channel and the rest of Galveston Bay have declined in the past 15 years or so, yet the population in the drainage basin has continued to increase and massive amounts of oil and chemicals are still shipped across the Bay daily. Obviously this is an area with a potential for continuing pollution problems but one which shows definite recent improvements.

Much of Galveston Bay is closed to taking of shellfish, yet it is the most productive shellfish fishery in Texas, accounting for 50 to 80% of the catch. Many people say the shellfish industry in Galveston Bay is in danger of collapse, perhaps due to pollution (Stanley, 1992; Jensen et al., 1993), but if so why didn't it collapse in the 1970's when pollution was reportedly worse? We believe there is very little reliable data on specific pollutant concentrations in Galveston Bay prior to about 1985. Even now less than 1% of the wastewater discharge permits require reporting PCB's, chloronated hydrocarbons, etc. and only about 5% require reporting heavy metal concentrations. State and federal monitoring programs to supplement this permit required self-reporting are very few; and, in our admittedly biased view, much of the routine monitoring data is of questionable quality. As a result, we are unsure of the trends in inputs of most specific pollutants into Galveston Bay prior to the start of the NOAA Mussel Watch program. Better estimates of current inputs are becoming available (e.g., Armstrong and Ward, 1993), but past inputs can only be obtained from sediment core data if the old monitoring data is not reliable. A comparsion of pollutants in sediments deposited in the 1970's to those of the past few years should shed light on the seeming anomaly of a cleaner but less healthy Galveston Bay (NOAA, 1989).

The TAMU Galveston group had done extensive sediment collection in Galveston Bay before this project began. Somewhat surprisingly, they found that much of the Bay bottom is not currently accumulating sediment. Except in East Bay, Trinity Bay and the Ship Channel (which, however, is frequently dredged), there is very little sediment accumulation. East Bay has been found to be the primary site where radionuclide and trace element-rich muddy sediments are currently accumulating. Such an observation is in agreement with a seismic profiling study carried out by Dr. John Anderson of Rice University. Earlier work had shown that some Trinity Bay cores had ^{210}Pb-based sedimentation rates of the order of 0.1 - 0.4 cm/yr, in agreement with the long-term average sedimentaiton rate for Galveston Bay (for the last 11,000 years based on Holocene sediment thickness (Lankford and Rogers, 1969). Excess ^{210}Pb inventories in these cores can also be compared to the atmospheric fallout of ^{210}Pb in Galveston of 1.03 dpm cm^{-2} yr^{-1} (Baskaran et al., 1993).

SAMPLING AND ANALYTICAL PROCEDURES

Several cores were collected in Galveston Bay and near the mouth of the Mississippi River's Southwest Pass in areas known to have sedimentation rates appropriate for this study (see earlier discussion). Approximate locations have been referred to earlier and exact locations are discussed later in this report and are shown in Figures 1 10 and 13. Cores were taken with a custom-built 2 meter long gravity corer, by hand, by a SCUBA diver or using a 60 cm deep box corer which was then sub-sampled with 6 cm diameter plastic tubes. Cores were extruded in the lab and cut into 1 cm sections.

The analysis of ^{210}Pb, ^{226}Ra and ^{137}Cs in the 1-cm sediment core sub-sections was carried out at TAMUG's geochemical laboratory following the methods outlined in Flynn (1968) and Baskaran et al. (1988). Radiochemical assays of ^{210}Pb was done using an alpha spectrometer while ^{226}Ra (to subtract the parent-supported ^{210}Pb concentration) and ^{137}Cs were measured using a Ge-Well detector. In selected samples, ^{239,240}Pu isotopes were also be measured to study the validity of ^{137}Cs as a tracer to determine the sediment mixing coefficients. Water content on the wet sediment was determined by the weigh loss on drying at 90 degrees technique. About 2 g of dry sediment powder was taken into solution by digestion in conc. HCl, HF and HNO3 after the addition of ^{208}Po (obtained from AMERSHAM Co.) as yield monitor. Polonium from this solution was electroplated onto silver planchets following the method of Flynn (1968) and subsequently this silver planchet was assayed in an

alpha spectrometer. For $^{239,240}Pu$, about 10 g of dried, powdered sample was leached with hot 6 M HCl three times. The leachates were combined and then processed for Pu after the addition of ^{242}Pu as a yield monitor (obtained from Department of Energy Laboratory). The separation and purification of Pu was done by the standard ion exchange technique (Kressin, 1977; Santschi et al., 1980). About 10-30 g of dried powdered sediment sample was placed in a gamma counting vial or an aluminum can and specific concentrations of ^{226}Ra and ^{137}Cs was determined using the 351 keV ^{214}Pb gamma line for ^{226}Ra and the 661.6 keV line for ^{137}Cs.

Either NIST radioactive spikes and material or radioactive standards that are calibrated with NIST standards were used for calibrating the counting equipment. Precision in the concentration of ^{210}Pb, $^{239,240}Pu$, ^{226}Ra and ^{137}Cs was better than 5%. Since our radioactive spikes are tracable to those supplied by NIST and our counting equipment was well calibrated, our accuracy was similar to our precision.

The analytical procedures for trace metal and trace organic determinations used in this work were those currently in use at TAMU/GERG/TERL in the NOAA's NS&T Mussel Watch Program. All QA/QC procedures used for Mussel Watch samples were also followed in this work, including replicate analysis, spikes, standard reference materials, etc. These are detailed in the TAMU/GERG/TERL SOP's which are available from the NOAA Status & Trends Program office or from us upon request. Only a brief outline of these standard methods will be given here.

Organic carbon content (TOC) on each core section was determined using a LECO induction furnace instrument with infrared detector. Blanks, duplicates and reference material for percent total organic carbon (TOC) determinations were analyzed along with each set of twenty samples. Blanks were below the limit of detection and duplicates determinations were within ± 5% relative percent difference. Standard reference sediment TOC concentrations were within ±5% of the reference values.

Sediments for organic analyses were extracted using the methods described in Wade et al. (1988). Approximately 10 grams of freeze-dried sediment were soxhlet-extracted with methylene chloride. The solvent was concentrated to approximately 20 ml in a flat-bottomed flask equipped with a three-ball Snyder column condenser. The extract was then transferred to Kuderna-Danish tubes, which were heated in a water

bath (60°C) to concentrate the extract to a final volume of 2 ml. During concentration of the solvent, dichloromethane was exchanged for hexane.

The extracts were fractionated by alumina:silica (80-100 mesh) open column chromatography. Silica gel was activated at 170°C for 12 hours and partially deactivated with 3% (v/w) distilled water. Twenty grams of silica gel were slurry packed in dichloromethane over ten grams of alumina. Alumina was activated at 400°C for four hours and partially deactivated with 1% distilled water (v/w). The dichloromethane was replaced with pentane by elution, and the extract was applied to the top of the column. The extract was sequentially eluted from the column with 50 ml of pentane (aliphatic fraction) and 200 ml of 1:1 pentane-dichloromethane (aromatic-pesticide fraction). The fractions were then concentrated to 1 ml using Kuderna-Danish tubes heated in a water bath at 60°C.

Quality assurance for each set of ten samples included a procedural blank and a sample spiked with all calibrated analytes (matrix spike) which were carried through the entire analytical scheme and an appropriate standard reference material (i.e. SRM 1941a). All internal standards (surrogates) were added to the samples prior to extraction and were used for quantification.

Aliphatic hydrocarbons were analyzed by gas chromatography in the splitless mode using a flame ionization detector (FID). A 30 m x 0.32 mm I.D. fused silica column with DB-5 bonded phase (J&W or equivalent) was used, with the chromatographic conditions providing baseline resolution of the n-C_{17}/pristane and n-C_{18}/phytane peak pairs. Aromatic hydrocarbons were separated and quantified by gas chromatography-mass spectrometry (GC-MS) (HP5890-GC and HP5970-MSD). The samples were injected in the splitless mode onto a 0.25 mm x 30 m (0.32 μm film thickness) DB-5 fused silica capillary column (J&W Scientific Inc., or equivalent) at an initial temperature of 60°C and temperature programmed at 12°C/min to 300°C and held at the final temperature for 6 min. The mass spectral data were acquired using selected ions for each of the PAH analytes. The pesticides and PCBs were separated by gas chromatography in the splitless mode using an electron capture detector (ECD). A 30 m x 0.32 mm I.D. fused silica column with DB-5 bonded phase (J&W Scientific or equivalent) was used. The chromatographic conditions for the pesticide-PCB analysis are 100°C for 1 min, then 5°C/min to 140°C, hold for 1 min, then

2.5°C/min to 250°C, hold for 1 min, and then 10°C/min to 300°C, and a final hold of 5 min.

Trace metal analysis were performed by atomic absorption spectroscopy (AAS), instrumental neutron activation analysis (INAA) and/or inductively coupled plasma spectrometry (ICP) depending on the metal and the concentration. The most sensitive method for each metal was always used when concentrations were low to insure accurate and precise values for all metals in all samples. This requirement meant that many of the analyses were by graphite furnace AA.

Sediment samples were prepared for trace metal analysis by freeze-drying a representative aliquot and grinding it to a fine powder. No further treatment was needed for INAA; thus this technique provided a check on the sample dissolution techniques that must be applied for AA analysis. This is very important for oil well drill mud barium sulfate, certain chromium minerals and other refractive compounds. For AA and ICP analysis our standard closed bomb digestion using nitric, hydrofluoric and boric acids were used because this results in complete dissolution of almost all materials. Following digestion, samples were analyzed by flame, furnace or cold vapor AA or by ICP using our standard techniques, as stated above. Standard reference materials, blanks , spikes and replicates were digested and analyzed with every sample set. The complete sample prepration and analysis were repeated when data did not meet the data quality objectives (this basically means all data for reference materials was within 10% of accepted values and duplicates agreed to within 10% for elements > 3x the detection limit, see our SOP's for details).

RESULTS AND DISCUSSION, MISSISSIPPI RIVER DELTA

The Mississippi Delta sediment core was collected approximately 24 Km due west of the mouth of the southwest pass of the Mississippi River (28° 55.4827' N and 89° 40.6352 W, Figure 1) at a water depth of approximately 60 m. A sedimentation rate of 0.82 cm $year^{-1}$ was determined based on the depth of the plutonium peak and the profile of excess ^{210}Pb, verified against the depth of the 1962-1963 ^{137}Cs spike (PENNINGTON *et al.*, 1973; SANDERS *et al.*, 1992). The age of core sections was assigned by dividing the depth at the middle of each core section by the sedimentation rate.

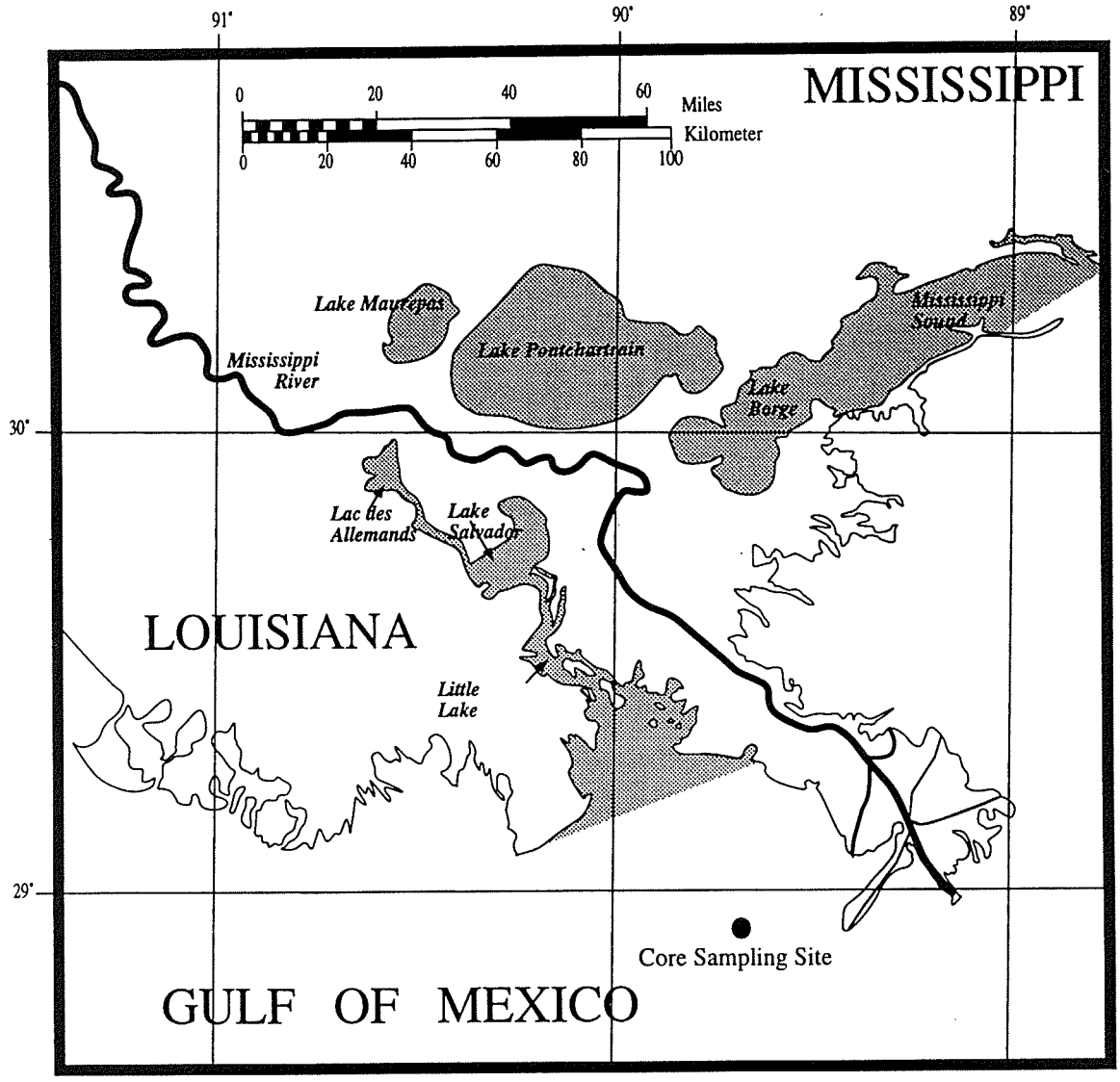
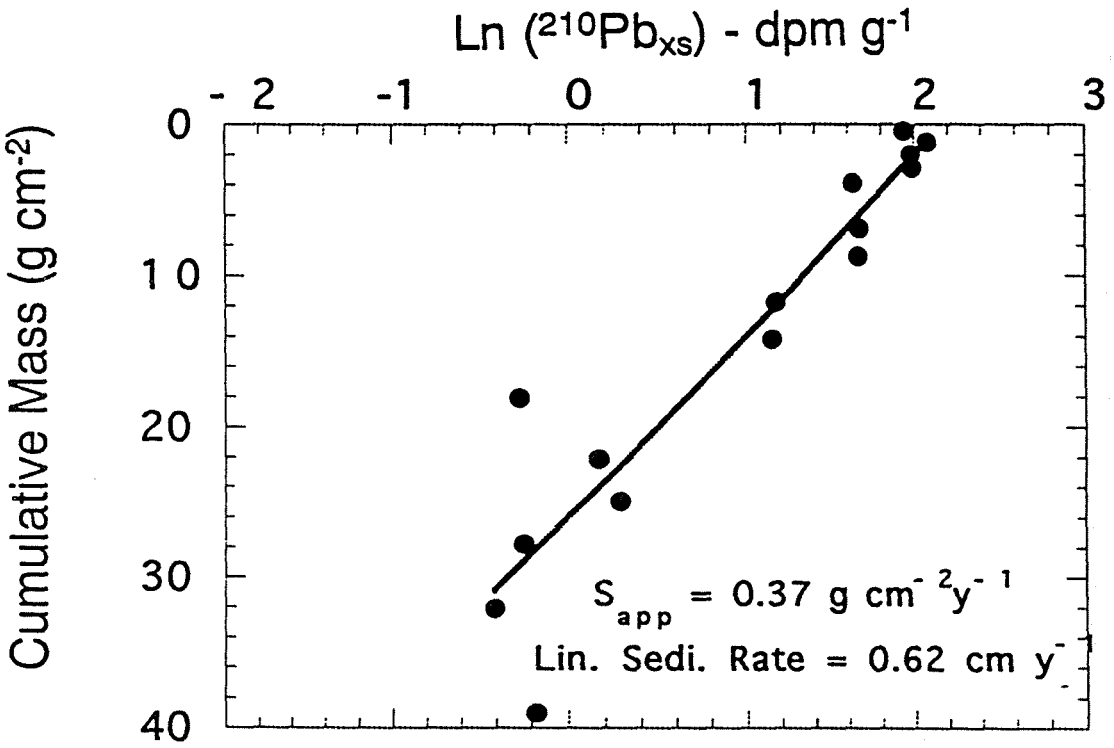


Figure 1. Location of core sampling site in the Mississippi River Delta.

Figure 2: Pb-210 Activity vs. Mass Accumulation for the MRD



The disadvantage of using sediment depth for age estimation is that the effect of sediment compactation in deeper core sections needs to be considered (SCHINK *et al.*, 1975). Otherwise, the associated error of the estimated ages increases with sediment depth. In Figure 2, where mass accumulation is plotted against excess Pb-210, compaction is considered but in the figures to follow, where core depth and the estimated year in which a given sediment layer was deposited are given, compaction has been ignored. This latter procedure seemed to give a better match between the assigned radiometric age and known events, such as phasing in and out of leaded gasoline use. We are still working to refine age assignments for the various core sections.

Percent dry weights in sediment sections were determined as soon as samples were received. The vertical distribution of percent dry weight with depth shows a rather sharp porosity decrease with depth (Figure 3.a). Relatively small variation in percent organic carbon occurred with depth in this clay rich core (Figure 3.b).

POLYCYCLIC AROMATIC HYDROCARBONS

Most PAHs increased in concentrations starting in the early 1940's and maximized in the 1970's. The increasing concentrations observed are likely the result of increasing anthropogenic activities in the drainage basin of the Mississippi River. Sporadic input events are seen as isolated peaks in concentration in one sediment section; whereas, episodic input events are seen where at least two adjacent core sections show increasing or decreasing concentrations reaching a maximum or a minimum concentration. Total PAH concentrations tripled from 1940 to 1960, peaked in the early 1970's and shows no significant decreases thereafter (Figure 4). The fastest rate of increased occurred during the 1950's. The total PAH distribution does not show the transition from coal to petroleum fuel which is characterized by a large PAH concentration peak in the 1940-1950 time period (BATES *et al.*, 1984; ZHANG *et al.*, 1993a).

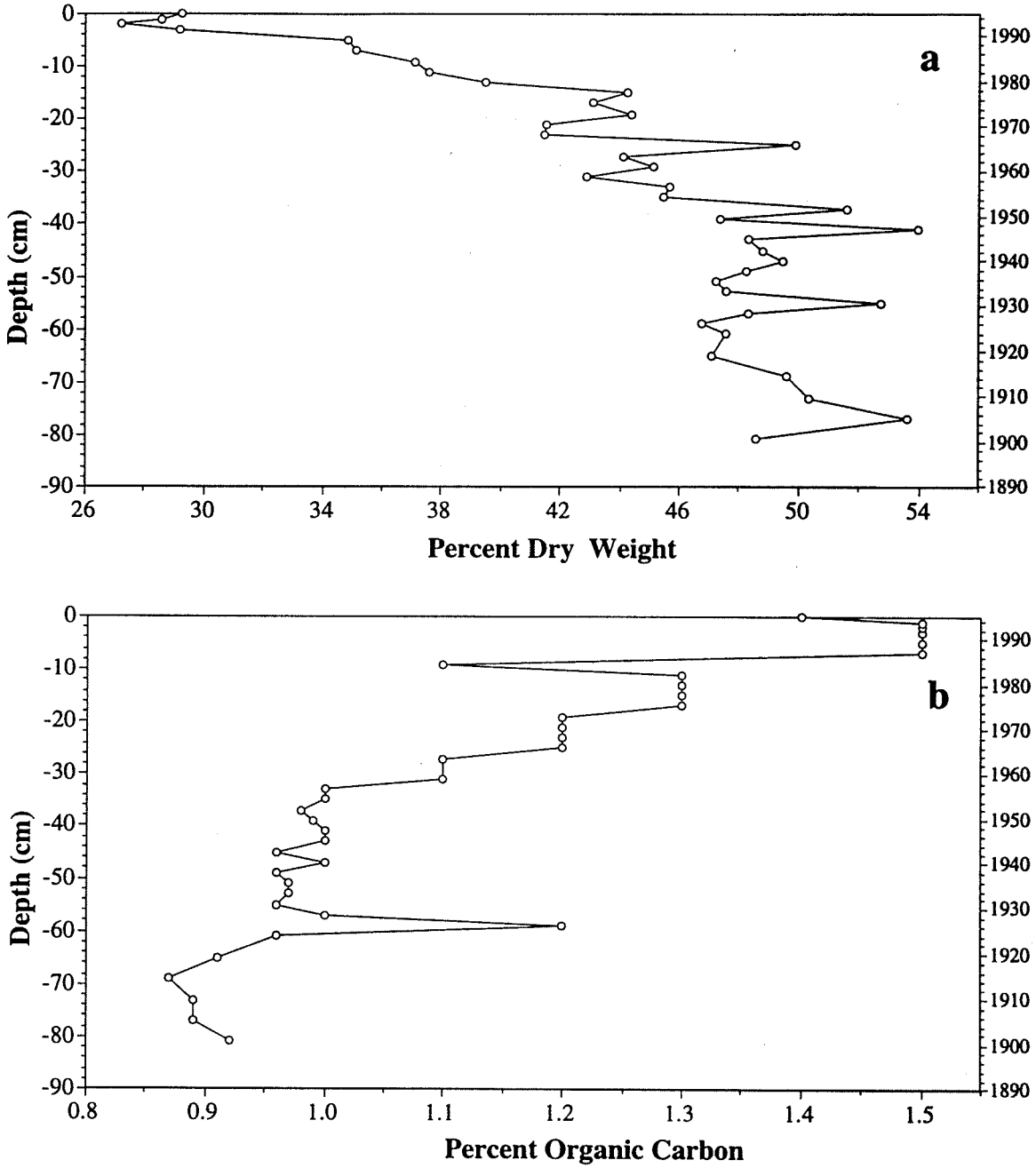


Figure 3. Vertical distributions of a) percent dry weight and b) percent organic carbon at the Mississippi River Delta.

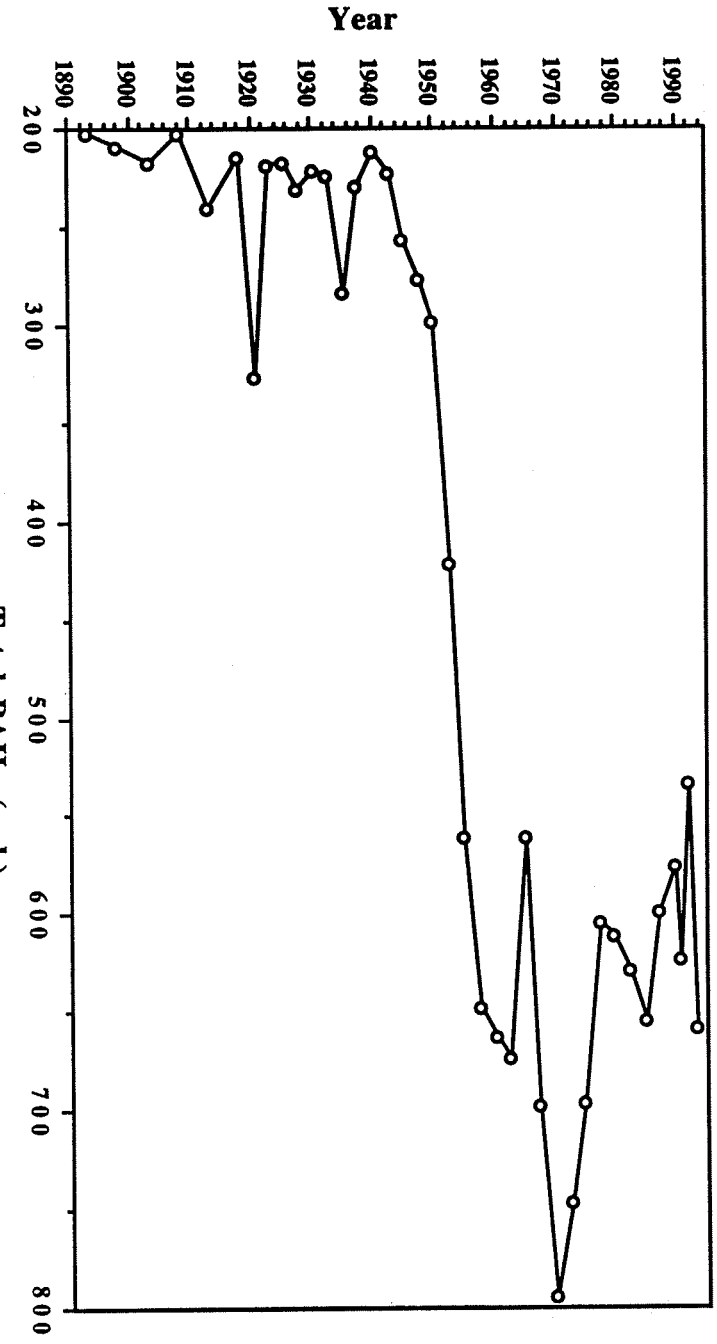


Figure 4. Vertical distribution of total PAHs at the Mississippi River Delta.

The range of total PAHs increased from 200 ppb in 1908 to 795 ppb in 1970. Total PAH concentrations increased dramatically from relatively low concentrations (~200-300 ppb) in the lower core sections to relatively high concentrations (~535-795 ppb) in the upper core sections. After 1940, three episodic events are seen in the total PAH concentration; the first occurred from 1940 to 1965, the second from 1965 to 1978 and the third from 1978 to 1990. Two isolated total PAH concentration peaks occurred in 1920 (325 ppb) and 1935 (285 ppb). The appearance of these sporadic events will be discussed in detail later. Each individual PAH had an unique vertical distribution as a result of varying source compositions, input amounts, partition during transport and spatial changes in the area of deposition. However, most individual PAH constituents had distributions similar to the total PAH distribution. Caution should be used in interpreting PAH sources from the PAH sediment data (LAFLAMME and HITES, 1978). For example, after PAHs are atmospherically deposited on soil and water, the lowest homologues may fractionate into the aqueous phase to an extent inversely proportional to their carbon number, and the PAH distribution remaining in the sediments will be different from that of the input.

Total PAH homologues concentrations (*i.e.*, total naphthalenes) were calculated as the sum of the alkylated and unalkylated homologue concentrations. For example, the sum of the concentrations of pyrene, fluoranthene and alkyl-pyrenes-fluoranthenes are discussed as total pyrenes-fluoranthenes. In order to compare the degree of alkylation among homologue families, the percentage of unalkylated homologues (*i.e.*, percent chrysene) was determined with respect to the sum of the homologues concentrations.

The decreasing concentration order of the sum of five homologue families was total naphthalenes > phenanthrenes-anthracenes > pyrenes-fluoranthenes > chrysenes > fluorenes > dibenzothiophenes. Total naphthalenes and total phenanthrenes-anthracenes had similar concentration distributions with depth in the sediment column, as did fluorenes and dibenzothiophenes, but these families were different from each other. Total chrysenes and pyrenes-fluoranthenes distributions had some similarities to the distributions of the above two groups but also had some differences and were different from each other. The similarity between vertical distributions may be produced by similar sources and transport histories (SPORSTØL

et al., 1983). The order of percent unalkylated homologue was %chrysene > %phenanthrene > %naphthalene ≥ %fluorene ≥ %dibenzothiophene. The sediment core PAH constituent concentrations and percentages indicate that PAHs from petroleum and combustion sources varied with time.

Increases of total naphthalenes are observed approximately five years after the increase for total PAHs. Naphthalenes concentrations tripled between the mid 1940's and mid 1950's and remained approximately constant until the late 1980's when they increased again. The ranges of naphthalene and total naphthalenes concentrations were from 4.0 (in 1893) to 76.0 ppb (in 1991) and from 30.1 (in 1908) to 240 ppb (in 1991), respectively. Naphthalene and total naphthalenes had increasing concentrations from 1950 and 1945, respectively, to 1965 and simultaneously from 1965 to 1982. Naphthalene had an increasing concentrations from 1982 to 1993; while total naphthalenes had increasing concentrations from 1990 to 1993. Only total naphthalenes showed the concentration peak observed in total PAHs in 1935. However, naphthalene concentrations had the 1920 and 1935 peaks observed in total PAHs and in approximately the same concentration ratio (1.15). The events that produced total PAH and naphthalene peaks are probably due to isolated events such as an oil spill or climatic event (*i.e.* storms, flood) that transported fine materials to the core site (BERO and GIBBS, 1990; DOWGIALLO, 1994).

With few exceptions, the relative order of alkylated naphthalenes for the entire core was C1- > C2- ≥ C3- > C4- ≈ naphthalene. This pattern is indicative of naphthalene from moderately weathered petroleum sources (SPORSTØL *et al.*, 1983; WANG *et al.*, 1994). The total naphthalenes concentration ranges fall within the reported concentrations near point sources such as a surficial sediment from a site near a petroleum refinery (SPORSTØL *et al.*, 1983). The concentration order of alkyl-naphthalenes in the sediment core is, however, different probably due to different sources, transport and deposition conditions.

The range of percent naphthalene varied from 8.1 to 31.7% and averaged around 15% with high percentages in 1920, 1945 and 1991 of 29.0, 19.4 and 31.7%, respectively. These percentages may indicate that during these years episodic inputs from either a nearby oil spill, seepage, or particles transporting oil reached the collection site relatively quickly. This would explain the lack of PAH aqueous fractionation or degradation of naphthalene homologues. Although oil spills on the ocean surface are subjected to processes that alter the original oil composition, oil

attached to fine particles are moved to deeper zones and may be indistinguishable from oil seeps (WOLFE *et al.*, 1994). This effect may explain the naphthalene homologue concentration order found that suggest oils sources, and event peak concentrations occurring in 1920 and 1935.

The ranges of fluorene and total fluorenes concentrations were 1.1 (in 1893) to 6.2 ppb (in 1970) and 8.2 (in 1923) to 55.5 ppb (in 1993), respectively. Fluorene concentrations show episodic events from 1943 to 1965 and from 1965 to 1990 with maximum concentrations in 1960 and 1970, respectively. Total fluorenes concentrations show three events from 1948 to 1967, 1967 to 1980 and 1980 to 1990. The first event had a double maxima in 1955 and 1962, the second and third event had maxima in 1970 and 1982, respectively. With few exceptions, the relative order of alkylated fluorenes for the whole core was C3- $\geq$ C2- > C1- > fluorene. The difference between the concentrations before compared to after the 1940's decreased as the number of alkyl groups increased.

The range of percent fluorene varied from 7.6 to 17.1%. Low fluorene percentages occurred in 1898 (7.6%), 1920 (8.9%), 1935 (7.9%) and 1993 (9.2%). Percent fluorene had eight peak values, in 1918 (11.9%), 1923 (18.3%), 1940 (12.3%), 1950 (14.8%), 1960 (14.7%), 1967 (16.9%), 1977 (14.4%) and 1990 (17.1%). These percentages and the fluorenes concentration order suggest periodic inputs of fresh to moderately weathered oil inputs. The low total fluorenes and fluorene concentrations and the relative stable percent fluorene may indicate that this homologue family had stable PAH sources and transport and deposition processes. The distributions obtained show no decline in fluorene inputs in recent times.

The ranges of phenanthrene, anthracene and total phenanthrenes-anthracenes concentrations were 5.1 (in 1893) to 28.1 ppb (in 1972), 1.1 (in 1893) to 6.9 ppb (in 1970) and 30.3 (in 1908) to 127 ppb (in 1962), respectively. These vertical distributions had similar patterns to the unalkylated fluorene and naphthalene concentration distributions but different concentrations.

With some exceptions, the concentration order was C2- $\approx$ C1- $\geq$ phenanthrene > C3- > C4- > anthracene. This indicates a mixture of combustion and petroleum sources. The potential influence of retene, a terrestrial biomarker, in the C4- concentration is not reflected by this order (PETERS and MOLDOWAN, 1993; YUNKER *et al.*, 1993); this may also indicate that coal is not a major sources of PAHs

(VENKATESAN, 1988). The phenanthrene/anthracene ratio had a narrow range with a mean ± one standard deviation of 4.6 ± 0.99 indicative of combustion sources (GSCHWEND and HITES, 1981). No obvious temporal trend was observed. Ratios of 14 and 50 are indicative of crude oil and petroleum fuel, respectively, the ratios found for the core ranged from 3.6 (1913) to 9.5 (1991). These ratios are within the reported range from 2 to 26 in coastal and lacustrine sediments (COLOMBO *et al.*, 1989; ZHANG *et al.*, 1993b). No recent decline in the inputs of phenanthrenes and anthracenes are observed in their vertical distributions.

The vertical concentrations of dibenzothiophene and total dibenzothiophenes increased in the early and mid 1940's, respectively. The ranges of dibenzothiophene and total dibenzothiophenes concentrations were 0.4 (in 1918) to 2.7 ppb (in 1962) and 0.7 (in 1893) to 27.4 ppb (in 1993), respectively. Although total dibenzothiophenes mimicked dibenzothiophene distribution, the distributions do not perfectly matched each other. For example, while the dibenzothiophene concentrations plateaued during the 1970's, total dibenzothiophenes concentrations decreased in the early 1970's. This may indicate variability in the sources of dibenzothiophenes.

The range of dibenzothiophene percentages was from 6.3% (in 1918) to 100% (in 1984); however, with the exception of these two sections, dibenzothiophene percentages are in the range from 8.0% to 13.5%. This suggests that the dibenzothiophenes sources have been moderately uniform and that no major effect of aqueous fractionation occurred. The only indication that aqueous fractionation may have occurred is that low total dibenzothiophenes concentrations always corresponded to high percentages of dibenzothiophene; in the other cases, total dibenzothiophenes and percent dibenzothiophene did not show any relationship. The smallest dibenzothiophene percent range with the least fluctuation occurred from 1940 to 1980 in which the percentages only varied from 10.5% to 13.0%. Percent dibenzothiophene had eight peak values in 1913 (13.4%), 1930 (13.4%), 1938 (11.8%), 1950 (12.6%), 1957 (12.8%), 1967 (13.1%), 1977 (12.4%) and 1987 (110.8%). Peak dibenzothiophenes percents corresponded to peak fluorene percents in 1950, 1967, 1977 and two years behind in 1940, 1960 and 1990. Although they have similar structures (Figure 3), they have different molecular weights (166.2 and 186.2) and polarity due to the presence of sulfur in dibenzothiophene. This characteristics would result in different solubilization of dibenzothiophene and

fluorene (1.47 and 1.69 mg/kg) into the aqueous phase unless distance from input to deposition is rapid.

Total dibenzothiophenes distributions resembled total phenanthrenes-anthracenes distributions and were different from the naphthalene, fluorene and chrysene distributions. However, from 1950 to 1980, dibenzothiophene mimicked total naphthalenes and naphthalene distributions. The dibenzothiophene homologues had an order of concentration for the entire core of C3- ≈ C2- > C1- > dibenzothiophene. Although dibenzothiophene sources may have varied with time, this order of alkyl homologue concentration and its relative concentration with respect to the other PAH homologue families suggest oil sources that were from fresh to moderately weathered (WANG *et al.*, 1994). No decreasing concentrations were observed in sediments deposited in the 1990's.

The ranges of chrysene and total chrysenes concentrations were 4.6 (in 1893) to 22.8 ppb (in 1970) and 20.0 (in 1940) to 85.9 ppb (in 1985), respectively. Both distributions show isolated input events in 1920 and 1935 with ratios of 1.09 and 1.89 for chrysene and total chrysene, respectively. The high ratio for total chrysenes is due to absence of alkylated chrysenes in 1935. The concentration order that occurred in 1920 and 1935 was the same as the one in 1955-1960 of C1- > C2- > chrysene > C4- > C3-. This order may reflect similar source inputs, transport and deposition processes. Chrysene and total chrysene had large increases in concentration in the early 1950's and mid 1940's, respectively. Two input events increased the total chrysenes, the first one occurred from 1950 to 1977 and the second from 1977 to 1991. The 1990's chrysenes concentration show no decline in their input.

Before 1945 the concentration order of the chrysenes homologues was chrysene ≈ C1- > C2- > C4- > C3- and after 1945 was C2- ≈ C1- > chrysene > C4- > C3-. This alkylation order indicates that chrysene sources changed after 1945; it may result from the switch from coal to petroleum as combustion fuels (BATES *et al.*, 1984; LAFLAMME and HITES, 1978). The consistent orders of homologue concentration indicate that the sources of chrysene were approximately constant for these time periods. Isolated events such as the one in 1920 not only alter total chrysene concentrations but the relative chrysene homologue concentrations.

The range of chrysene percentages varied from 41.0% (in 1940) to 20.3% (in 1972). The most outstanding feature is the low percents that occurred from 1943 to

1985 and the steep increases thereafter. This period corresponds with the rapid increase in total chrysenes. Percent chrysenes had a drastic decrease in the mid 1940's from 39.0% to 24.8% and the same range of fluctuation from the early 1920's to the early 1940's (34-41%) and from the mid 1940's to the early 1980's (20-27%).

The distributions of acenaphthylene, pyrene and benzo[ghi]perylene had different patterns than the rest of the PAH constituents (Figure 5a). Concentrations of pyrene and benzo[ghi]perylene increased in the early 1940's and acenaphthylene in the mid 1950's, peaked simultaneously in the early 1970's and decreased thereafter. After 1970, only acenaphthylene concentrations decreased near to its pre-1940's concentrations. The concentration ranges for acenaphthylene, pyrene and benzo[ghi]perylene were 0.5 (in 1893) to 17.5 ppb (in 1970), from 8.6 (in 1930) to 55.4 ppb (in 1970) and from 6.3 (in 1940) to 51.7 ppb (in 1970), respectively. These three PAH constituents have molecular structures are more condensed than the other PAHs with equivalent molecular weight (Figure 3). Their distributions are similar to total PCB, which will be discussed later. These PAHs can be products from kerosene combustion that also includes PAHs such as cyclopent[bc]acenaphthylene, benz[e]acenaphthylene, cyclopenta[cd]pyrene and perylene (LEE *et al.*, 1977). Acenaphthylene, pyrene and benzo[ghi]perylene have similar trends and simultaneous maxima as lead concentrations (TREFRY *et al.*, 1985 and this report); their simultaneous maxima appear be the result of large consumptions of leaded gasoline.

Fluoranthene and total pyrenes-fluoranthenes had concentration ranges from 7.4 (in 1893) to 34.9 ppb (in 1970) and 29.5 (in 1930, 1940 and 1943) to 122.3 ppb (in 1970), respectively. Fluoranthene and total pyrenes-fluoranthenes had concentrations peaks in 1920 and 1935 with ratios of 1.52 and 1.35, respectively. Fluoranthene had three increasing-decreasing events from 1943 to 1965, from 1965 to 1982 and from 1982 to 1992. Total pyrenes-fluoranthenes had a vertical distribution similar to fluoranthene with increasing-decreasing events from 1943 to 1975 and a well define event from 1975 to 1982. The first event of fluoranthene and total pyrenes-fluoranthenes is recorded by pyrene; both fluoranthene and total pyrenes-fluoranthenes distributions had maximum concentrations in 1970 and a similar pattern to pyrene from 1965 to 1982. Fluoranthene and total pyrenes-fluoranthenes concentrations had no clear decreasing trend in the 1990's.

Figure 5.b shows the ratio fluoranthene/pyrene which ranged from 0.61 (in 1967) to 1.25 (in 1991). The inversion of the ratio before and after 1950 may indicate the transition from coal to petroleum fuel. The ratio fluoranthene/pyrene of crude, fuel oil, wood and coal combustion ratios are 0.3, 0.9, 1.0 and 1.4, respectively (GSCHWEND and HITES, 1981; ZHANG *et al.*, 1993b). Diesel and gasoline combustion emissions have ratios of 1.5 and 1.4, respectively (ZHANG *et al.*, 1993b). The ratios for 1920 and 1935 were 0.78 and 1.3, respectively; which suggests oil and coal combustion sources for 1920 and 1935 inputs, respectively. The 1920 ratio corresponded to ratios from either the 1960's and mid-1980's. Interpreting the ratios alone without considering PAH constituent concentrations may lead to erroneous conclusions. The increasing values of PAH constituent concentrations and fluoranthene/pyrene ratio from late last century to the 1930's may reflect the growing anthropogenic industrial and domestic activities based to the use of coal energy (CHRISTENSEN and ZHANG, 1993). The dramatic increase of PAH constituent concentrations after the 1940's and the steady decline in fluoranthene/pyrene ratios may indicate the use of petroleum as a source of energy. This may be a better indicator than maximum concentration of total PAHs in the time interval 1940-1950 (BATES *et al.*, 1984).

The increase in fluoranthene/pyrene ratio from the 1970's to the 1990's may have been produced by light spill fuels and exhaust emission from increasing vessel traffic in the vicinity of the sampling site. This is supported by the concentration spike of low molecular weight PAHs such as naphthalenes, fluorene and phenanthrene observed in 1991. Thus, the ratios obtained indicate that fluoranthene and pyrene had crude oil sources. Ratios in Green Bay and Lake Michigan sediments were relatively constant varying from 1.06 ± 0.28 to 1.48 ± 0.20 (ZHANG *et al.*, 1993b); by comparing with the average ratio obtained at Mississippi River Delta of 0.90 ± 0.18 standard deviation, it may be inferred that petroleum sources dominated the PAH inputs.

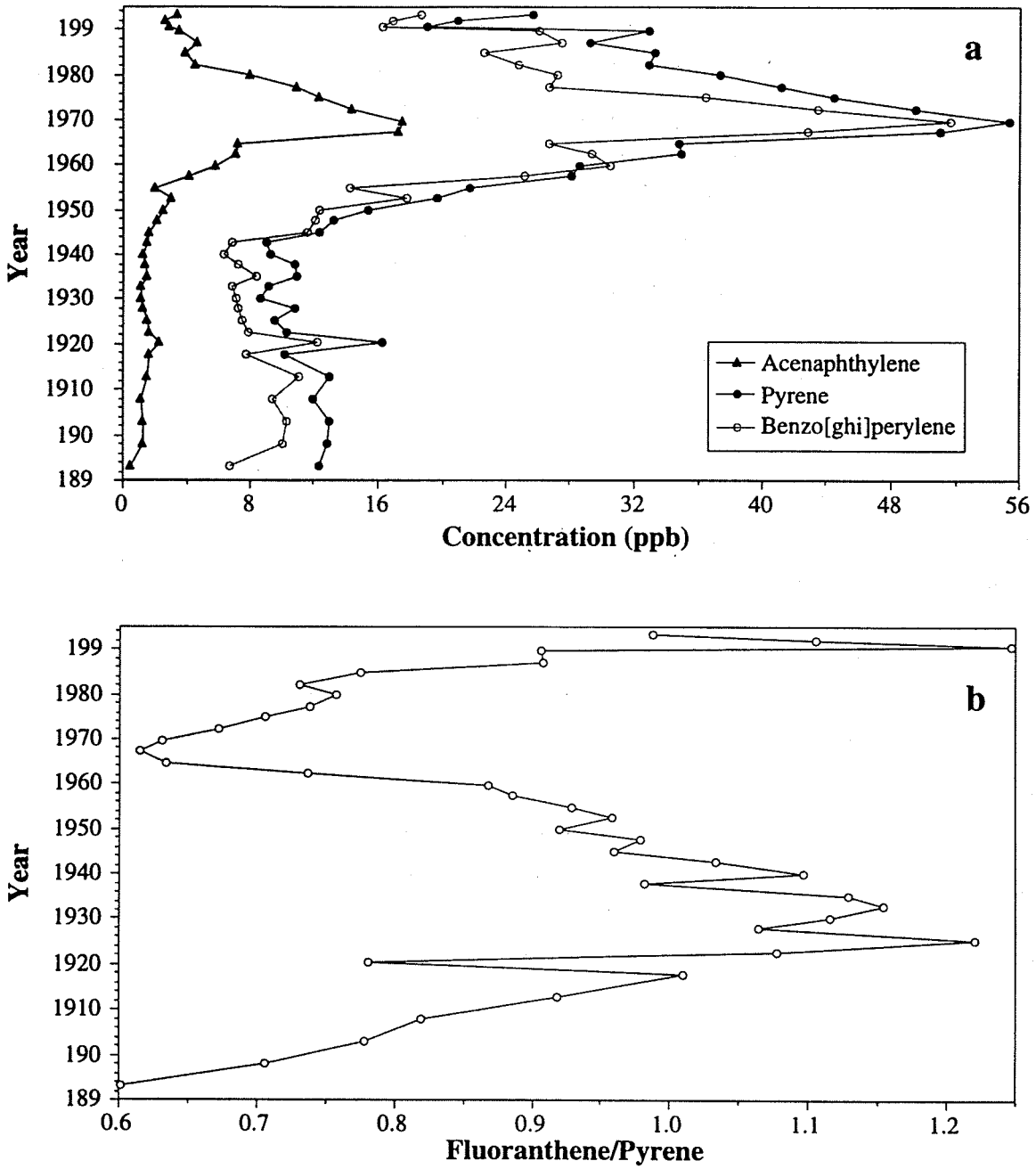


Figure 5. Vertical distributions of a) acenaphthylene, pyrene and benzo[ghi]perylene and b) fluoranthene/pyrene ratio at the Mississippi River Delta.

Similar vertical distributions were found for benzo[b]-, benzo[k]-fluoranthene, benzo[e]-, benzo[a]pyrene, indeno[1,2,3cd]pyrene and dibenz[ah]anthracene. The concentration range and vertical distribution of the isomers were similar; indeno[1,2,3cd]pyrene had approximately four times higher concentrations than dibenz[ah]anthracene but they both had similar distributions. Benzo[b]- and benzo[k]-fluoranthene had equivalent concentration ranges varying from 7.1 (in 1983, 1938 and 1940) to 27.7 ppb (in 1982). The concentration ranges of benzo[e]- and benzo[a]pyrene varied from 6.2 (in 1893 and 1940) to 26.9 ppb (in 1970) and from 6.0 (in 1983) to 32.7 ppb (in 1970), respectively. The concentration range of indeno[1,2,3cd]pyrene and dibenz[ah]anthracene varied from 5.1 (in 1893) to 29.8 ppb (in 1970) and from 1.0 (in 1935) to 7.6 ppb (in 1970), respectively. With the exception of dibenz[ah]anthracene, all of these PAHs had concentration peaks in 1920 and 1935 and ratios of 1.62, 1.62, 1.39, 1.49 and 1.74 for benzo[b]-, benzo[k]-fluoranthene, benzo[e]-, benzo[a]pyrene, and indeno[1,2,3cd]pyrene, respectively. These six PAH constituents suggest episodic events that occurred simultaneously and of approximately the same magnitude. The first event occurred from the early 1940's to the mid 1960's, the second event from the mid 1960's to the late 1970's and the third event from the late 1970's to the early 1990's. The first and second events had maxima in 1960 and 1970, respectively. The similarity in the vertical distributions of these PAH constituents indicate that they had common sources.

The benzo[a]anthracene concentrations were approximately twice as high as dibenz[ah]anthracene ranging from 5.2 (in 1893) to 17.4 ppb (in 1977). Benzo[a]anthracene had concentration peaks in 1920 and 1935 with a ratio of 1.54. Perylene concentrations ranged from 8.2 (in 1918) to 43.5 ppb (in 1985). Perylene decreased from late last century to approximately a constant 9 ppb from the early 1920's to the early 1930's (Figure 5a). Its concentrations steadily increased from 9.1 (in 1940) to 29.6 ppb (in 1970), a drastically increased from 1980 to 1985, followed by a drastic decrease to 17.8 ppb (in 1992). This last event occurred as total chrysenes. Since perylene inputs can be natural (microorganisms) and combustion (LAFLAMME and HITES, 1978), it is difficult to explain its distribution. However, it is likely that its increase after the 1940's and the event of the 1980's are associated with increased inputs from combustion. The range of biphenyl and acenaphthene concentrations varied from 1.2 (in 1903 and 1925) to 13.9 ppb (in 1991) and from 0.4 (in 1898) to 2.6

ppb (in 1991), respectively. The range of acenaphthylene concentrations were approximately seven times higher than the acenaphthene range. The low correlation between acenaphthene and acenaphthylene concentrations ($r = 0.529$, $a = 0.001$ and $n = 38$) indicates that they have different sources. Acenaphthene had a correlation coefficient of 0.863 and 0.742 ($a = 0.001$) with fluorene and naphthalene, respectively, in a similar sources and transport processes. Biphenyl and acenaphthene have in common the same 1991 spike that is also observed for naphthalene and fluorene.

The changes in vertical concentrations and the relative proportions of and among the PAH homologue families reflect both changes in and constancy of inputs. Most of the homologue members of each PAH family kept a defined concentration order for almost the entire core. The anthropogenic impact on the individual PAH constituent concentrations is best observed after the mid 1940's. Similar episodic input events among PAH constituents during periods of time may reflect their common origin.

Three concentration maxima associated with episodic input events were observed in most PAH constituents. With some exceptions, the events lasted from the early 1940's to the mid 1960's, from the mid 1960's to the early 1980's and from then to the early 1990's. In most cases, the highest concentrations of individual PAH constituents were observed in 1970. Previous studies in the area where the core was collected and the present core showed maximum lead concentrations in 1970, associated with a maximum consumption of leaded gasoline (TREFRY *et al.*, 1985; PRESLEY *et al.*, 1980). The PAH variations observed in the Mississippi Delta core reflected anthropogenic activity and regulations on industrial and vehicle exhaust emissions.

ORGANOCHLORINE PESTICIDES

The concentration of three families of organochlorine pesticides (HCHs, chlordanes and DDTs) are discussed here as the sum of the concentrations from their major components and/or metabolites. Total hexachlorocyclohexanes (HCHs) were calculated by adding the individual concentrations of four (a-, b-, g- and d-) of the eight possible HCH isomers (MELNIKOV *et al.*, 1971). Total chlordanes were estimated by adding the concentrations of heptachlor, heptachlor epoxide, oxychlordane, trans- and cis-chlordane and trans- and cis-nonachlor. Total DDTs is reported as the sum of 2,4'- and 4,4'-DDT isomers and respective metabolites DDE and DDD, only two of the several possible metabolites (WEDEMEYER, 1967; MATSUMURA, 1985). Low

core during this period. Chlordanes have been detected in air and tissue samples from places as remote as the Arctic (MUIR *et al.*, 1988; NORSTROM *et al.*, 1988; FELLIN *et al.*, 1996); indicating that they are present in the environment, travel long distances and are bioavailable. The distributions of these pesticides are in good agreement with the years of production. Trans-chlordane and heptachlor had the highest and lowest concentrations of the chlordanes, respectively. The decreasing concentration order was trans-chlordane > cis-nonachlor > heptachlor epoxide > oxychlordane > cis-chlordane > trans-nonachlor > heptachlor. The major constituents of technical chlordanes are trans- and cis-chlordane.

DDTs. The highest concentrations of the organochlorine pesticides measured were the DDTs. Total DDTs increased drastically in the late 1940's (Figure 6.b) which followed the increasing production and use of DDT which reached a maximum in the late 1950's (BRIGGS, 1992). No consistent decline in DDT concentrations in sediment sections was observed in sediments deposited after the 1972 U.S. DDT ban. The range of total DDT concentration was from ND to 1.64 ppb (in 1993). The concentration ranges of 2,4'- and 4,4'-DDT were from ND to maxima of 0.12 ppb (in 1993) and 0.34 ppb (in 1993), respectively. The concentration ranges of 2,4'- and 4,4'-DDE were from ND to maxima of 0.09 ppb (in 1993) and 0.69 ppb (in 1993), respectively. 4,4'DDE concentrations increased rapidly and steadily from the mid 1940's to the 1990's. The concentration ranges of 2,4'- and 4,4'-DDD were from ND to maxima of 0.09 ppb (in 1993) and 0.44 ppb (in 1982 and 1965), respectively. The vertical distributions and concentration ranges of the 4,4'-DDT, DDE and DDD were similar, but only 2,4'-DDT and DDD had similar concentrations ranges and vertical distributions. The concentrations of the 2,4'-isomers were approximately ten times lower than the 4,4'-isomers. With the exception of 2,4'-and 4,4-DDE, 2,4'- and 4,4-isomers had similar vertical distributions. The lower concentrations for 2,4'- than for 4,4'-isomers may be the result their lower concentration proportions in commercial DDT technical compositions, higher water solubility and higher rates of microbial degradation.

Hexachlorobenzene (HCB). The HCB concentrations were low, ranging from ND to 0.86 ppb. The HCB concentrations in surface sediments show no decline in concentrations. There is no similarity between HCB and total HCHs and a-HCH. These contaminants have been reported to be transported and partition in similar

ways (FELLIN *et al.*, 1996); thus the difference obtained may be related to changes in inputs.

Aldrin Related Compounds and Mirex. Organochlorine pesticides such as mirex and aldrin were not detected in these sediments possibly due to low anthropogenic inputs, dilution or losses during transport (high rates of decomposition, dissolution or volatilization). Contrary to results for the Great Lakes (COMBA *et al.*, 1993), Mississippi Delta sediments did not contain mirex. Aldrin was not detected which is consistent with its low environmental stability. Dieldrin had higher concentrations (ND-0.27 ppb) in sediments deposited after the mid 1960's. Endrin was detected at very low concentrations ranging from ND to 0.06 ppb (in 1991). The endrin contamination that occurred in the Mississippi River in the late 1950's from a plant in Memphis, Tennessee was not detected (PRESLEY *et al.*, 1980; BLUS, 1995). The low or non-detectable concentrations of contaminants is indicative of the high dilution that contaminants introduced into the Mississippi River may experience.

POLYCHLORINATED BIPHENYLS

The vertical distribution of total PCBs concentrations reflects the dramatic increase in their past production and use followed by a decline after regulations were imposed. Total PCBs increased steadily above background concentration in the mid-1940's reached a maximum in the early 1970's and then decreased steadily (Figure 7). The concentration range of total PCBs was from 0.25 ppb (in 1894) to 20.9 ppb (in 1970) and mimicked pyrene distribution. From the mid 1950's to the mid 1980's, the vertical distributions of the concentration sum of PCB congeners with the same number of chlorine atoms were similar between the pairs 5-Cl and 6-Cl, 3-Cl and 7-Cl, 2-Cl and 8-Cl and 9-Cl and 10-Cl. The 4-Cl PCB group had a distribution pattern different from the other groups. The concentration orders were 4-Cl > 5-Cl ≈ 6-Cl > 3-Cl ≈ 7-Cl > 2-Cl ≈ 8-Cl > 9-Cl ≈ 10-Cl. Each group was composed of few congeners that accounted for at least 75% of each group total concentration. PCB group 2-Cl was composed primarily of PCBs 15 and co-eluted PCBs 8/5; group 3-Cl of 18, 28, 31 and co-eluted PCBs 16/32 and 33/20; group 4-Cl of 49, 52, 66, 70, 74 and co-eluted PCBs 47/48/75 and 60/56; group 5-Cl of 97, 99, 105, 110, 118 and co-eluted PCBs 101/90; group 6-Cl of 128, 146 and co-eluted PCBs 138/160 and 153/132; group 7-Cl of 177, 180 and co-eluted PCBs 187/182; group 8-Cl of 194, 201 and co-eluted PCBs 196/203 and finally group 9-Cl of 206.

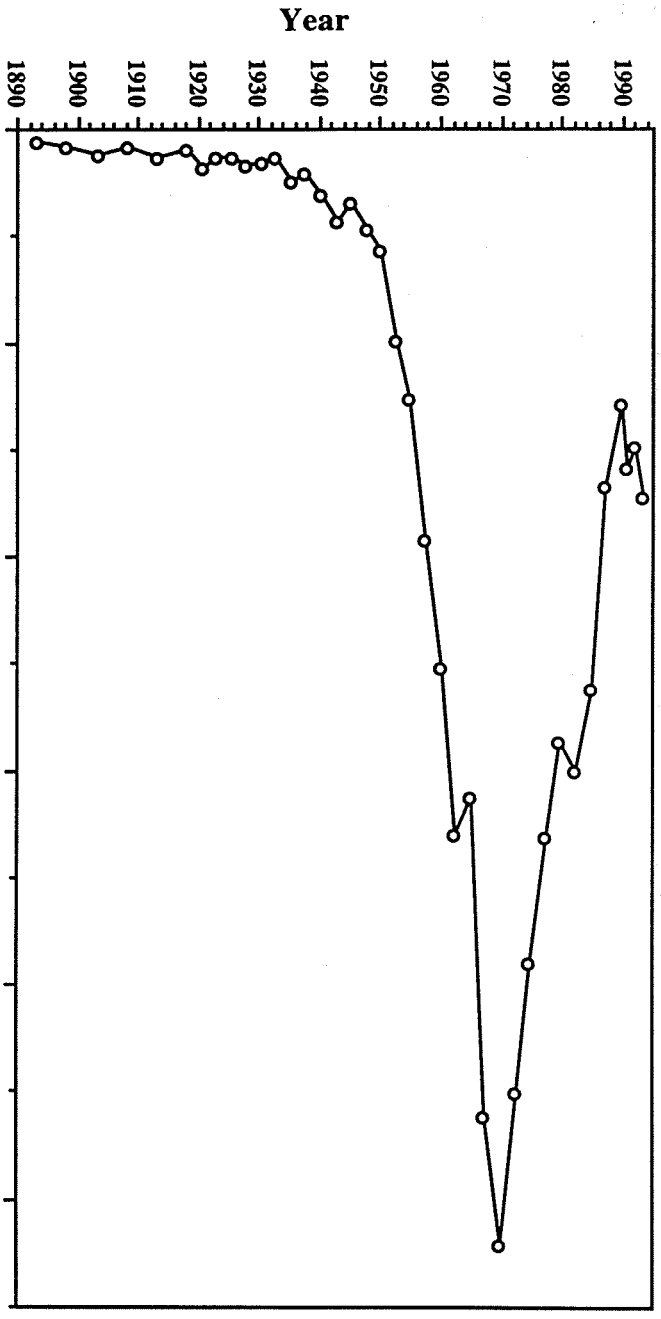


Figure 7. Vertical distribution of total PCBs at the Mississippi River Delta.

The vertical distributions of the percentages of PCB congeners with the same number of chlorine atoms with respect to total PCBs concentration suggest no dramatic variations in PCB input sources. The concentration percents of Cl-9 and Cl-10 PCBs increased from zero percent in the 1920's, reaching a maximum of 13% and 32%, respectively, in the mid 1930's and declining to a constant percentage (~1.5%) in the mid 1950's. PCBs with 2, 3, 7 and 8 chlorine atoms keep approximately constant percentages of 2.5%, 8%, 2.5% and 10%, respectively. The concentration percentages of Cl-5 and Cl-6 PCBs were more similar to each other than any other pair after the 1940's where they had minimum percentages (~10%) that increased steadily to approximately 22% in surface core sections. PCB with four chlorine atoms had consitently the highest percentages (~25%) that the other PCBs.

Individual congeners had different vertical distributions which were not related to their molecular weight, concentration ranges or percentages in commercial arochlors. Approximately 60% of the individual congener concentrations showed no maximum in 1970, and only around 20% had similar distributions to the total PCBs distribution. Vertical distributions and concentration ratios of individual PCB congeners do not suggest commercial PCB aroclor compositions (WHO, 1993). In most instances, vertical distributions of individual congener with a low maximum concentration ($\leq$ 0.10 ppb) showed erratic pattern varying with isolated increases and undefined distributions. Erratic distribution patterns occurred primarily in high (8 and 9 chlorines) molecular weight PCBs. In sediment sections deposited before the 1940's, few congeners (< 6%) had concentrations > 0.06 ppb. With several exceptions, individual PCB congeners showed decreasing concentrations in surface sediments; however, their surficial concentrations were not close to their before 1940's concentrations.

SUMMARY OF MISSISSIPPI ORGANIC DATA

The concentrations of the major classes of organic contaminants in the Mississippi Delta core are given in Table 1. All data is available in a data report submitted with this report. Contamination recorded in the Mississippi Delta sediments reflects the sum of inputs and transport and deposition processes. PAHs increased after the early 1940's and in most cases had their higher increase rate during the 1950's. Total PAHs had a dramatic increase in which concentrations tripled in approximately 20 years; their sources appeared to be varying proportions of petroleum and combustion sources.

The low concentrations of organochlorine pesticides make interpretations difficult. consequently, no conclusive interpretation of the vertical distributions of members of pesticides families can be given. All the pesticides had their higher concentration in surface core sections. Total DDTs distribution was similar to total PAHs, the DDTs vertical profile did not indicate any effect produced by the regulation and subsequent ban on the production and use of DDT.

The absence of pesticides such as mirex and aldrin may be the result of low inputs, dilution and/or high degradation rates. The distribution of total PCBs is in good agreement with similar previous studies. Total PCBs concentrations increased in the mid 1940's maximize in 1970, then decreased until the early 1990's to a concentration maximum of approximately ten times baseline concentrations.

Three general patterns were observed in the contaminant concentrations with respect to the time of their regulations and/or bans. The first is an increase in concentrations reaching a maximum in the early 1970's to decrease thereafter; the second is an increase with wide fluctuations and the third is similar to the second but having a new dramatic increase in the early 1990's. The presence of contaminants which have been baned in Mississippi Delta sediments indicate their continued presence in the environment and their potential bioavailability.

Table 1. Organic Contaminants in Mississippi River Delta sediments (dry weight basis).

Section (cm)	Year	Total PAHs (ng/g)	Total Chlordanes (ng/g)	Total DDT (ng/g)	Total PCBs (ng/g)
0 - 1	1993.2	658.5	0.28	1.64	6.88
1 - 2	1992.0	535.0	0.21	1.06	5.96
2 - 3	1990.7	623.3	0.19	1.03	6.36
3 - 4	1989.5	576.9	0.05	0.66	5.15
5 - 6	1987.0	599.8	0.07	0.67	6.68
7 - 8	1984.6	654.6	0.09	1.28	10.46
9-10	1982.1	629.2	0.09	1.27	12.01
11-12	1979.6	611.6	0.06	0.72	11.48
13-14	1977.2	604.9	0.06	0.72	13.25
15-16	1974.7	697.6	0.08	0.70	15.57
17-18	1972.2	747.6	0.07	0.72	18.02
19-20	1969.7	794.8	0.06	0.79	20.85
21-22	1967.3	698.7	0.06	0.62	18.47
23-24	1964.8	562.0	0.04	0.80	12.50
25-26	1962.3	673.7	0.04	0.68	13.20
27-28	1959.9	662.7	0.04	0.59	10.08
29-30	1957.4	648.6	0.02	0.55	7.71
31-32	1954.9	561.9	0.04	0.66	5.08
33-34	1952.5	422.5	0.02	0.32	3.97
35-36	1950.0	299.0	0.01	0.14	2.27
37-38	1947.5	277.6	0.01	0.12	1.87
39-40	1945.1	256.4	0.01	0.07	1.37
41-42	1942.6	223.7	0.03	0.11	1.74
43-44	1940.1	211.7	0.01	0.07	1.25
45-46	1937.6	230.3	0.01	0.05	0.85
47-48	1935.2	283.3	0.01	0.06	1.01
49-50	1932.7	223.8	0.01	0.05	0.54
51-52	1930.2	221.7	0.02	0.06	0.63
53-54	1927.8	231.1	0.02	0.07	0.71
55-56	1925.3	218.0	0.03	0.04	0.57
57-58	1922.8	218.5	0.03	0.06	0.55
59-60	1920.4	327.1	0.01	0.08	0.76
61-62	1917.9	215.5	0.02	0.04	0.42
65-66	1913.0	240.6	0.01	0.03	0.57
69-70	1908.0	202.3	0.01	0.02	0.37
73-74	1903.1	216.9	0.01	0.03	0.49
77-78	1898.1	209.8	0.01	0.02	0.35
81-82	1893.2	203.1	0.02	0.08	0.25

TRACE METALS

As was pointed out above, previous work on cores collected within a few miles of the location of our Mississippi River Delta core had shown temporal changes in trace metal concentrations which had been atributed to changes in human activities over the past 100 years (e.g., Presley, et al., 1980 and Trefry, et. al., 1985). It was no surprize, then, when the core collected for this work showed similar changes (Table 2 and Figures following). Our core was collected about 8 km north of the site of one of Trefry's 1985 cores, in a similar water depth (Figure 1). Sediment accumulation rate was similar at the two locations so the cores can be directly compared. Such a comparison was of particular interest for Pb because Trefry had noted an increase in Pb concentration between 1850 and 1970 then a decrease between 1970 and 1982, the time his core was collected.

Trefry attributed most of the increase in Pb concentration in Mississippi Delta sediments to increased use of leaded gasoline between 1920 and 1970 and the decrease to a decrease in its use after 1970. If Trefry's hypothesis is correct, our core should show a continued decrease in Pb concentration between 1982 and the time we collected it in 1993.

Data from our Mississippi River Delta core are, in fact, consistent with Trefry's suggestion that Pb distributions in the sediment at this location are influenced by inputs of lead from gasoline. Our data are similar to, but not identical with, Trefry's. Based on our radiometric dating, and ignoring corrections for porosity changes, the sediment at the bottom of our core was deposited about 1895. The Pb concentration in these 1895 sediment was about 25 ppm, a value close to that reported by Trefry for the 1900 time frame. Our Pb value remains approximately constant through 18 core sections, until about 34 cm depth in the sediment column or sediment deposited about 1950 (Figure 8). At that point the Pb concentration begans to increase and does so for the next 20 years or so. It then remains fairly constant at about 35 ppm for about 10 years before beginning a gradual decrease to a value of 27.4 ppm in the 1993 sample. A small part of the Pb decrease in our core in recent times may be due to a small decrease in the Fe concentration, from 4.4 % to 4.15 % (a 6 % relative decrease) and to an apparent somewhat larger but less certain Al decrease. In any case, the Al and Fe decreases can not explain the 23 % decrease in Pb concentration.

Table 2. Metal concentrations (on dry weight basis) and % water in Mississippi River Delta sediment.

Depth	Percent	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Sn	Tl	Zn	Ba
cm	Water	PPM	(%)	PPM	PPM	PPM	PPM	(%)	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
0-1	69.62	0.16	6.94	12.32	0.175	71.62	21.31	4.15	0.139	1044	45.03	27.41	1.38	0.28	1.94	0.51	144	
1-2	69.08	0.16	7.19	12.36	0.179	73.45	24.16	4.13	0.119	1084	46.54	28.58	0.88	0.47	1.91	0.53	144	871
2-3	68.86	0.16	7.29	11.97	0.187	73.59	23.86	4.19	0.070	1091	36.81	27.93	0.97	0.39	2.55	0.46	144	957
3-4	68.32	0.20	7.27	11.48	0.188	74.14	26.54	4.25	0.073	1078	46.20	29.47	1.41	0.39	2.49	0.50	147	950
4-5	65.94	0.19	7.15	11.80	0.198	74.46	23.70	4.18	0.084	1087	35.97	28.17	1.50	0.46	2.49	0.47	145	939
5-6	63.07	0.19	7.41	12.72	0.232	75.89	27.78	4.27	0.085	1025	36.37	28.45	1.16	0.42	2.68	0.47	144	1136
6-7	61.93	0.21	7.58	11.96	0.226	76.57	25.48	4.18	0.101	993	36.45	29.00	1.35	0.54	2.66	0.48	146	1246
7-8	60.79	0.22	7.69	12.30	0.231	78.83	23.36	4.31	0.093	1073	36.20	29.33	1.25	0.45	2.86	0.50	151	
8-9	59.90	0.18	7.46	13.31	0.231	79.02	26.46	4.26	0.078	1033	36.51	30.88	1.23	0.53	2.90	0.49	148	
9-10	59.93	0.21	8.04	13.96	0.282	82.03	24.38	4.41	0.099	1078	36.87	33.02	1.22	0.45	3.13	0.48	151	894
10-11	60.16	0.21	8.11	13.76	0.253	81.33	26.28	4.43	0.086	1055	38.75	32.08	1.23	0.60	3.15	0.49	149	
11-12	61.76	0.21	8.04	13.95	0.270	80.91	24.99	4.41	0.071	1078	37.44	33.33	1.20	0.44	2.99	0.49	151	744
12-13	59.42	0.21	8.03	13.49	0.297	87.57	25.87	4.38	0.074	1082	46.00	36.99	1.14	0.51	3.31	0.51	149	
13-14	59.75	0.24	7.97	14.19	0.329	87.41	26.18	4.41	0.089	1128	43.63	34.63	1.06	0.53	3.24	0.48	152	712
14-15	63.40	0.20	7.59	12.61	0.316	81.95	23.56	4.24	0.107	1093	40.23	34.00	0.91	0.49	3.09	0.44	146	
15-16	59.42	0.21	7.85	13.79	0.336	88.26	24.48	4.39	0.089	1159	42.26	34.57	0.97	0.55	3.11	0.45	151	
16-17	61.18	0.22	7.57	13.49	0.334	85.08	24.09	4.26	0.121	1125	42.14	34.64	0.90	0.65	3.18	0.47	149	
17-18	58.43	0.21	7.88	13.31	0.341	88.10	23.28	4.29	0.114	1210	40.43	33.42	0.95	0.77	3.16	0.45	146	763
18-19	59.22	0.22	8.03	12.46	0.350	88.25	23.00	4.41	0.112	1185	38.55	35.94	1.01	0.63	3.24	0.49	154	
19-20	57.45	0.24	7.86	13.34	0.361	87.98	22.51	4.41	0.136	1167	42.88	34.79	1.02	0.79	3.21	0.50	150	751
22-23	56.62	0.20	7.74	12.43	0.274	87.28	22.04	4.24	0.125	1294	40.50	33.16	0.95	0.79	2.99	0.44	141	685
25-26	54.97	0.18	8.06	11.23	0.226	80.60	22.54	4.32	0.100	1486	34.28	30.94	0.94	0.78	2.94	0.48	140	592
28-29	52.11	0.17	8.08	10.97	0.195	80.39	22.47	4.19	0.100	1138	34.50	30.09	0.99	0.79	3.04	0.47	138	593
31-32	52.85	0.14	7.76	11.74	0.148	78.76	23.74	4.03	0.089	1087	34.59	29.13	0.99	0.69	2.92	0.62	136	494
34-35	51.72	0.14	7.89	11.97	0.137	72.71	22.65	3.95	0.096	836	42.73	24.79	0.93	0.76	2.55	0.60	129	
37-38	53.28	0.15	7.71	12.52	0.157	71.17	23.15	4.02	0.065	876	33.69	25.46	1.02	0.61	2.46	0.59	128	469
40-41	49.78	0.14	8.04	12.48	0.153	70.81	21.67	4.26	0.053	1148	41.46	25.73	0.98	0.43	2.54	0.43	129	
43-44	48.86	0.14	8.03	11.20	0.146	71.99	22.04	4.26	0.045	945	39.01	25.40	0.99	0.48	2.50	0.54	134	
46-47	49.94	0.14	7.77	12.68	0.142	71.83	22.26	4.25	0.063	912	38.78	25.55	1.03	0.51	2.61	0.48	133	442
49-50	49.13	0.14	7.54	12.91	0.144	71.29	22.90	4.27	0.072	911	38.45	25.50	0.97	0.44	2.45	0.50	133	
52-53	50.5	0.12	7.87	12.21	0.137	71.10	22.33	4.42	0.078	963	40.42	25.26	0.97	0.53	2.32	0.50	132	
55-56	49.45	0.14	8.41	13.31	0.145	73.38	23.58	4.38	0.083	1101	40.92	24.31	0.92	0.92	2.54	0.47	130	462
58-59	49.44	0.12	7.79	12.29	0.149	73.60	23.21	4.15	0.067	890	41.25	25.20	1.09	0.78	2.52	0.51	127	
61-62	49.78	0.12	8.21	13.61	0.152	71.58	23.67	4.11	0.065	918	38.07	24.33	0.86	0.47	2.49	0.52	127	
64-65	50.75	0.12	8.11	13.65	0.139	69.42	23.89	4.19	0.066	859	38.32	24.14	0.92	0.50	2.32	0.45	125	468
67-68	47.46	0.14	7.92	13.04	0.138	70.30	22.61	4.15	0.071	738	41.49	25.63	0.90	0.45	2.31	0.48	128	
70-71	47.58	0.10	8.83	12.62	0.139	71.51	24.40	4.33	0.077	749	40.44	25.40	0.97	0.61	2.16	0.49	129	
73-74	47.23	0.12	8.40	13.50	0.136	72.60	23.20	4.32	0.064	724	40.60	25.45	0.94	0.49	2.35	0.49	130	480
76-77	47.25	0.11	8.29	13.48	0.134	70.85	22.28	4.22	0.067	763	40.28	24.76	0.87	0.59	2.39	0.52	131	
79-80	43.32	0.10	8.20	13.59	0.131	70.90	23.87	4.25	0.077	885	38.76	24.39	0.74	0.77	2.19	0.48	128	
82-83	45.23	0.11	8.46	14.95	0.126	72.46	25.58	4.44	0.070	786	42.78	24.86	0.83	1.05	2.41	0.49	132	442

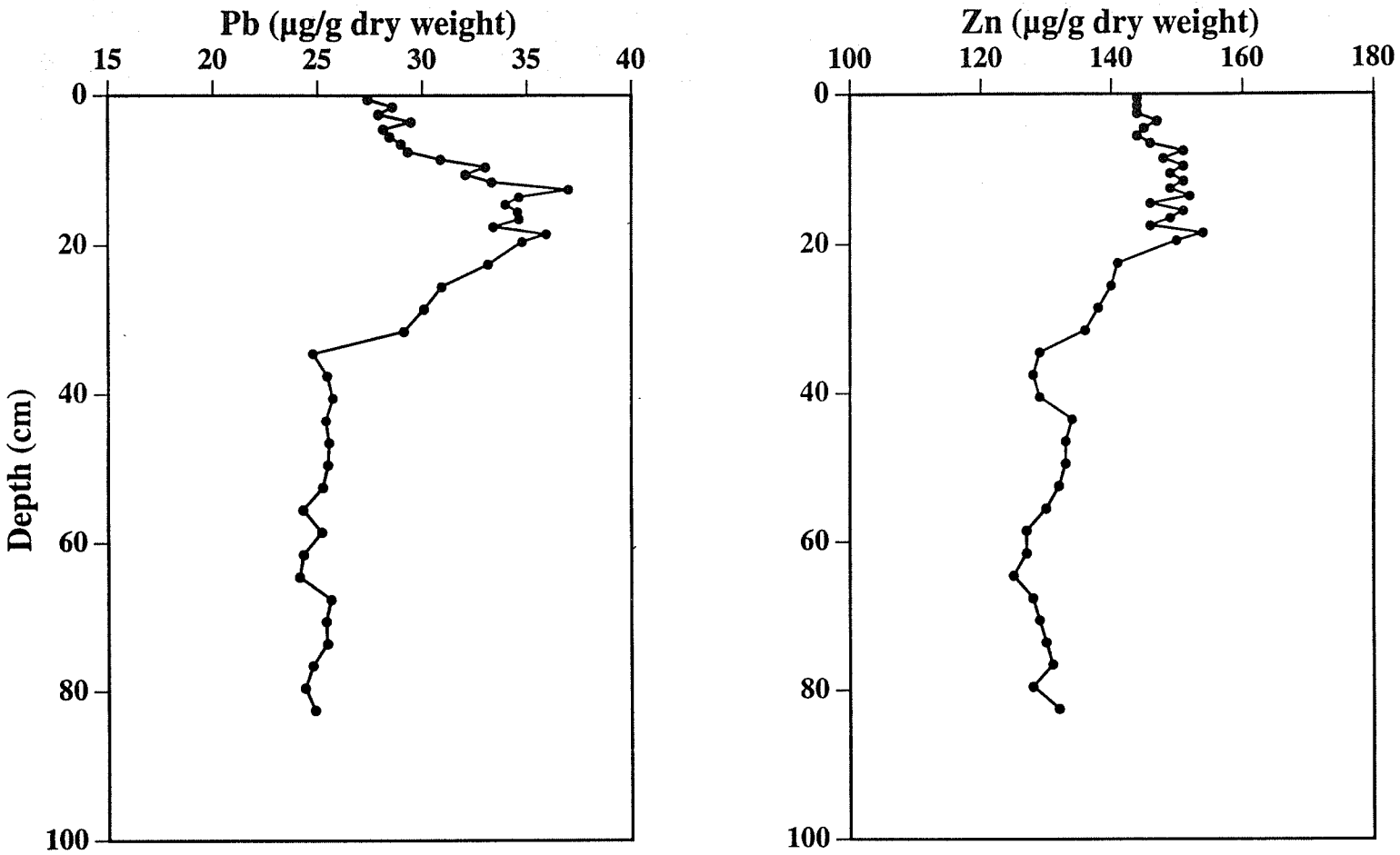


Figure 8. Pb and Zn in a core from the Mississippi River Delta.

Rather, the Pb decrease is almost certainly caused primarily by a decreased use ofleaded gasoline, as was suggested by Trefry. Note, however, that our Pb value at the core bottom is somewhat higher than what Trefry considers to be background for this area (25 vs. 20 ppm) and that our peak value is somewhat lower than Trefry's (37 vs 40 ppm) The trends and timing, however, are identical. Our core bottom may not be old enough to give a background Pb value but we have no explanation for our somewhat lower Pb maximum.

Several other elements show concentration gradients in our Mississippi delta core similar to that shown by Pb and the Zn shown along with it in Figure 8. For example, Ag and Cd (Figure 9) begin to increase in concentration at about the same time Pb does, go through a maximum, and like Pb show decreases since about 1980. These two elements exibit much larger relative increases over time than does Pb, with Ag more that doubling and Cd going up almost three-fold. Zinc and Cr, on the other hand, went through less of an increase than Pb did and Ni and Cu even less. It should be noted that all the trace metal values for this core are relatively near those for average crustal abundances and average uncontaminated Gulf Coastal fine grained sediment, thus there is no evidence of massive contamination. The evidence of contamination is, however, clear and can be seen in the relative changes with time which are summarized in Table 3.

Barium concentration follows a different pattern from the other elements. It is near the expected value for uncontaminated sediment at the core bottom (about 450 ppm), then begins to increase in the 1940s, coincident with the beginning of oil well drilling mud use in this area. The change is gradual until about 1980 when a sharp increase doubles the concentration. It then triples in the late 80s. Values in the upper 4 cm of the core decrease to about double background, probably due to fewer drill mud discharges in this area in recent times.

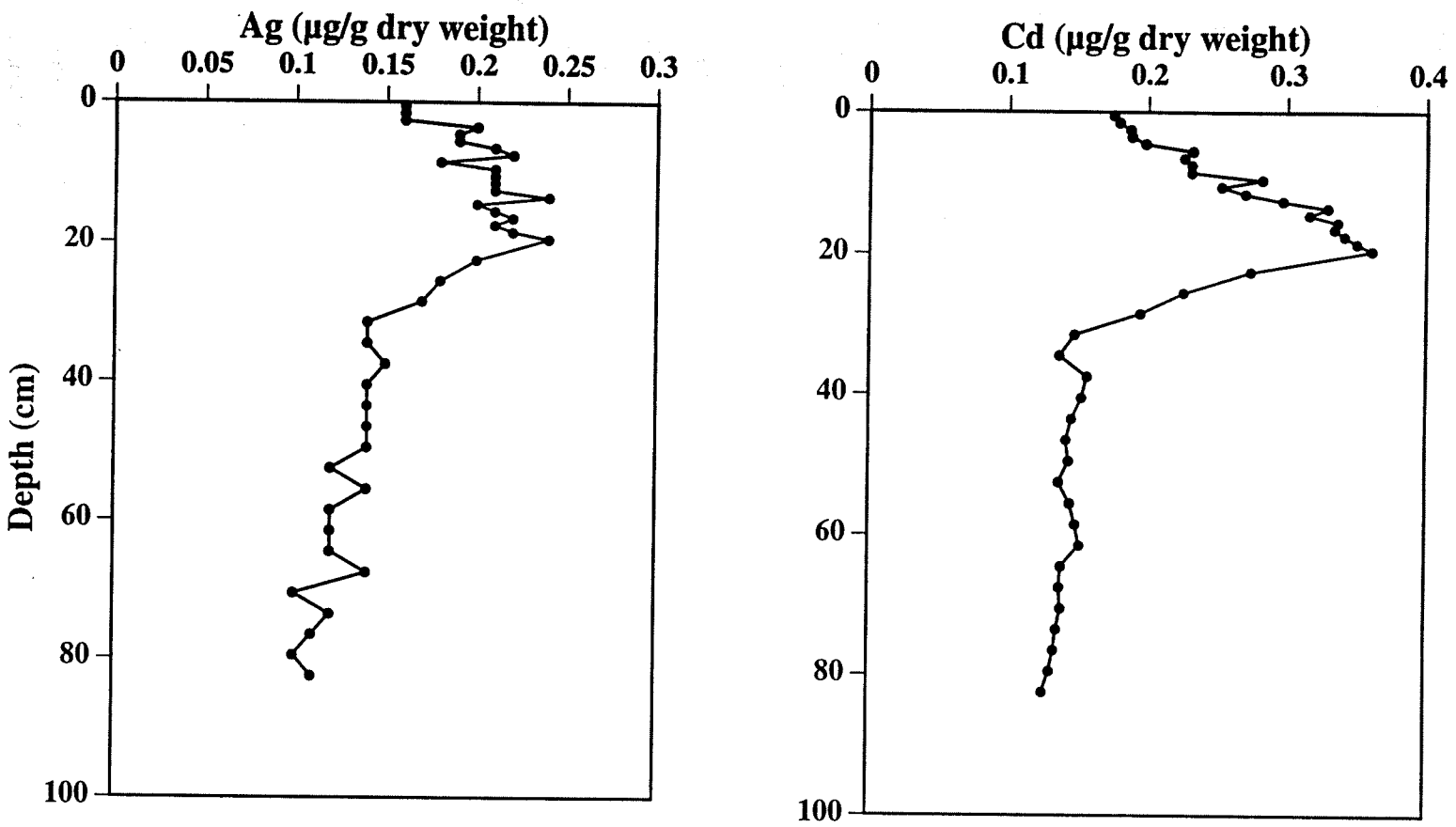


Figure 9. Ag and Cd in a core from the Mississippi River Delta.

Table 3. Metal concentrations in Mississippi River Delta sediments at 3 time periods and % change from 1893. Values in ppm except Fe in wt %.

	1893	1973	% change 1973	1993	% change 1993
Fe	4.25	4.4	+3.5	4.15	-2.5
Mn	750	1150	+53	1050	+40
Cr	72	88	+22	72	0
Ni	40	42	+5	45	+13
Cu	23	25	+9	23	0
Zn	130	150	+15	145	+12
Ag	0.11	0.24	+118	0.16	+45
Cd	0.13	0.35	+170	0.18	+38
Sn	2.5	3.5	+40	2.5	0
Pb	25	35	+40	28	+12

Manganese shows a large peak in concentration at nearly the same time the other elements do but this is almost certainly caused by diagenetic remobilization rather than by human activity. Some fraction of the increases in the other elements could also be due to natural remobilization but we think this effect is small, except possibly for Cd. The pore water concentrations of elements other than Mn are too small to allow extensive remobilization in the time available in rapidly accumulating sediments. In addition, Trefry (1977) presents data for some of these metals in cores from deeper water on the Mississippi delta. These cores commonly have Mn enriched layers with 1-3,000 ppm Mn and occasional values over 10,000 ppm, much higher than anything found in this study. These deeper water Mn-enriched layers are, however, not enriched in other metals.

RESULTS AND DISCUSSION, TAMPA BAY

The Tampa Bay core was collected by Dr. Terry Wade with the assisstance of Dr. Larry Doyle who is very familiar with Tampa Bay sedimentation. Despite Larry expertise and experience, great difficulty was encountered in finding a location which appeared to be physically undisturbed by dredging or other human activity. A site was finally selected in very shallow water in Big Bayou within the city of St. Petersburg (Figure 10). A 51 cm long core was taken by driving a plastic core tube into the firm sediment by hand and digging it out in order to retain the largely coarse grained material. The sediment varied in appearance and texture with depth as well as in chemistry, therefore had not been homogenized physically. Nevertheless, the coarse-grained, carbonate-rich sediment was low in radio-isotopes throughout, making it difficult to date. Based on a small peak in the plutonium concentration the sedimentation rate seemed to be about 0.45 cm/yr. The core was also low in contaminants because clay-poor, carbonate-rich sediment is not efficient at absorbing contaminants.

ORGANIC CONTAMINANTS

In spite of the coarse-grained, carbonate-rich nature of the Tampa sediment, the organic contaminant concentrations were higher than those of the Mississippi Delta and Galveston Bay cores (Table 4).

Figure 10: Location of the Sampling Site in Big Bayou, Tampa Bay in Relation to the Status and Trends Sites.

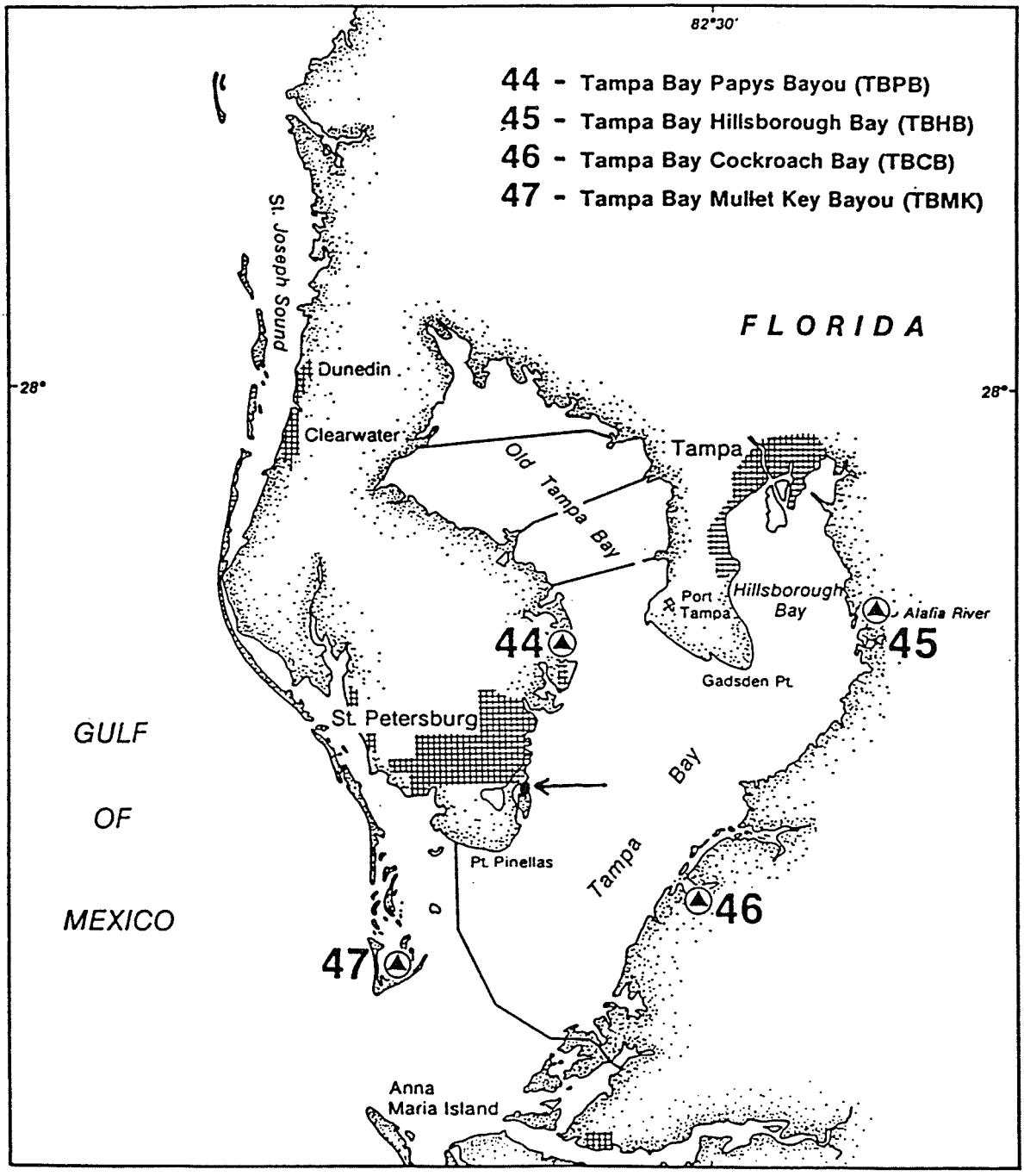


Table 4. Organic contaminants in Tampa Bay sediment.

Depth	PCB	PAH	DDT	Chlordane
1	28.4	6268	10.6	11.87
3	16.7	13092	2.37	5.81
5	23.81	20378	5.01	3.61
7	22.34	18855	4.66	4.11
10	19.5	16598	6.03	7.84
12	25.59	13982	7.33	6.98
14	26.15	18572	10.15	7.37
16	16.52	9838	2.75	4.5
19	20.3	15057	3.39	3.91
21	12.63	5864	3.13	3.63
24	12.1	5675	6.69	5.65
27	14.17	1684	96.14	166.76
29	5.04	1611	1.91	10.09
31	11.96	1002	295	15.73
34	7.9	1636	4.38	7.3
37	16.5	1138	14.71	132
42	9.44	755	9.01	59
46	7.14	2294	2.96	3.83
50	2.83	743	0.94	0.91
53	5.33	4569	0.75	0.99

The total PCB, DDT, PAH, and Chlorodane ranged from 2.83 to 28.8 ng/g; 0.75 to 295 ng/g; 743 to 20,378 ng/g and 0.91 to 167 ng/g respectively. All constituents were in higher concentrations in surface sediments, but were detected at all depths. This suggests sediment mixing throughout the core or incorrect radiometric dating. The core shows several episodes of Chlorodane and DDT enrichment where the concentrations increased by a factor of 10 or more over a few cm. This suggest a dynamic environment and possible physical disturbance of the sediment. The fact that Chlorodane and DDT concentration peaks were found at depths that, based on the radiometric dating, were deposited before these compounds were produced commercially adds to the suspicion that sediment at this location had been disturbed.

TRACE METALS

When the raw data for trace metal concentrations in the Tampa core are plotted, it looks much like the Mississippi delta data discussed above. A big peak in concentration is seen for several elements at about 10 cm depth in the sediment column, similar to the 20 cm peak seen in the Mississippi delta sediment (e.g., Ag and Cd in Figure 11). The explanation for the peak is, however, completely different. In the Tampa core the peak is due to a difference in grain size and mineralogy, and only partially to human activity. This is evident when the Fe and Al values are examined. These elements are very unlikely to have been influenced by humans, yet their distribution is identical to that of Ag, Cd and other trace metals. The data must be normalized to see a true picture of changes in trace metals with time. This could be done using grain size and mineralogy but Fe and Al which are very low in most coarse-grained, as well as in most carbonate-rich, sediment can also be used for normalization. When other metals in the Tampa core are ratioed to Fe and plotted vs. depth the peak in the values at 10 cm disappears. Rather, a small peak is seen at about 30 cm for several metals, which is most prominantly shown by Pb (Figure 12). These metal peaks at 30 cm might be due to human influence but the concentrations are low, and are influenced by ratioing to the very low Fe value, therefore, any conclusion is tentative.

The absolute concentrations of some of the metals (Table 5) are higher than would be expected for coarse-grained sediment and the sedimentation rate determined would give a 1930 date for the 30 cm peak in metal to iron ratios, which seems too early for an anthropogenic peak in trace metal input.

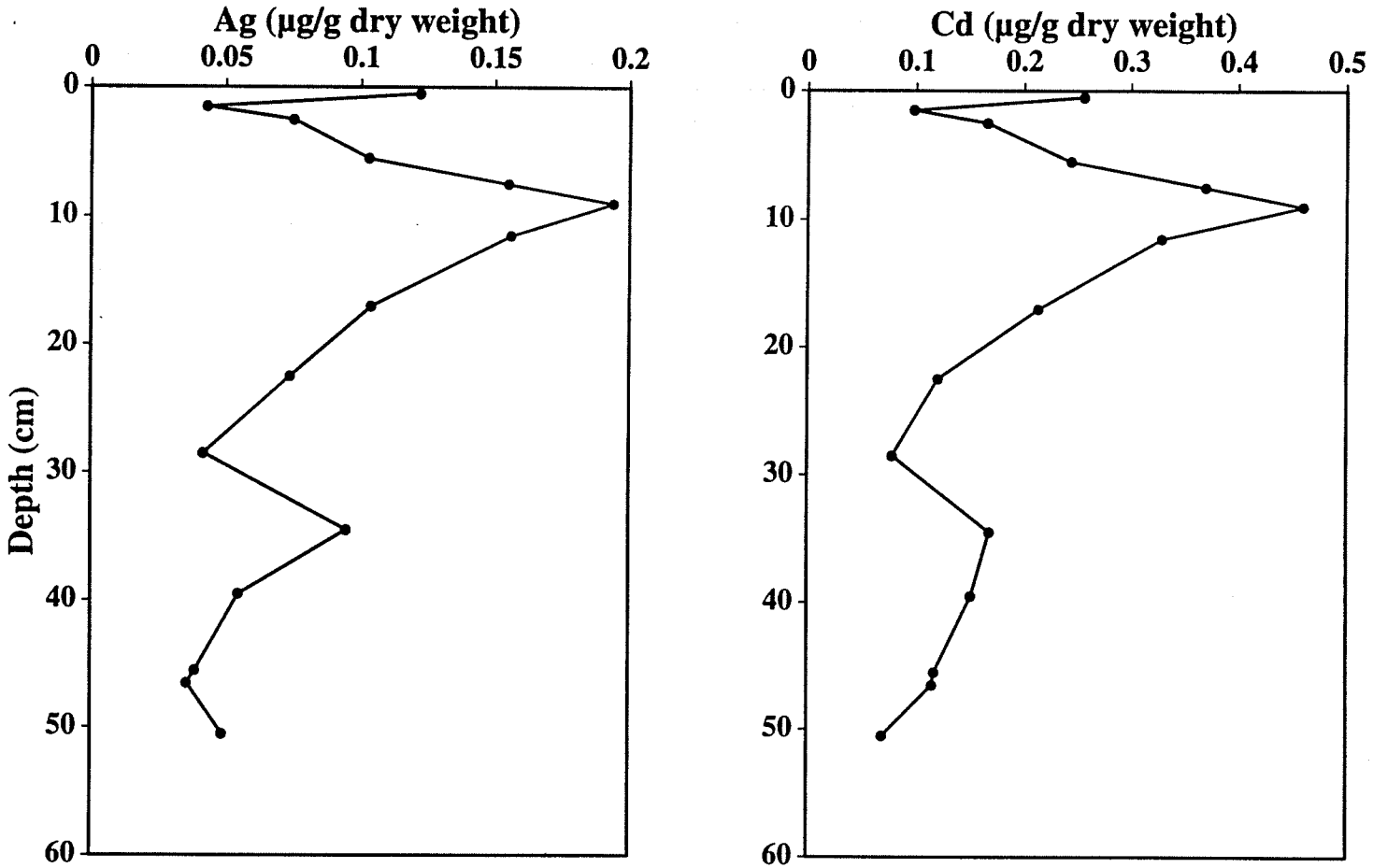


Figure 11. Ag and Cd in a core from Big Bayou, Tampa Bay.

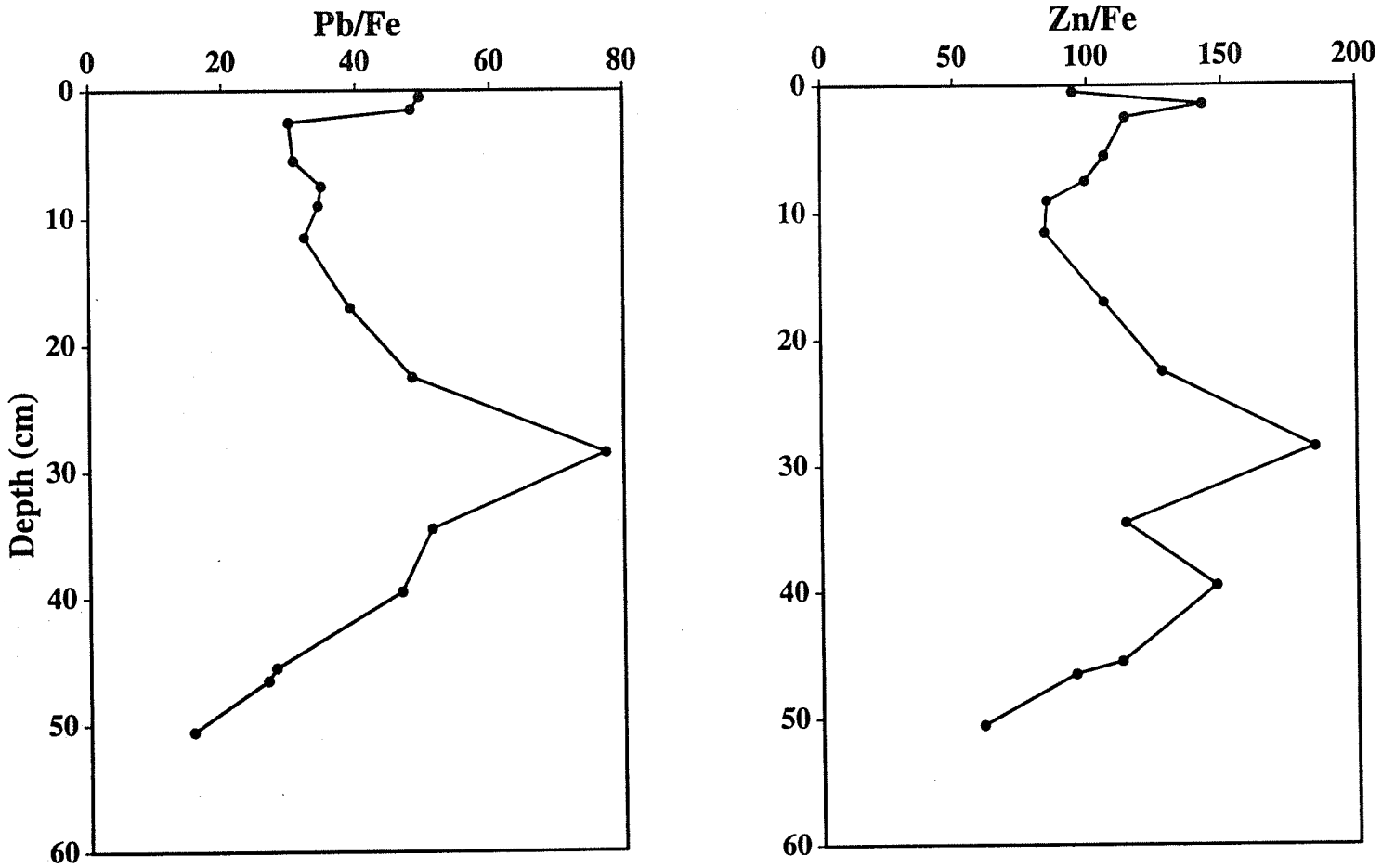


Figure 12. Pb and Zn concentrations relative to Fe (ppm/%) in a core from Big Bayou, Tampa Bay.

Table 5. Metal concentrations (on dry weight basis) and % water in Tampa Bay sediment

Depth	Percent	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Sn	Tl	Zn	Ba
cm	Water	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
O to 1	33.65	0.12	6424	2.35	0.256	20.06	9.07	3172	0.06	9.55	4.11	15.71	0.08	0.47	0.49	0.11	30	32.3
1 to 2	23.65	0.04	2300	1.33	0.098	7.64	2.72	1276	0.02	6.84	1.67	6.15	0.05	0.33	0.23	0.05	18	20.1
2 to 3	28.73	0.07	4624	1.66	0.166	11.43	5.41	2007	0.04	5.73	2.75	6.04	0.00	0.29	0.31	0.04	23	22.2
5 to 6	31.03	0.10	5808	2.24	0.244	15.33	6.83	2781	0.05	9.21	3.30	8.58	0.14	0.35	0.36	0.07	30	18.3
7 to 8	37.85	0.16	9917	2.88	0.370	24.36	10.39	4314	0.06	12.47	5.26	15.07	0.13	0.62	0.54	0.14	43	34.9
8 to 9	43.20	0.19	13012	3.42	0.460	32.22	18.22	5497	0.08	18.21	6.79	18.94	0.15	0.66	0.65	0.11	47	47.5
10 to 11	35.94	0.16	9158	2.73	0.329	23.93	11.18	4076	0.06	10.21	6.19	13.20	0.18	0.44	0.44	0.13	34	
15 to 16	28.59	0.10	4988	2.10	0.214	14.75	6.60	2583	0.08	12.55	3.66	10.10	0.14	0.22	0.39	0.07	27	
20 to 21	22.57	0.07	2950	1.86	0.121	8.16	3.97	1523	0.03	7.68	2.06	7.36	0.17	0.21	0.30	0.07	19	14.5
25 to 26	17.24	0.04	1539	1.39	0.079	5.16	2.92	744	0.02	4.58	1.42	5.76	0.10	0.07	0.20	0.05	14	
30 to 31	20.29	0.10	3438	2.01	0.169	10.30	5.61	1886	0.05	6.81	2.49	9.67	0.16	0.19	0.38	0.09	21	
40 to 41	19.03	0.06	2317	1.53	0.152	7.14	4.61	1248	0.03	4.59	1.82	5.82	0.09	0.17	0.44	0.04	18	15.8
45 to 46	20.77	0.04	2661	1.94	0.118	7.07	3.70	1502	0.04	6.78	2.14	4.19	0.09	0.19	0.24	0.03	17	
46 to 47	20.99	0.04	3242	1.72	0.116	7.21	4.01	1552	0.04	7.50	2.78	4.14	0.12	0.15	0.27	0.05	15	
50 to 51	20.90	0.05	3854	2.19	0.070	7.68	2.61	1626	0.00	6.88	2.15	2.52	0.14	0.18	0.76	0.06	10	15.2

RESULTS AND DISCUSSION, GALVESTON BAY

Finding a suitable place to sample in Galveston Bay proved to be just as hard as finding a place in Tampa Bay. Much of Galveston Bay is not now receiving sediments because upstream dams have reduced the sediment supply and diversion of water by cities and industry has greatly reduced flow into the bay. Much of the bay is also very obviously physically disturbed by dredging and trawling. It is possible that some of the small sub-bays off the main bay contain pockets of sediment that has accumulated continuously over the past 100 years but these are more likely to have been influenced by local sources of contamination and therefore may not be representative of the whole bay. For this reason, we chose several sites in Trinity Bay, one of the large open lobes making up Galveston Bay (Figure 13). We also examined several cores in East Bay, another main sub-bay of the Galveston Bay system. None of these cores gave useable Pb-210 profiles. Finally, a core from central Galveston Bay, consisting of uniformly very fine grained sediment appeared to be undisturbed. Radiometric dating gave a sedimentation rate of about 0.35 cm/yr., thus even though the core was only 44 cm long the sediment at the core bottom was more than 100 years old (Figure 14).

ORGANIC CONTAMINANTS

The Galveston Bay core showed low concentrations of all measured organic contaminants. Total PCB and DDT concentrations ranged from background to 13.8 ng/g, and from background to 0.44 ng/g, while total PAH concentrations ranged from 89 to 479 ng/g (Figure 15 and Table 6). The highest concentration of all of these constituents was in 10-12 cm section of the core, which, based on the sedimentation rate estimated radiometrically, would have been deposited in the late 1960s. Based on known production and use data, the maximum DDT concentrations should, in fact, be found in sediment deposited in the early 1970s, about where it was found. The DDT concentrations are very low, however, and provide only weak support for the radiometric dating.

Figure 13: Location of the Sampling Site in Trinity Bay in Relation to the Galveston Status and Trends Sites.

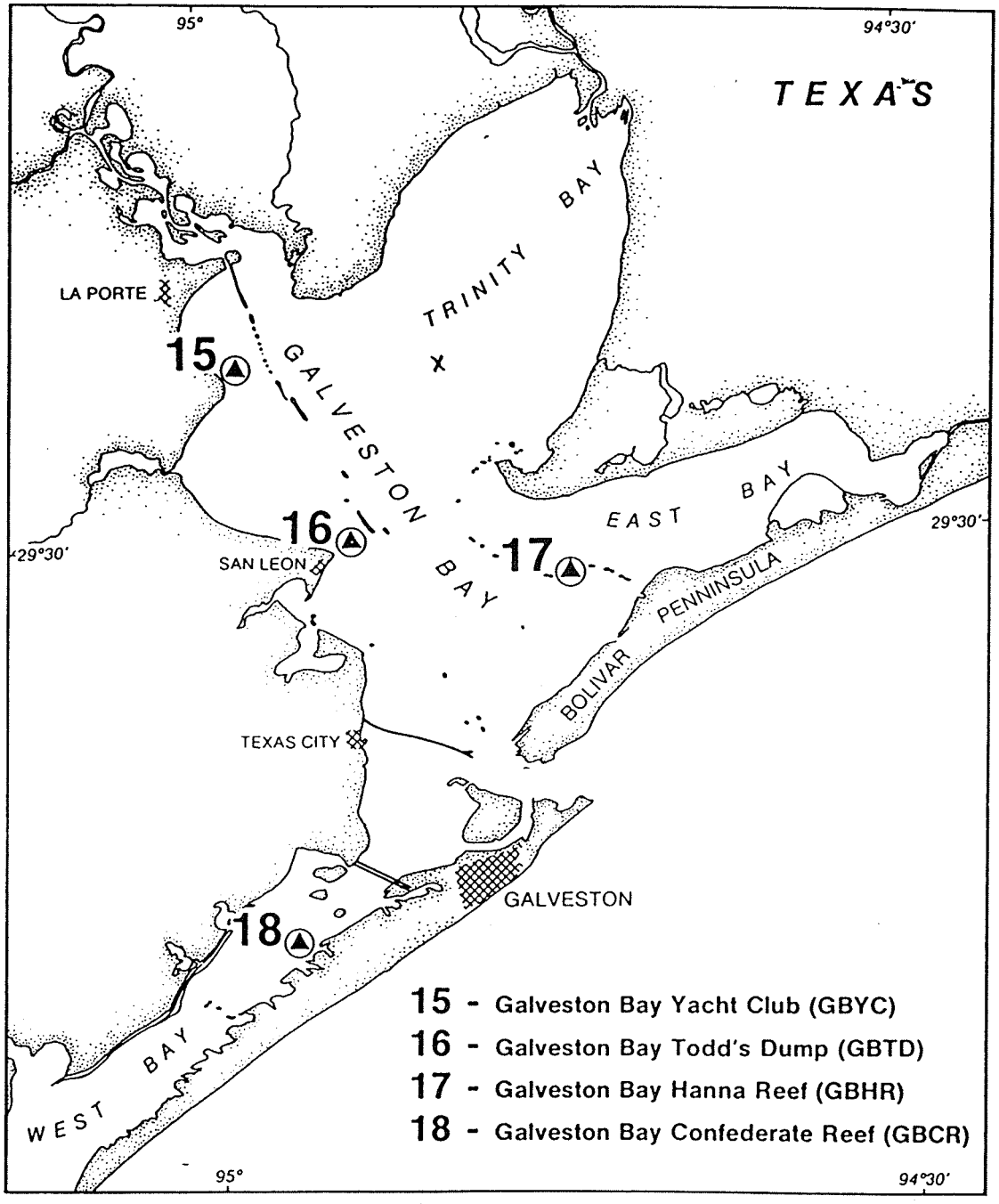
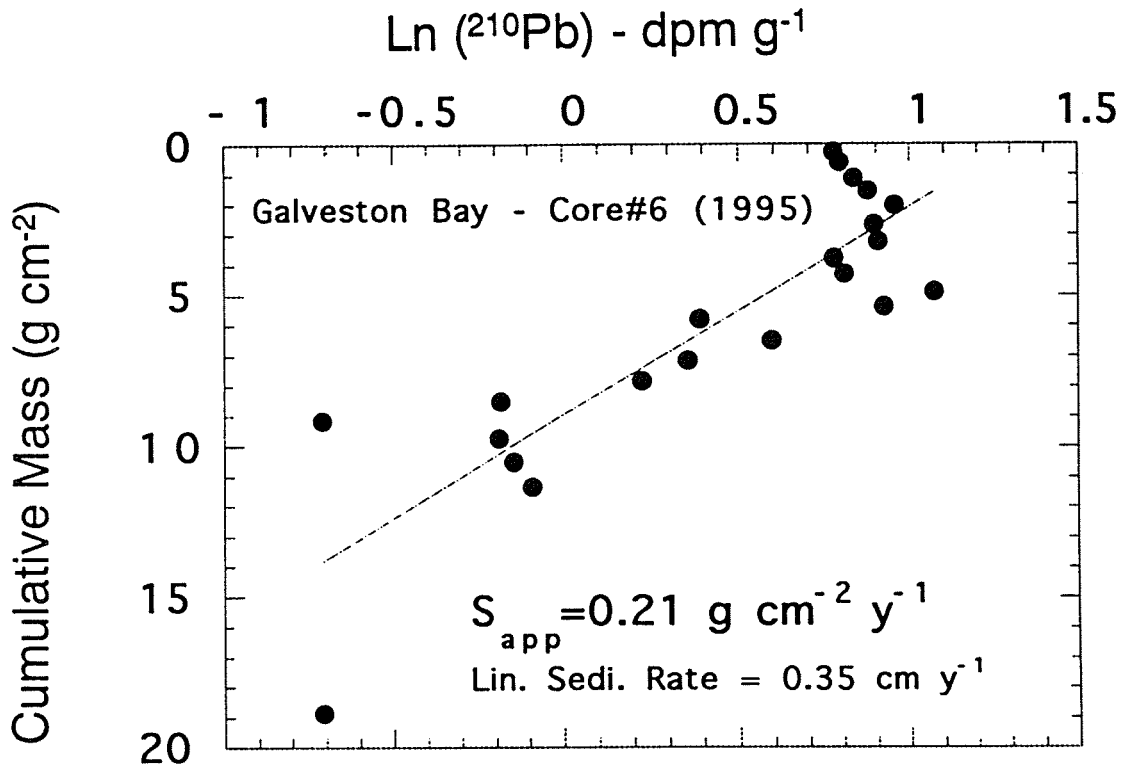


Figure 14: Pb-210 Activity vs. Mass Accumulation for the GB Core



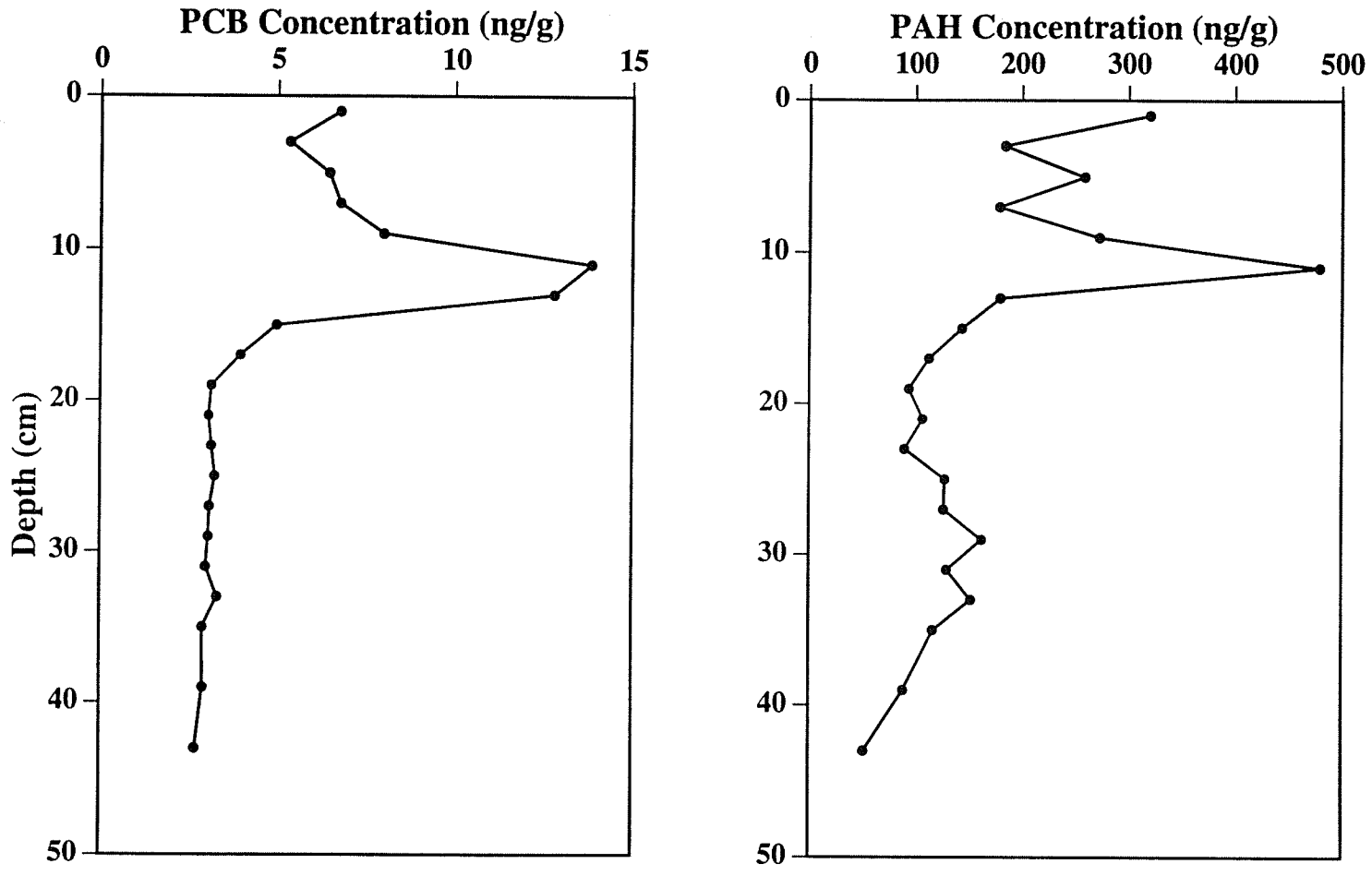


Figure 15. PCB and PAH concentrations in Galveston Bay sediment.

Table 6. Organic contaminants in Galveston Bay sediment.

DEPTH	PCB	PAH	DDT
1	6.76	320	0.32
3	5.34	184	0.1
5	6.46	259	0.21
7	6.78	179	0.09
9	8	273	0.21
11	13.85	479	0.44
13	12.81	180	0.2
15	4.99	144	0.1
17	3.97	113	0.05
19	3.16	94	0
21	3.08	107	0
23	3.16	90	0
25	3.26	128	0
27	3.11	127	0
29	3.08	163	0
31	3.01	130	0
33	3.33	153	0
35	2.92	117	0
37			0
39	2.93	89	0
41			0
43	2.71	52	0

Totat PCB and total DDT were at background concentrations in this core until the mid 1940s (16-18 cm). PCB goes through a maximum in the 1970s and then decreases to a fairly constant value from the 1980s until the present. Total DDT shows a maximum concentration at the same time as PCBs do but shows no consistent trend in more recent times where declines were expected. PAHs were detected in all core sections but were highest in the 1940s. Other organic contaminants were too near their analytical detection limits to draw any conclusions regarding their distributions.

TRACE METALS

Sediment at the sampling site was more clay-rich and thus more iron-rich than is tipical of most of Galveston Bay and therefore should have been a good recorder of pollutant inputs. Iron concentrations were between 3.5 and 4% , except for the bottom 3 cm of the core where values were around 3%, a value more tipical for the bay as a whole (Figure 16 and Table 6). This small variation in Fe with depth in most of the core makes it un-necessary to ratio the trace metal data to Fe. The raw data for most metals changes little with depth, thus giving no indication of changing human influence over the time period represented by the cored sediment. Silver, however, which is shown in Figure 17 along with Cd, shows a small increase in recent times. Furthermore, most element concentrations in these sediments are similar to average values for Galveston Bay and other Texas bay sediment reported by previous investigators (e.g., Jiann, 1993; NOAA, 1988). Thus, there is no clear indication of contamination of these sediments with most metals, especially when their clay-rich nature is considered. In fact, Cu sems to be considerably below average in these sediments. On the other hand, As seems to be above average, especially based on the atomic absorption data. The INAA As data is about 25% lower than the AA data, a difference that is being resolved, but even the INAA data makes these sediments look enriched in As by 50% or so compared to most Texas bay sediments. The As enrichment might be related to oil production in this area (see Ba discussion below) but we have no proof of this.

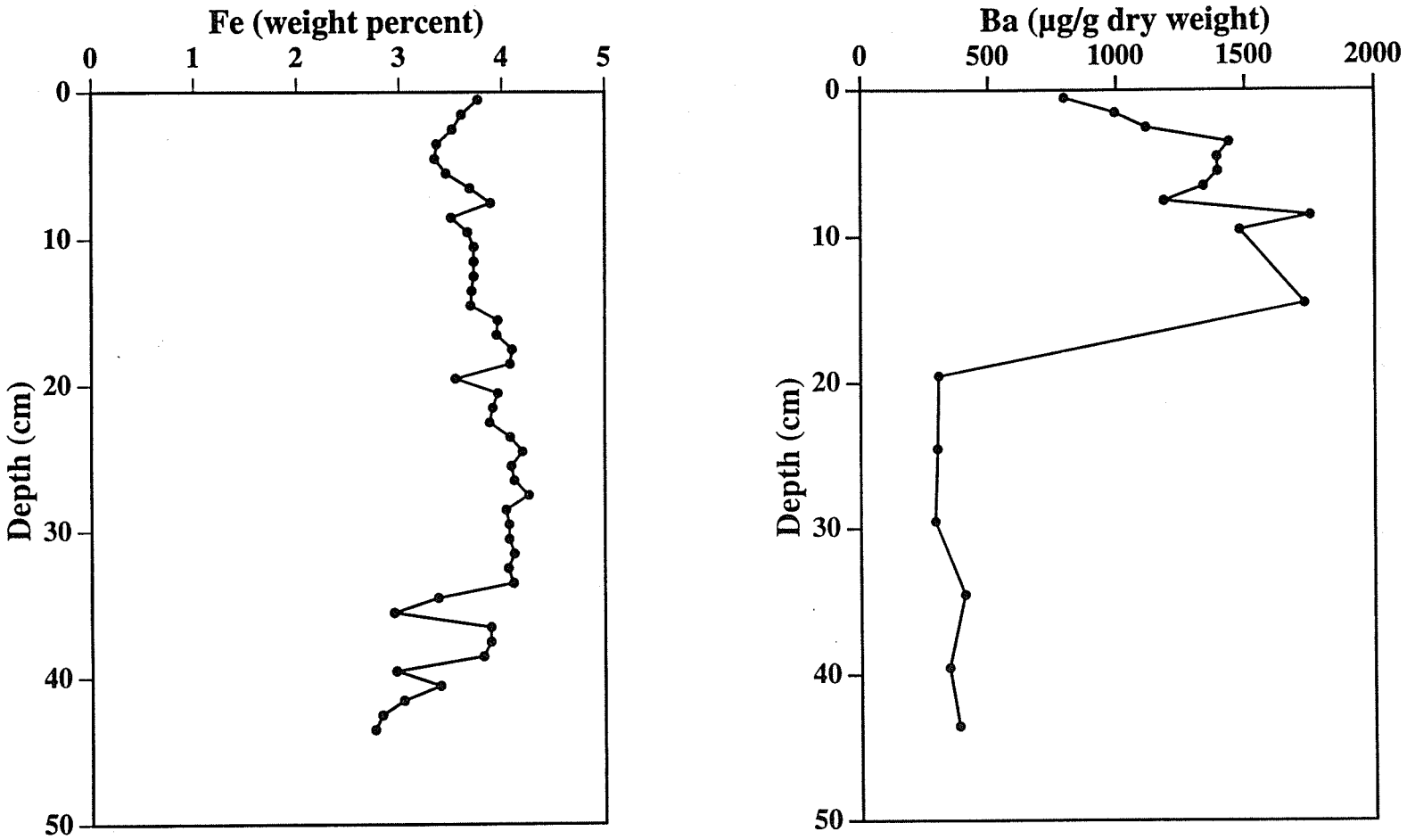


Figure 16. Fe and Ba in a core from Galveston Bay.

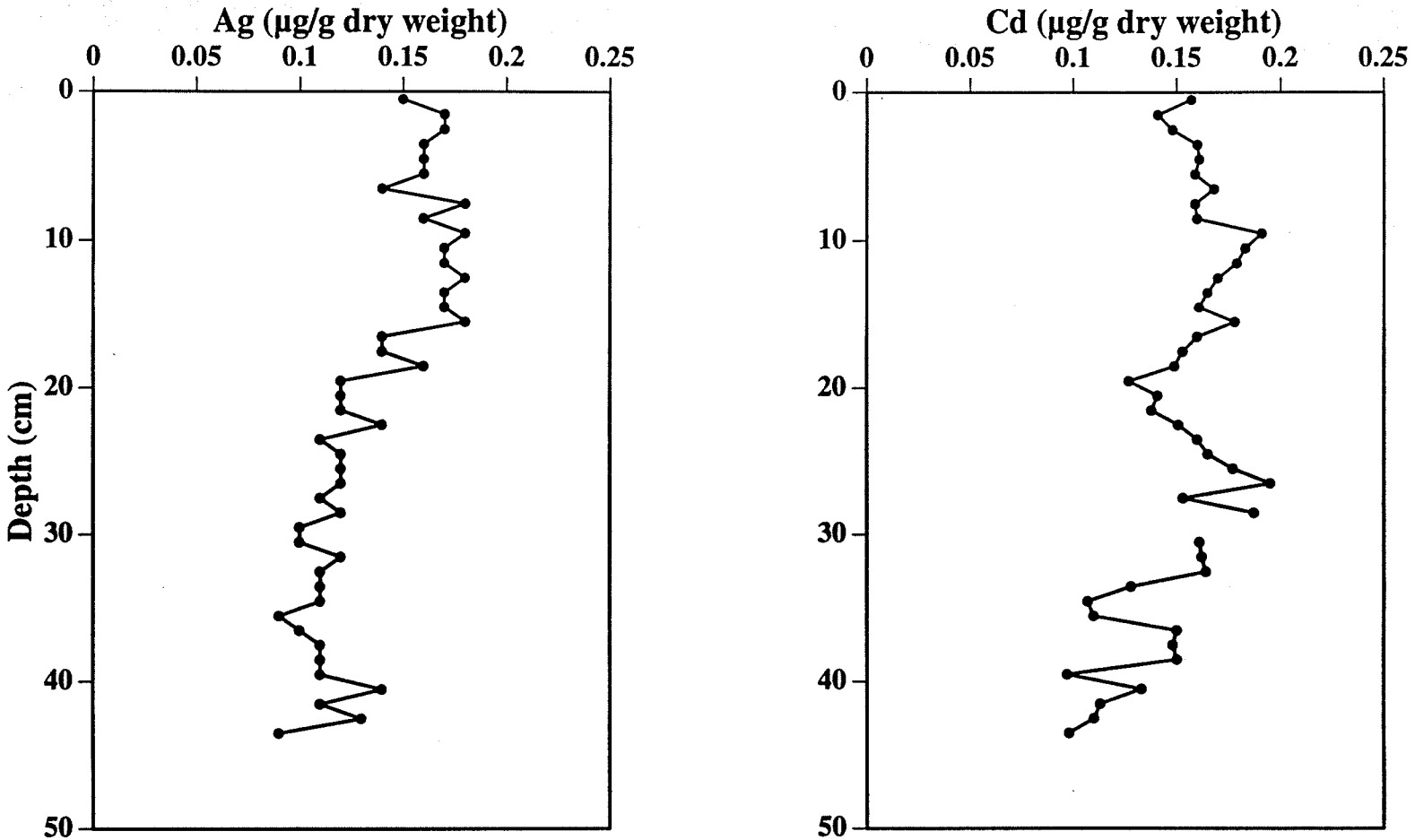


Figure 17. Ag and Cd in a core from Galveston Bay.

Table 7. Metal concentrations (on dry weight basis) and % water in Galveston Bay sediment.

Depth	Percent	Ag	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni
cm	Moisture	PPM	(%)	PPM	PPM	PPM	PPM	(%)	PPM	PPM	PPM
0-1	60.99	0.15	7.89	11.44	0.157	68.32	13.94	3.77	0.08	792	29.92
1-2	60.22	0.17	7.93	8.84	0.141	70.85	11.95	3.61	0.07	519	26.11
2-3	55.59	0.17	7.88	8.94	0.148	71.03	14.28	3.52	0.06	422	30.40
3-4	54.01	0.16	7.76	10.27	0.160	68.30	13.06	3.37	0.07	341	28.39
4-5	53.20	0.16	7.53	10.84	0.161	68.97	15.95	3.35	0.07	304	32.01
5-6	51.68	0.16	7.63	11.87	0.159	68.20	14.57	3.46	0.07	318	31.13
6-7	54.28	0.14	7.87	13.66	0.168	72.62	18.51	3.69	0.09	376	34.63
7-8	53.66	0.18	8.16	13.59	0.159	77.07	15.96	3.89	0.08	422	36.51
8-9	53.59	0.16	7.58	12.65	0.160	70.58	14.96	3.51	0.08	424	32.45
9-10	53.45	0.18	7.85	13.96	0.191	70.36	15.68	3.67	0.09	497	34.27
10-11	50.97	0.17	7.92	13.26	0.183	74.28	16.70	3.73	0.09	521	35.61
11-12	52.38	0.17	8.03	12.57	0.179	69.41	16.07	3.73	0.09	528	36.13
12-13	53.11	0.18	8.23	15.22	0.170	71.44	15.33	3.73	0.08	505	34.45
13-14	49.05	0.17	8.24	14.01	0.165	67.58	14.94	3.71	0.07	420	34.31
14-15	51.21	0.17	8.29	14.26	0.161	77.61	16.17	3.70	0.07	418	31.74
15-16	54.62	0.18	8.70	14.54	0.178	75.56	15.18	3.96	0.07	402	32.73
16-17	51.90	0.14	9.18	14.37	0.160	74.38	15.61	3.95	0.06	391	32.85
17-18	48.62	0.14	9.87	12.50	0.153	83.56	15.61	4.10	0.07	400	34.48
18-19	47.69	0.16	9.54	12.19	0.149	78.19	15.89	4.08	0.07	400	33.95
19-20	51.54	0.12	8.43	12.84	0.127	68.80	14.05	3.55	0.06	349	30.25
20-21	50.84	0.12	9.45	17.66	0.141	79.38	14.98	3.96	0.06	390	35.05
21-22	54.04	0.12	9.40	15.85	0.138	75.44	14.76	3.91	0.06	363	33.00
22-23	54.38	0.14	9.00	15.38	0.151	72.92	14.14	3.88	0.06	337	31.94
23-24	54.69	0.11	9.51	14.14	0.160	82.34	16.28	4.08	0.06	329	34.01
24-25	54.54	0.12	9.58	14.83	0.165	74.14	16.20	4.20	0.07	318	33.65
25-26	55.88	0.12	9.60	16.12	0.177	70.01	15.34	4.09	0.06	303	34.39
26-27	53.09	0.12	9.60	17.94	0.195	71.56	17.04	4.12	0.07	303	36.78
27-28	52.36	0.11	9.79	15.53	0.153	72.67	15.54	4.26	0.06	326	37.82
28-29	56.27	0.12	9.30	14.00	0.187	70.75	15.62	4.04	0.06	348	34.94
29-30	56.69	0.10	9.08	17.04		72.50	16.98	4.07	0.06	327	34.56
30-31	55.59	0.10	9.45	13.95	0.161	72.40	15.48	4.07	0.06	331	37.28
31-32	52.90	0.12	9.58	13.63	0.162	77.25	15.41	4.12	0.06	324	35.67
32-33	54.96	0.11	9.50	12.83	0.164	76.79	16.13	4.06	0.06	361	36.84
33-34	63.49	0.11	9.48	13.70	0.128	74.81	16.90	4.11	0.06	437	36.36
34-35	47.34	0.11	7.65	10.80	0.107	63.83	12.86	3.38	0.04	429	28.20
35-36	45.73	0.09	6.90	11.27	0.110	56.18	10.47	2.95	0.04	311	21.06
36-37	51.30	0.10	8.82	14.67	0.150	66.84	14.82	3.89	0.06	327	34.00
37-38	52.48	0.11	8.90	12.75	0.148	69.21	14.94	3.89	0.06	356	35.04
38-39	52.27	0.11	8.56	11.63	0.150	67.45	15.13	3.82	0.06	425	33.36
39-40	47.50	0.11	6.89	24.51	0.097	56.05	10.95	2.97	0.05	288	27.03
40-41	48.64	0.14	7.82	12.09	0.133	61.15	12.30	3.40	0.05	261	27.29
41-42	46.40	0.11	6.75	10.68	0.113	57.63	10.65	3.04	0.04	232	24.98
42-43	43.83	0.13	6.17	10.01	0.110	49.93	9.40	2.83	0.04	234	23.88
43-44	36.20	0.09	6.04	9.03	0.098	51.99	8.25	2.76	0.04	233	22.82

Of all the elements determined in the Galveston Bay sediment core only Ba showed big concentration changes with depth. The bottom half of the core (below about 19 cm) had Ba concentrations of about 300 ppm, which is average or perhaps below average for uncontaminated Texas bay sediments. Over the next 5 cm, however, the Ba concentration increases sharply, reaching almost 1800 ppm. There seems to be a 10 cm layer of this very Ba-enriched sediment, overlain by 5 cm of somewhat less enriched sediment and then a decrease in the top 3-4 cm of the core (Figure 16). It's possible that the pattern above the 10 cm thick highly Ba-enriched layer is due to physical or biological mixing upward of this material. In other words, all the Ba came in over a relatively short time period in the past, almost certainly from oilwell drilling mud, and little or no contaminant Ba has been added since then. The radiometric dating suggests that the Ba-enriched layer is about 55 years old so it was deposited about 1940, a time when oil development in the area was well underway. Coincidentially, a major hurricane hit this area in 1940 which may have caused the very sharp increase in Ba by redistributing residues from oil well drilling.

This page deliberately left blank

REFERENCES

Appelbaum B.S. and Bouma A.H. (1972) Geology of the upper continental slope in the Alaminos Canyon region. *Trans. Gulf Coast Assoc. Geol. Soc.* **22**, 157-164.

Armstrong, N. W. and G. H. Ward (1993) *Point source loadings to Galveston Bay.* In: *Proceedings, The Second State of the Bay Symposium*, Feb. 4-6, 1993, Galveston, TX GBNEP-23.

Ashraf M.S. and Borah D.K. (1992) Modelling pollutant transport in runoff and sediment. *Transactions of the ASAE* **35**, 1789-1797.

Baskaran, M., C. H. Coleman, and P. H. Santschi (1993) *Atmospheric depositional fluxes of ^{7}Be and ^{210}Pb at Galveston and College Station, Texas. J. Geophys. Res.*, submitted).

Baskaran, M., J. J. Kelley, A. S. Naidu and D. Holleman (1988) *Radiocesium and radiopotassium concentrations in Alaskan Arctic soils, plants and animals.* Report submitted to the Universityi of Alaska, IMS-R88-1.

Bates T.S., Hamilton S.E., and Cline J.D. (1984) Vertical transport and sedimentation of hydrocarbons in the central main basin of Puget Sound, Washington. *Environ. Sci. Technol.* **18**, 299-305.

Bero A.S. and Gibbs R.J. (1990) Mechanisms of pollutant transport in the Hudson Estuary. *The Science of the Total Environment* **97/98**, 9-22.

Blumberg A.F., Signell R.P., and Jenter H.L. (1993) Modelling transport processes in the coastal ocean. *J. Mar. Environ. Engineer.* **1**, 31-52.

Blus L.J. (1995) Organochlorine pesticides. In: *Handbook of Ecotoxicology* (Eds. Hoffman D.J., Rattner B.A., Burton G.A. Jr., and Cairns J. Jr.). CRC Press. pp 275-300.

Bollag J.-M. (1992) Decontaminating soil with enzymes. *Environ. Sci. Technol.* **28**, 1876-1881.

Boothe, P. N. and B. J. Prelsey (1989) *Trends in sediment trace metal concentrations around six petroleum drilling platforms in the northwestern Gulf of Mexico.* In: *Proceedings, 1988 International Conference on Drilling Wastes*, Calgory, Canada, 5-8 April, p. 3-21.

Bouma, A. H. (1969) *Methods for the Study of Sedimentary Structures.* Wiley-Interscience, New York, 458 p.

Briggs S.A. (1992) *Basic Guide to Pesticides: Their Characteristics and hazards.* Taylor & Francis. 283 pp.

Buchanan D. and Corcoran B. (1959) Sealed tube combustions for determination of ^{14}C and total carbon. *Analyt. Chem.* **31**, 1635-1638.

Caron G., Suffet I.H., and Belton T. (1985) Effect of dissolved organic carbon on the environmental distribution of nonpolar organic compounds. *Chemosphere* **14**, 993-1000.

Christensen E.R. and Zhang X. (1993) Sources of polycyclic aromatic hydrocarbons to Lake Michigan determined from sedimentary records. *Environ. Sci. Technol.* **27**, 139-146.

Colombo J.C., Pelletier E., Brochu C., Khalil M., and Cataggio J.A. (1989) Determination of hydrocarbon sources using n-alkane and polyaromatic hydrocarbon distribution indexes. Case study: Rio de la Plata Estuary, Argentina. *Environ. Sci. Technol.* **23**, 888-894.

Comba M.E., Norstrom R.J., Macdonald C.R., and Kaiser K.L.E. (1993) A lake Ontario-Gulf of St. Lawrence dynamic mass budget for mirex. *Environ. Sci. Technol.* **27**, 2198-2206.

Cotham W.E. and Bidleman T.F. (1992) Laboratory investigations of the partitioning of organochlorine compounds between the gas phase and the atmosphere aerosols on glass fiber filters. *Environ. Sci. Technol.* **26**, 469-478.

Curtis, W. F., J. K. Culbertson and E. D. Chase (1973) *Fluvial sediment discharge to the ocean from the conterminous* United States. U.S. Geolog. Surv. Circular 670, 17 p.

Dobbs R.A., Wang L., and Govind R. (1989) Sorption of toxic organic compounds on wastewater solids: Correlation with fundamental properties. *Environ. Sci. Technol.* **23**, 1092-1097.

Dowgiallo M.J. (1994) Introduction. In: *Coastal Oceanographic Effects of Summer 1993 Mississippi River Flooding* (Ed. Dowgiallo M.J.). Special NOAA Report. NOAA Coastal Ocean Office/National Weather Service, Silver Spring, MD. pp 1-2.

Eadie, B. J., J. A. Robbins, P. Blackwelder, S. Metz, J. H. Trefry, B. McKee and T.A. Nelson (1990) *A retrospective analysis of nutrient enhanced coastal ocean productivity in sediments from the Louisiana continental shelf.* In: *Proceedings of a NECOP Workshop*, held in College Station, texas

Engst R., Macholz R.M., and Kujawa M. (1977) Recent state of lindane metabolism. *Residue Rev.* **68**, 59-66.

EPA (1980*) A water quality success story: Lower Houston Ship Channel and Galveston Bay, Texas.* U.S. Environmental Protection Agency, Office of Water Planing and Standards, Washington, DC.

Ergin M., Bodur M.N., Ediger D., Ediger V., and Yilmaz A. (1993) Organic carbon distribution in the surface sediments of the Sea of Marmara and its control by the inflows from adjacent water masses. *Mar. Chem.* **41**, 311-326.

Farrington J.W. (1991) Biogeochemical processes governing exposure and uptake of organic pollutant compounds in aquatic organisms. *Environ. Health Perspectives* **90**, 75-84.

Farrington J.W., Goldberg E.D., Risebrough R.W., Martin J.H., and Bowen V.T. (1983) U.S. "Mussel Watch" 1976-1978: An overview of the trace-metal, DDE, PCB, hydrocarbon, and artificial radionuclide data. *Environ. Sci. Technol.* **17**, 490-496.

Fellin P., Barrie L.A., Dougherty D., Toom D., Muir D., Grift N., Lockhart L., and Billeck B. (1996) Air monitoring in the artic: Results for selected persistent organic pollutants for 1992. *Environ. Tox. and Chem.* **15**, 253-261.

Flynn, W.W. (1968) *The determination of low levels of Polonium-210 in environmental materials. Anal. Chim. Acta, 43:* 221-227.

GERG (1995) *Standard Operating Procedure.* NOAA Status and Trends Mussel Watch Program--Analytical Methods. Geochemical and Environmental Research Group, Texas A&M University. pp. SOP-ST02, SOP-ST04.

Ghadiri H. and Rose C.W. (1991) Sorbed chemical transport in overland flow: I. A nutrient and pesticide enrichment mechanism. *J. Environ. Qual.* **20**, 628-633.

Goolsby D.A. (1994) Flux of herbicides and nitrate from the Mississippi River to the Gulf of Mexico. In: *Coastal Oceanographic Effects of Summer 1993 Mississippi River Flooding* (Ed. Dowgiallo M.J.). Special NOAA Report. NOAA Coastal Ocean Office/National Weather Service, Silver Spring, MD. pp 32-35.

Gschwend P.M. and Wu S.-C. (1985) On the constancy of sediment-water partition coefficients of hydrophobic organic pollutants. *Environ. Sci. Technol.* **19**, 90-96.

Heaps N.S. (1986) *Three-dimensional coastal ocean models.* Amer. Geophys. Union. Washington, D.C.

Ichiye, T., Mungall C., Inoue M. and Horne D. (1978) Gulf of Mexico dispersion calculations. U.S. Department of Commerce, NOAA. Grant 04-7-158-44060, Ref. 78-10-T. Department of Oceanography, Texas A&M University. 49 pp.

Jenkins W.A. and Gibbs R.J. (1988) Settling and dispersion of ocean dumped seawage sludge. *Mar. Poll. Bull.* **19**, 120-124.

Jensen, R.W, R. W. Kiesling, and F. S. Shipley (Eds.) (1993) *Proceedings of the Second State of the Bay Symposium, Feb. 4-6, 1993*, Galveston Bay National Estuary Program, GBNEP-23, Clear Lake, TX, 392 p.

Johns W.D. and Grim R.E. (1958) Clay mineral composition of recent sediments from the Mississippi River Delta. *J. Sediment. Petrol.* **28**, 186-199.

Jones J.I. O'Brien J.J. and Hsueh Y. (1973) Physical Oceanography of the Northeast Gulf of Mexico and Florida continental shelf area. In: *A Summary of Knowledge of the Eastern Gulf of Mexico* (Eds. Jones J.I., Ring R.E., Rinkel M.O., and Smith R.E.). The State University System of Florida, Institute of Oceanography. pp IIB-1-69.

Kennicutt M.C.II, Sericano J.L., Wade T.L., Alcazar F., and Brooks J.M. (1987) High molecular weight hydrocarbons in Gulf of Mexico continental slope sediments. *Deep-Sea Res.* **34**, 403-424.

Koide M., Soutar A., and Goldberg E.D. (1972) Marine geochronology with ^{210}Pb. *Earth Planet. Sci. Lett.* **14,** 442-446.

Kressin, I.K. (1977) *Electroposition of Plutonium and Americium for high resolution alpha spectrometry. Anal. Chem., 49*: 842-846.

Laflamme R.E. and Hites R.A. (1978) The global distribution of polycyclic aromatic hydrocarbons in recent sediments. *Geochim. Cosmochim. Acta* **42**, 289-303.

Lane D.A., Johnson N.D., Hanley M.-J.J., Schroeder W.H., and Ord D.T. (1992) Gas- and particle-phase concentrations of a-hexachlorocyclohexane, g-hexachlorocyclohexane, and hexachlorobenzene in Ontario air. *Environ. Sci. Technol.* **26**, 126-133.

Lankford, R.R. and J.J.W. Rogers (1969*) Holocene Geology of the Galveston Bay Area.* Houston Geological Society, Houston, TX, 141 p.

Lee M.L., Prado G.P., Howard J.B., and Hites R.A. (1977) Source identification of urban airborne polycyclic aromatic hydrocarbons by GC/MS and HRMS. *Biomed. Mass. Spec.* **4**, 182-186.

Leifeste, D.K (1974) *Dissolved solids discharge to the oceans from the conterminous United States.* U. S. Geol. Survey. Circ. 685, 8 p.

Majewski M.S., Glotfelty D.E., Tha-Paw-U K., and Seiber J.N. (1990) A field comparison of several methods for measuring pesticide evaporation rates from soil. *Environ. Sci. Technol.* **24**, 1490-1497.

Matsumura F. (1985) *Toxicology of Insecticides.* 2nd. Edition. Plenum Press. 598 pp.

McAllister R.F. Jr. (1964) Clay minerals from west Mississippi Delta marine sediments. In: *Papers in Marine Geology, Shepard Commemorative Volume* (Ed. Miller R.L.). MacMillan. pp 457-473.

Melnikov N.N., Gunther F.A., and Gunther J.D. (1971) *Chemistry of Pesticides.* (English Trans. Busbey R.L.) Springer-Verlag. 1-77 pp.

Merrell W.J. and Morrison J.M. (1981) On the circulation of the western Gulf of Mexico with observations from April 1978. *J. Geophys. Res.* **86**, 4181-4185

Muir D.C.G., Norstrom R.J., and Simon M. (1988) Organochlorine contaminants in Arctic marine food chains: Accumulation of specific polychlorinated biphenyls and chlordane-related compounds. *Environ. Sci. Technol.* **22**, 1071-1079.

Müller M.D., Schlabach M., and Oehme M. (1992) Fast and precise determination of a-hexachlorohexane enantiomers in environmental samples using chiral high-resolution gas chromatography. *Environ. Sci. Technol.* **26**, 566-569.

Nihoul J.C.J. and Jamart B.J. (1987) *Three-dimensional models of marine and estuarine dynamics.* Elsevier, Amsterdam. 437 pp.

NOAA (1989) *Galveston Bay: Issues, resources, status and management.* NOAA Estuary-of-the-Month Seminar Series No. 13, Washington, DC.

Norstrom R.J., Simon M., Muir D.C.G., and Schweinsburg R.E. (1988) Influence of organic cosolvents on leaching of hydrophobic organic chemicals through soils. *Environ. Sci. Technol.* **22**, 1063-1071.

Olsen C.R., Cutshall N.H., and Larsen I.L. (1982) Pollutant-particle associations and dynamics in coastal marine environments: A review. *Mar. Chem.* **11**, 501-533.

Pennington W., Cambray R.S., and Fisher E.M. (1973) Observations on lake sediments using fall-out Cs-137 as a tracer. *Nature* **242**, 324-326.

Pequegnat W.E. (1972) A deep bottom current on the Mississippi Cone. In: *Contributions on the Physical Oceanography of the Gulf of Mexico*, Vol 2 (Eds. Capurro L.R.A. and Reid J.L.). Texas A&M University, Oceanographic Studies. pp 65-87.

Pereira W.E., Rostad C.E., and Leiker T.J. (1990) Mechanisms of pollutant transport in the Hudson Estuary. *The Science of the Total Environment* **97/98**, 41-53.

Peters K.E. and Moldowan J.M. (1993) *The Biomarker Guide. Interpreting Molecular Fossils in Petroleum and Ancient Sediments.* Prentice Hall, Englewood Cliffs, New Jersey. pp 170-173.

Pfalum R.C. (1982) Distribution of cesium-137 in the Mississippi Delta. M.S. Thesis Texas A&M University. College Station, Texas. 123 pp.

Pflaum, R.C. (1982) *Distribution of Cesium-137 in the Mississippi Delta.* M.S. thesis, Texas A&M University, College Station, TX

Presley B.J., Trefry J.H., and Shokes R.F. (1980) Heavy metal input to Mississippi Delta sediments. *Water, Air, and Soil Poll.* **13**, 481-494.

Presley, B. J., R. J. Taylor, and P. N. Boothe (1990) *Trace metals in Gulf of Mexico oysters. Science of the Total Environment, 97/98*: 551-593.

Presley, B.J., J. H. Trefry, and R. F. Shokes (1980) Heavy metal inputs to Mississippi Delta sediments: A historical view. *Water, Air and Soil Pollut., 13*, 481-494.

Rijnaarts H.H.M., Bachmann A., Jumelet J.C., and Zehnder A.J.B. (1990) Effect of desorption and intraparticle mass transfer on the aerobic biomineralization of a-hexachlorocyclohexane in a contaminated calcareous soil. *Environ. Sci. Technol.* **24**, 1349-1354.

Roberts. T.R., Klein W,, Still G.G., Kearney P.C., Drescher N., Desmoras J., Esser H.O., Aharonson N., and Vonk J.W. (1984) Non-extractable pesticide residues in soils and plants. *Pure & Appl. Chem.* **56**, 945-956.

Rotter, R. J. (1985) *^{210}Pb and ^{239,240}Pu in nearshore Gulf of Mexico sediments.* Ph.D. Thesis, Texas A&M University, College Station, TX, 157 p.

Sackett W.M. and Cook G. (1969) Uranium geochemistry of the Gulf of Mexico. *Trans. Gulf Coast Assoc. Geol. Soc.* **19**, 233-238.

Sanders G., Jones K.C., Hamilton-Taylor J., and Dörr H. (1992) Historical inputs of polychlorinated biphenyls and other organochlorines to a dated lacustrine sediment core in rural England. *Environ. Sci. Technol.* **26**, 1815-1821.

Sanford L.P. (1994) Wave-forced resuspension of upper Chesapeake Bay muds. *Estuaries* **17**, 148-165.

Santana-Casiano J.M. and González-Dávila M. (1992) Characterization of the sorption and desorption of lindane to chitin in seawater using reversible and resistant components. *Environ. Sci. Technol.* **26**, 90-95.

Santschi, P. H., S. Nixon, M. Pilson and C. Hunt (1984) *Accumulation of sediments, trace metals (Pb, Cu) and hydrocarbons in Narragansett Bay, Rhode Island. Est. Coast. Shelf Sci., 19*(4): 427-450.

Santschi, P. H., Y.-H. Li, J. Bell, D. Adler, M. Amdurer and U. P. Nyffeler (1983) *The relative mobility of natural (Th, Pb, Po) and fallout (Pu, Cs. Am) radionuclides in the coastal marine environment: Results from model ecosystems (MERL) and Narragansett Bay studies. Geochim. Cosmochim. Acta, 47,* 201-310.

Santschi, P. H., Y.-H. Li, J. Bell, R. M. Trier, K. Kawtaluk (1980) *Plutonium in the coastal marine environment. Earth and Planet. Sci. Lett., 51*: 248-265.

Santschi, P.H. (1986) *Radionuclides as tracers for sedimentation and remobilization processes in the ocean and in lakes.* In: *Sediments and Water Interactions*, P.G. Sly, ed., Springer Verlag, 435-447.

Scafe D.W. and Kunze G.W. (1971) A clay mineral investigation of six cores from the Gulf of Mexico. *Mar. Geol.* **10**, 69-85.

Schantz M.M., Benner B.A. Jr., Chesler S.N., Christensen R.G., Koster B.J., Kurz K.J., Parris R.M., and Wise S.A. (1993) NIST methods for certification of SRM 1941 and SRM 1974. In: *Sampling and Analytical Methods of the National Status and Trends Program National Benthic Surveillance and Mussel Watch Project 1984-1992: Comprehensive Descriptions of Trace Organic Analytical Methods*, Vol. IV (Eds. Lauenstein G.G. and Cantillo A.Y.). National Status and Trends Program for marine environmental quality. Technical Memorandum NOS ORCA 71, National Oceanic and Atmosphere Administration, Department of Commerce, United States of America. pp 165-182.

Schink D.R., Guinasso N.L. Jr., and Fanning K.A. (1975) Processes affecting the concentration of silica at the sediment-water interface of the Atlantic Ocean. *J. Geophys. Res.* **80**, 3013-3031.

Schmitz W.J., Wright W.R. and Hogg N.G. (1987) Physical Oceanography. In: *The Marine Environment of the U.S. Atlantic Continental Slope and Rise* (Eds. Milliman J.D. and Wright W.R.). Columbia University Press. pp 27-55.

Scott R.M. (1981) Radionuclides in the Gulf of Mexico. In: *Proc. of a Symposium on Environmental Research needs in the Gulf of Mexico (GOMEX).* Key Biscayne, Florida, 30 Sept.-5 Oct., 1979. **Vol. IIB**, 187-223.

Scott, M. R., P. F. Salter, and J. E. Halverson (1983) *Transport and deposition of Plutonium in the ocean: Evidence from Gulf of Mexico sediments. Earth Planet. Sci. Lett., 63,* 202-222.

Sheldon R.W., Prakash A., and Sutcliffe W.H. Jr. (1972) The size distribution of particles in the ocean. *Limnology and Oceanog.* **17**, 327-340.

Sherwood C.R., Butman B., Cacchione D.A., Gross T.F., Sternberg R.W., Wiberg P.L., and Williams III A.J. (1994) Sediment-transport events on the northern California continental shelf during the 1990-1991 STRESS experiment. *Continental Shelf Res.* **14**, 1063-1099.

Shokes R.F. (1976) Rate-dependent distributions of lead-210 and interstitial sulfate in sediments of the Mississippi River Delta. *Technical Report, Reference 76-1-T. Office of Naval Research.* Department of Oceanography, Texas A&M University, College Station, Texas. 122 pp.

Shokes, R. F., (1976) *Rate dependent distributions of lead-210 and interstitial sulfate in sediments of the Mississippi River Delta.* Ph.D. dissertation, Texas A&M University, College Station, TX.

Sporstøl S., Gjøs N., Lichtenthaler R.G., Gustavsen K.O., Urdal K., Oreld F., and Skel J. (1983) Source identification of aromatic hydrocarbons in sediments using GC/MS. *Environ. Sci. Technol.* **27**, 530-538.

Stanley, D.W. (1992*) Historical Trends. Water Quality and Fisheries: Galveston Bay.* U.S. Dept. of Commerce, NOAA Coastal Ocean Office, National Ocean Pollution Program, UNC Sea Grant Report UNC-SG-92-03, Raleigh, NC.

Teal J.M., Farrington J.W., Burns K.A., Stegeman J.J., Tripp B.W., Woodin B., and Phinney C. (1992) The West Falmouth oil spill after 20 years: Fate of fuel oil compounds and effects on animals. *Mar. Poll. Bull.* **24**, 607-614.

Trefry J.H. (1977) The transport of heavy metals by the Mississippi River and their fate in the Gulf of Mexico. Ph.D. Diss. Texas A&M University, College Station, Texas. 223 pp.

Trefry J.H. and Presley B.J. (1976) Heavy metal treansport from the Mississippi River to the Gulf of Mexico. In: *Marine Pollutant Transfer* (Eds. Windom H.L. and Duce R.A.). Lexington Books. pp 40-77.

Trefry J.H., Metz S., Trocine R.P., and Nelson T.A. (1985) A decline in lead transport by the Mississippi River. *Sci.* **230**, 439-441.

Trefry, J. H., S. Metz, R. P. Trocine, and T. A. Nelson (1985) *A decline in lead transport by the Mississippi River. Science, 230*: 439-441.

Valette-Silver, N. (1992) *Historical reconstruction of contamination using sediment cores: A review.* NOAA Tech. Memo NOS/ORCA65, Rockville, Md.

van Esch G.J. (1992) *Alpha- and Beta-hexacyclohexanes.* Environmental Health Criteria 123. World Health Organization. 170 pp.

Van Heerden, I.L. and H. H. Roberts (1988) *Facies development of the Atchafalaya Delta, Louisiana: A modern bayhead delta. Bull. Amer. Assoc. Petrol. Geol., 72*: 439-453.

Venkatesan M.I. (1988) Organic geochemistry of marine sediments in Antarctic region: Marine lipids in McMurdo Sound. *Org. Geochem.* **12**, 13-27.

Wade T.L., Atlas E.L., Brooks J.M., Kennicutt M.C., Fox R.G., Sericano J., Garcia-Romero B., and Defreitas D. (1988) NOAA Gulf of Mexico Status and Trends Program: Trace organic contaminant distribution in sediments and oysters. *Estuaries* **11**, 171-179.

Wade T.L., Brooks J.M., Kennicutt M.C., McDonald T.J., Sericano J., and Jackson T.J. (1993) GERG trace organics contaminant analytical techniques. In: *Sampling and Analytical Methods of the National Status and Trends Program National Benthic Surveillance and Mussel Watch Project 1984-1992: Comprehensive Descriptions of Trace Organic Analytical Methods*, Vol. IV (Eds. Lauenstein G.G. and Cantillo A.Y.). National Status and Trends Program for marine environmental quality. Technical Memorandum NOS ORCA 71, National Oceanic and Atmosphere Administration, Department of Commerce, United States of America. pp 121-141.

Wade, T. L., B. Garcia-Romero and J. M. Brooks (1988) *Tributyltin Contamination of Bivalves from U. S. Coastal Estuaries. Environmental Science and Technology, 22*: 1488-1493.

Wade, T.L. and J. G. Quinn (1979) *Geochemical distribution of hydrocarbons in sediments from Mid-Narragansett Bay, Rhode Island. Organic Geochemistry, 1*: 157-167.

Wade, T.L., E. L. Atlas, J. M. Brooks, M. C. Kennicutt II, R. G. Fox, J. Sericano, B. Garcia-Romero and D. DeFreitas (1988) *NOAA Gulf of Mexico Status and Trends Program: Trace Organic Contaminant Distribution in Sediments and Oysters. Estuaries, 11*, 171-179.

Walsh J.J. (1988) *On the Nature of Continental Shelves.* Academic Press, Inc. pp 57-111.

Wang J.D., Blumberg A.F., Butler H.L., and Hamilton P. (1990) Transport prediction in partially stratified tidal water. *J. Hydraulic Enginnering* **116**, 380-396.

Wang Z., Fingas M., and Sergy G. (1994) Study of 22-year-old Arrow oil samples using biomarker compounds by GC/MS. *Environ. Sci. Technol.* **28**, 1733-1746.

Wedemeyer G. (1967) Dechlorination of 1,1,1-trichloro-2,2-bis(p-chlorophenyl) ethane by *Aerobacter aerogenes*. I. Metabolic products. *Appl. Microbiol.* **15**, 569-574.

Wells, F. C. (1980) *Hydrology and water quality of the lower Mississippi River.* Louisiana Dept. Pub. Works, U.S. Geol. Survey Tech. Report 21, Baton Rouge, LA.

WHO (1993) Environmental Health Criteria 140. Polychlorinated biphenyls and terphenyls (Second Edition). World Health Organization, Geneva.

Wolfe D.A., Hameedi M.J., Galt J.A., Watabayashi G., Short J., O'Claire C.O., Rice S., Michel J., Payne J.R., Braddock J., Hanna S., and Sale D. (1994) The fate of the oil spilled from the Exxon Valdez: The mass balance is the most complete and accurate of any major oil spill. *Environ. Sci. Technol.* **27**, 699-708.

Yunker M.B., Macdonald R.W., Cretney W.J., Fowler B.R., and McLaughlin F.A. (1993) Alkane, terpene, and polycyclic aromatic hydrocarbon geochemistry of the Mackenzie River and Mackenzie shelf: Riverine contributions to Beaufort Sea coastal sediment. *Geochim. Cosmochim. Acta* **57**, 3041-3061.

Zhang X., Christensen E.R., and Gin M.F. (1993b) Polycyclic aromatic hydrocarbons in dated sediments from Green Bay and Lake Michigan. *Estuaries* **16**, 628-652.

Zhang X., Christensen E.R., and Yan L.-Y. (1993a) Fluxes of polycyclic aromatic hydrocarbons to Green Bay and Lake Michigan sediments. *J. Great Lakes Res.* **19**, 429-444.

Appendix I

NOAA HISTORICAL TRENDS

Mississippi River Delta Core Data

PAHs Data

Mississippi Delta Core
PAH

File No.	Section	TOC	Naphthalene	C1 Naphthalenes	C2 Naphthalenes	C3 Naphthalenes	C4 Naphthalenes	Biphenyl	Acenaphthylene	Acenaphthene	Fluorene	C1 Fluorenes	C2 Fluorenes	C3 Fluorenes
L8732	0 - 1 cm	1.4	26.1	35.5	43.6	54.3	42.3	7.5	3.4	2.5	5.1	8.1	15.9	26.4
L8733	1 - 2 cm	1.5	21.2	32.7	33.1	42.1	32.1	5.4	2.7	1.5	4	6.3	11.8	19.5
L8734	2 - 3 cm	1.5	76	47.1	40.5	45.5	30.8	13.9	2.9	2.6	5.4	7.9	9.5	16.4
L8735	3 - 4 cm	1.5	20.19	31.18	25.09	17.12	13.47	5.86	3.61	1.84	4.11	4.03	7.18	8.68
L8737	5 - 6 cm	1.5	18.51	35.66	27.27	22.13	17.52	6.72	4.69	1.88	4.26	4.84	10.38	17.04
L8739	7 - 8 cm	1.5	15.85	32.56	28.74	27.53	17.22	5.57	3.95	1.96	4.71	7.37	16.11	14.82
L8741	9-10 cm	1.1	13.81	25.65	22.93	24.2	15.33	4.42	4.52	1.94	4.68	8.69	14.71	15.63
L8743	11-12 cm	1.3	19.28	36.34	29.33	23.83	19.95	6.81	8.02	1.98	4.68	5.36	10.81	12.77
L8745	13-14 cm	1.3	18.37	35.14	29.71	24.09	19.5	7.22	10.98	1.79	5.01	6.34	11.32	12.04
L8747	15-16 cm	1.3	20.06	35.86	30.66	27.79	21.09	7.33	12.37	1.72	5.21	5.55	11.07	18.24
L8749	17-18 cm	1.3	20.4	36.96	30.96	26.92	20.66	7.91	14.35	1.92	5.76	7.91	12.68	13.32
L8751	19-20 cm	1.2	20.35	37.62	33.03	26.51	20.54	8.47	17.51	1.72	6.19	7.22	13.32	15
L8753	21-22 cm	1.2	20.75	36.74	29.4	26.78	19.38	8.33	17.25	1.68	5.74	6.37	9.84	11.92
L8755	23-24 cm	1.2	10.1	18.61	17.42	20.28	13.11	4.92	7.28	1	4.02	6.7	13.13	15.01
L8757	25-26 cm	1.2	17.71	35.72	29.19	28.05	19.69	9.56	7.08	1.62	5.34	6.79	15	16.08
L8759	27-28 cm	1.1	16.86	32.18	29.29	27.66	19.07	9.17	5.88	1.58	5.58	7.28	13.12	11.96
L8761	29-30 cm	1.7	18.98	37.71	31.9	29.28	17.75	9.77	4.22	1.39	5.39	6.58	12.81	15.81
L8763	31-32 cm	1.1	18.25	34.64	32.32	30.33	18.03	7.86	2	1.35	4.41	8.89	14.68	14.8
L8765	33-34 cm	1.0	13.02	21.91	16.99	14.8	10.97	5.18	3.02	1.18	3.28	4.93	7.85	9.88
L8767	35-36 cm	1.0	9.1	15.82	12.51	13.52	7.78	2.87	2.54	0.83	2.47	2	5.05	7.17
L8769	37-38 cm	0.98	9.39	15.17	11.59	10.79	5.91	2.6	2.17	0.74	2.02	1.64	5.08	6.03
L8771	39-40 cm	0.99	8.66	12.35	9.52	8.75	5.37	2.54	1.71	0.46	2.06	2.57	5.63	6.87
L8773	41-42 cm	1.0	8.4	10.7	11.4	16.3	11.9	1.9	1.5	0.7	1.6	2.4	5.2	7
L8775	43-44 cm	1.0	9.1	9.8	10.8	14.3	9.8	2.4	1.3	1.1	1.9	2.6	4.4	6.5
L8777	45-46 cm	0.96	7.6	8.7	11.8	14.7	10.9	1.7	1.4	1.2	1.5	3	4.4	8.4
L8779	47-48 cm	1.0	11.3	14.2	15.3	20.5	14	2.9	1.5	0.8	1.9	3.7	6.7	11.6
L8781	49-50 cm	0.96	6.6	9.3	10.1	14.6	10.6	1.5	1.1	0.8	1.8	2.7	5.6	6.9
L8783	51-52 cm	0.97	8	9.7	11.1	15.2	11	1.8	1.2	0.6	1.6	2.2	5.2	7.4
L8785	53-54 cm	0.97	8.2	10	11	13.3	9.6	1.8	1.3	0.6	1.7	2.4	5.3	5.4
L8787	55-56 cm	0.96	6.9	8.7	8.2	11.1	10.5	1.2	1.5	1	1.7	2	3.6	7.2
L8789	57-58 cm	1.0	6.6	7.9	9.4	14.1	9.7	1.4	1.6	0.7	1.5	1.7	2.6	2.4
L8791	59-60 cm	1.2	12.97	7.41	9.51	7.51	7.38	1.72	2.32	0.63	1.93	3.92	6.13	9.59
L8793	61-62 cm	0.96	6.6	7.7	9	10.8	10.8	1.6	1.6	0.9	1.5	1.6	5.1	4.4
L8797	65-66 cm	0.91	6.47	9.84	8.12	9.11	5.37	1.8	1.58	0.62	1.5	1.75	3.31	6.51
L8801	69-70 cm	0.87	5.12	7.53	6.51	6.27	4.71	1.53	1.2	0.6	1.17	1.71	2.74	5.59
L8805	73-74 cm	0.89	5.04	7.71	5.89	8.96	5.94	1.22	1.24	0.58	1.2	1.5	3.87	6.43
L8809	77-78 cm	0.89	4.82	7.71	6.25	7.63	5.17	1.33	1.3	0.44	1.2	1.59	3.85	9.25
L8813	81-82 cm	0.92	4.01	7.38	11.57	14.5	11.8	1.76	0.54	0.89	1.14	2.7	5.17	

Mississippi Delta Core
PAH

File No.	Section	Phenanthrene	Anthracene	C1 Phenanthrene-Anthracene	C2 Phenanthrene-Anthracene	C3 Phenanthrene-Anthracene	C4 Phenanthrene-Anthracene	Dibenzothiophene	C1 Dibenzothiophene
L8732	0 - 1 cm	21.4	4.1	21.9	28.1	19.8	15.1	2.5	4.6
L8733	1 - 2 cm	17.1	3.3	18.3	21.1	16.5	10.3	1.6	3.3
L8734	2 - 3 cm	29.6	3.1	18.8	19.3	14.6	9.4	1.8	3.3
L8735	3 - 4 cm	22.52	4.95	20.81	24.99	17.25	12.8	2.53	5.12
L8737	5 - 6 cm	21.62	4.76	22.62	24.58	16.8	11.56	2.25	4.51
L8739	7 - 8 cm	23.61	4.91	28.49	26.94	20.34	11.51	2.56	4.83
L8741	9-10 cm	21.52	4.27	28.06	24.17	17.52	17.5	2.14	5.96
L8743	11-12 cm	25.62	4.23	25.69	27.46	20.67	12.57	2.35	3.83
L8745	13-14 cm	25.33	5.69	25.18	25.43	18.86	10.94	2.54	4.7
L8747	15-16 cm	26.26	6.48	27.59	29.15	18.44	15.46	2.51	4.99
L8749	17-18 cm	28.15	6.72	27.05	29.26	22.86	16.4	2.54	5.35
L8751	19-20 cm	27.48	6.86	27.85	28.56	19.03	16.23	2.58	5.09
L8753	21-22 cm	25.24	6.21	25.73	27.46	16.03	10.67	2.49	4.24
L8755	23-24 cm	18.99	4.23	25.12	22.31	17.03	10.27	2.24	5.14
L8757	25-26 cm	26.06	6.45	29.89	32.24	21.55	17.37	2.68	4.89
L8759	27-28 cm	22.37	5.78	28.44	29.1	17.28	15.88	2.4	4.82
L8761	29-30 cm	26.54	5.72	29.63	31.16	21.84	16.2	2.64	4.76
L8763	31-32 cm	22.61	4.1	27.49	25.67	17.02	11.28	2.24	4.96
L8765	33-34 cm	16.26	3.64	16.87	17.48	11.66	11.32	1.34	3.05
L8767	35-36 cm	12.4	2.79	11.76	12.47	9.08	7.84	1.18	1.79
L8769	37-38 cm	10.74	2.64	10.61	10.61	7.48	6.75	1.1	1.65
L8771	39-40 cm	9.46	2.19	9.41	9.29	7.39	6.55	0.93	1.65
L8773	41-42 cm	6.8	1.4	7.5	8.8	6.3	5.3	0.8	1.3
L8775	43-44 cm	6.8	1.5	7.2	7.4	6.2	5	0.6	1.3
L8777	45-46 cm	7.1	1.7	9	8	8.1	5.3	1	1.4
L8779	47-48 cm	8.9	2.1	9.3	11.1	8.9	7.1	1	1.6
L8781	49-50 cm	7.2	1.4	8.2	8.5	7.7	6.2	0.8	1.4
L8783	51-52 cm	6.2	1.2	7	8.8	6.3	5.3	0.9	1.1
L8785	53-54 cm	7.4	1.9	8.7	9.1	8.1	6.1	0.9	1.3
L8787	55-56 cm	6.4	1.5	8.6	7.6	5.8	5.8	0.6	1.2
L8789	57-58 cm	6.3	1.7	7.7	7.3	5.9	3.4	0.6	1.1
L8791	59-60 cm	8.53	2.44	10.99	12.43	10.89	6.14	1.07	1.89
L8793	61-62 cm	5.8	1.2	6.8	7.1	7.1	6.9	0.4	0.9
L8797	65-66 cm	7.91	2.18	8.45	9.74	7.75	5.43	0.85	1.47
L8801	69-70 cm	6.75	1.83	6.82	7.54	5.77	3.38	0.64	0.96
L8805	73-74 cm	6.04	1.41	7.63	8.77	6.41	5.06	0.67	1.6
L8809	77-78 cm	6.18	1.24	6.76	8.32	6.58	4.92	0.68	1.02
L8813	81-82 cm	5.11	1.14	7.45	9.63	8.92	7.35	0.69	

Mississippi Delta Core
PAH

File No.	Section	C2 Dibenzothiophene	C3 Dibenzothiophene	Fluoranthene	Pyrene	C1 Fluoranthenes-Pyrenes	Benzo(a)Anthracene	Chrysene	C1 Chrysenes	C2 Chrysenes	C3 Chrysenes	C4 Chrysenes
L8732	0 - 1 cm	10.9	9.4	25.4	25.7	25.6	12.4	19.1	16.1	12.8	0.9	2.9
L8733	1 - 2 cm	6.1	6	23.1	20.9	20.2	13.2	17	11.5	10.5	1.1	2.8
L8734	2 - 3 cm	6	5.9	23.7	19	20.3	12.5	16.9	10.9	10.9	1	2.2
L8735	3 - 4 cm	7.58	8.85	29.79	32.86	28.77	16.16	15.78	17.84	17.05	1.86	7.3
L8737	5 - 6 cm	5.95	8.21	26.52	29.2	27.27	14.06	17.92	18.66	16.25	2.4	8.88
L8739	7 - 8 cm	8.55	11.1	25.76	33.22	31.09	17.27	20.48	27.44	26.98	3.28	7.71
L8741	9-10 cm	8.51	9.51	24.1	32.93	27.99	16.04	19.28	26.8	28.83	3.16	7.63
L8743	11-12 cm	6.72	7.37	28.24	37.29	28.94	16.96	12.59	14.69	17.05	2.05	6.28
L8745	13-14 cm	7.21	6.06	30.42	41.18	26.45	17.41	12.51	14.99	14.27	1.68	5.17
L8747	15-16 cm	6.39	7.64	31.37	44.43	32.58	15.41	17.67	18.65	20.59	2.42	6.96
L8749	17-18 cm	8.27	8.01	33.3	49.56	31.76	16.58	14.83	20.87	25.13	2.43	9.69
L8751	19-20 cm	8.32	7.95	34.91	55.35	31.99	17.07	22.78	21.74	27.97	2.7	9.58
L8753	21-22 cm	6.39	5.95	31.36	51.05	29.09	16.37	17.79	21.22	22.37	2.06	7.1
L8755	23-24 cm	6	7.16	22.09	34.83	27.16	14.61	19.84	24.67	20.33	2.18	9.83
L8757	25-26 cm	7.77	8.07	25.78	34.96	33.12	15.71	14.84	21.51	22.34	2.23	7.41
L8759	27-28 cm	6.44	7.3	24.79	28.55	31.16	16.67	20.02	24.41	26.12	2.91	6.46
L8761	29-30 cm	5.76	7.45	24.88	28.1	31.04	16.65	14.54	22.16	18.11	2.26	5.97
L8763	31-32 cm	6.8	7.36	20.18	21.74	24.6	13.18	16.37	22.12	19.09	1.73	4.83
L8765	33-34 cm	3.59	4.18	18.85	19.68	20.61	12.31	11.11	14.28	14.38	1.1	4.91
L8767	35-36 cm	3.05	3.31	14.19	15.42	15.11	8.52	7.42	9.99	9.09	0.97	2.86
L8769	37-38 cm	2.76	3.96	12.95	13.24	14.53	7.5	7.95	10.03	10.18	0.81	2.47
L8771	39-40 cm	2.71	2.96	11.8	12.29	13.63	7.35	7.18	9.51	8.83	1	2.45
L8773	41-42 cm	3.1	2.5	9.3	9	11.3	5.4	8.3	7.2	4.4	0.6	0.8
L8775	43-44 cm	2.1	2.6	10.2	9.3	10.1	5.6	8.2	6.7	3.6	0.3	1.2
L8777	45-46 cm	3.1	3	10.6	10.8	12.6	5.7	8.6	8.2	4.6	0.6	1.2
L8779	47-48 cm	2.9	3.8	12.3	10.9	13.3	6.7	10.2	8.8	4.9	0.6	1.4
L8781	49-50 cm	2.4	2.6	10.5	9.1	11.2	6.4	7.9	8.2	5.2	0.5	1.3
L8783	51-52 cm	2.7	2	9.6	8.6	11.2	5.7	8.4	8.1	5	0.4	1.1
L8785	53-54 cm	2.4	2.4	11.5	10.8	13.3	6.9	8.5	8.3	5.5	0.3	1.5
L8787	55-56 cm	1.6	2.7	11.6	9.5	11.9	6.9	9	8.4	4.7	0.7	1.3
L8789	57-58 cm	1.5	2.9	11.1	10.3	13.4	6.9	9.3	9.9	6.1	0.5	1.2
L8791	59-60 cm	4.88	5.28	12.7	16.24	20.22	10.32	11.11	17.59	13.09	1.46	5.63
L8793	61-62 cm	2.4	2.7	10.3	10.2	12.8	6.5	8.5	8.8	5.7	0.4	1.4
L8797	65-66 cm	1.86	2.16	11.84	12.9	14.77	6.67	7.66	8.83	8.26	0.66	2.83
L8801	69-70 cm	1.62	2.21	9.79	11.95	12.9	6.48	6.49	7.75	7.4	0.87	1.82
L8805	73-74 cm	1.78	1.82	10.08	12.96	13.45	7.91	7.45	8.27	7.07	0.62	2.4
L8809	77-78 cm	2.02	2.09	9.06	12.83	14.18	6.21	5.56	8.28	6.98	0.99	2.25
L8813	81-82 cm			7.44	12.36	15.5	5.17	4.62	9.2	7.48		

Mississippi Delta Core
PAH

File No.	Section	Benzo(b)Fluoranthene	Benzo(k)Fluoranthene	Benzo(e)Pyrene	Benzo(a)Pyrene	Perylene	Indeno(1,2,3,c,d)Pyrene	Dibenzo(a,h,)Anthracene	Benzo(g,h,i)Perylene	Total PAHs	2 MethylNaphthalene
L8732	0 - 1 cm	17.5	17.5	17.3	20.6	25.7	14.8	2.7	18.7	658.5	20.7
L8733	1 - 2 cm	15.6	15.6	16.1	17.4	17.8	14.2	2.9	16.9	535	19.6
L8734	2 - 3 cm	15.7	15.7	14.8	17.3	20.7	13.5	2.4	16.2	623.3	28.1
L8735	3 - 4 cm	22.33	22.33	19.63	24.29	29.01	20.5	4.61	26.06	576.92	17.5
L8737	5 - 6 cm	23.13	23.13	20.69	23.57	30.65	21.79	5.22	27.38	599.83	20.35
L8739	7 - 8 cm	25.77	25.77	22.17	21.49	43.45	19.2	5.08	22.65	654.59	18.16
L8741	9-10 cm	27.68	27.68	21.57	21.23	33.37	19.2	4.66	24.77	629.22	15.21
L8743	11-12 cm	21.4	21.4	18.21	20.43	25.83	18.45	4.73	27.22	611.6	20.13
L8745	13-14 cm	20.5	20.5	17.75	19.52	26.24	17.6	4.74	26.72	604.86	19.76
L8747	15-16 cm	27.03	27.03	22.85	25.5	26.58	21.62	5.27	36.4	697.64	20.42
L8749	17-18 cm	29.52	29.52	23.43	29.65	28.08	26.64	6.94	43.41	747.62	21.14
L8751	19-20 cm	32.32	32.32	26.85	32.67	29.6	29.79	7.61	51.74	794.82	20.88
L8753	21-22 cm	27.27	27.27	22.9	26.43	25.51	22.98	6.03	42.79	698.67	20.6
L8755	23-24 cm	25.11	25.11	18.81	18.61	24.5	17.31	4.73	26.73	562.02	10.26
L8757	25-26 cm	24.48	24.48	19.55	22.96	30	20.16	6.06	29.33	673.72	20.31
L8759	27-28 cm	27.35	27.35	24.22	25.06	24.13	21.43	6.29	30.43	662.66	17.83
L8761	29-30 cm	24.02	24.02	19.5	23.46	21.67	19.47	5.99	25.1	648.56	21.18
L8763	31-32 cm	19.53	19.53	14.98	16.48	21.64	12.86	3.37	14.17	561.85	18.84
L8765	33-34 cm	17.05	17.05	13.95	17.69	20.36	15.36	3.97	17.81	422.51	12.68
L8767	35-36 cm	11.08	11.08	8.82	12.39	14.59	9.87	2.56	12.27	298.97	8.77
L8769	37-38 cm	11.03	11.03	9.04	11.33	18.25	9.59	2.51	12.02	277.64	8.55
L8771	39-40 cm	10.51	10.51	8.83	10.89	16.59	8.55	2.46	11.54	256.36	6.61
L8773	41-42 cm	7.6	7.6	6.7	8.3	11.7	6	1.5	6.9	223.7	5.9
L8775	43-44 cm	7.1	7.1	6.2	8.4	9.1	5.6	1.1	6.3	211.7	5.4
L8777	45-46 cm	7.1	7.1	7	8.6	11.3	6.2	1.1	7.3	230.3	4.9
L8779	47-48 cm	9.2	9.2	8.2	9.9	12.5	7.2	1	8.4	283.3	8
L8781	49-50 cm	7.3	7.3	7.2	9.5	9.1	6	1.3	6.9	223.8	5.1
L8783	51-52 cm	7.9	7.9	6.8	9	9.3	6.5	1.9	7.1	221.7	5.8
L8785	53-54 cm	7.5	7.5	7	9.8	9.1	5.4	1.2	7.2	231.1	5.7
L8787	55-56 cm	8.4	8.4	6.9	9.9	9.5	6.1	1.4	7.5	218	4.7
L8789	57-58 cm	8.6	8.6	7.4	11.1	9	7	1.2	7.9	218.5	4.2
L8791	59-60 cm	14.92	14.92	11.37	14.8	15.87	12.54	2.51	12.15	327.13	4.01
L8793	61-62 cm	7.4	7.4	7.2	10.4	8.2	6.5	1.4	7.7	215.5	4.2
L8797	65-66 cm	10.05	10.05	8.65	11.34	17.32	9.05	2.21	11.07	240.62	5.41
L8801	69-70 cm	9.01	9.01	7.74	10.04	16.33	7.73	1.81	9.35	202.34	4.1
L8805	73-74 cm	8.99	8.99	7.72	10.34	20.93	7.89	1.77	10.26	216.94	4.24
L8809	77-78 cm	8.36	8.36	7.38	9.29	23.31	7.77	1.9	10.01	209.76	3.88
L8813	81-82 cm	7.15	7.15	6.22	5.97	16.01	5.13	1.14	6.79	203.07	3.8

Mississippi Delta Core
PAH

File No.	Section	1 MethylNaphthalene	2,6 DimethylNaphthalene	1,6,7TrimethNaph	1 MethylPhenanthrene
L8732	0 - 1 cm	14.9	12.2	9.1	5.2
L8733	1 - 2 cm	13.1	9.5	6.9	4.2
L8734	2 - 3 cm	19	10.3	5.7	2.7
L8735	3 - 4 cm	13.68	9.73	6.88	5.05
L8737	5 - 6 cm	15.31	11.03	6.61	6.57
L8739	7 - 8 cm	14.4	11.94	9.77	4.43
L8741	9-10 cm	10.44	9.06	9.08	6.8
L8743	11-12 cm	16.21	11.13	7.66	6.54
L8745	13-14 cm	15.38	11.33	7.9	5.96
L8747	15-16 cm	15.44	10.83	7.86	5.26
L8749	17-18 cm	15.82	12.16	8.28	6.78
L8751	19-20 cm	16.74	11.71	8.88	7.47
L8753	21-22 cm	16.14	11.68	7.28	6.83
L8755	23-24 cm	8.35	6.97	6.98	6.05
L8757	25-26 cm	15.41	11.61	8.87	6.68
L8759	27-28 cm	14.35	11.46	8.16	7.52
L8761	29-30 cm	16.53	12.56	8.85	7.17
L8763	31-32 cm	15.8	10.48	9.08	6.87
L8765	33-34 cm	9.23	6.31	4.86	3.71
L8767	35-36 cm	7.05	4.45	3.63	2.83
L8769	37-38 cm	6.62	4.02	3	2.87
L8771	39-40 cm	5.74	3.55	2.8	2.26
L8773	41-42 cm	4.8	3	2.3	1.7
L8775	43-44 cm	4.4	2.8	2.2	1.7
L8777	45-46 cm	3.8	2.6	2.1	1.9
L8779	47-48 cm	6.2	3.5	3.2	1.8
L8781	49-50 cm	4.2	2.4	1.9	1.8
L8783	51-52 cm	3.9	2.6	2.1	1.3
L8785	53-54 cm	4.3	2.6	1.8	1.9
L8787	55-56 cm	4	2.5	1.6	1.6
L8789	57-58 cm	3.7	2.2	1.9	1.6
L8791	59-60 cm	3.4	2.87	3.25	2.63
L8793	61-62 cm	3.5	2.3	2.2	1.4
L8797	65-66 cm	4.43	2.76	1.93	1.75
L8801	69-70 cm	3.43	2.67	2.1	1.64
L8805	73-74 cm	3.47	2.47	1.96	2.01
L8809	77-78 cm	3.83	2.37	2.01	1.86
L8813	81-82 cm	3.58	1.58	3.21	1.66

Organochlorine Data

Mississippi Delta Core
Pesticide/PCB

File No.	Section	Total BHC	Total Chlordanes	Total DDT	1,2,4,5 TCB	1,2,3,4 TCB	PC-Benzene	PC-Anisole	Chlorpyrifos	Dicofol	Endosulfan II	Alpha BHC	HCB	Beta BHC	Gamma BHC	Delta BHC	Heptachlor
L8732	0 - 1 cm	0.18	0.28	1.64	0.15	0.13	0.18	0.09	0.00	0.00	0.21	0.09	0.29	0.02	0.05	0.03	0.01
L8733	1 - 2 cm	0.21	0.21	1.06	0.19	0.25	0.78	0.07	0.00	0.00	0.14	0.07	0.86	0.05	0.04	0.06	0.01
L8734	2 - 3 cm	0.22	0.19	1.03	0.70	0.31	0.67	0.06	0.00	0.00	0.13	0.06	0.67	0.04	0.05	0.07	0.01
L8735	3 - 4 cm	0.24	0.05	0.66	0.02	0.08	0.01	0.00	0.00	0.00	0.02	0.12	0.05	0.00	0.01	0.10	0.00
L8737	5 - 6 cm	0.15	0.07	0.67	0.12	0.09	0.00	0.03	0.00	0.00	0.02	0.08	0.04	0.02	0.02	0.03	0.00
L8739	7 - 8 cm	0.66	0.18	2.57	0.00	0.00	0.20	0.12	0.00	0.00	0.08	0.48	0.43	0.08	0.01	0.08	0.02
L8741	9-10 cm	0.38	0.18	2.55	0.14	0.25	0.21	0.10	0.00	0.00	0.12	0.19	0.45	0.09	0.02	0.08	0.02
L8743	11-12 cm	0.16	0.06	0.72	0.17	0.17	0.15	0.05	0.00	0.00	0.08	0.06	0.20	0.03	0.02	0.04	0.00
L8745	13-14 cm	0.14	0.06	0.72	0.07	0.22	0.13	0.04	0.00	0.00	0.10	0.06	0.16	0.03	0.01	0.03	0.01
L8747	15-16 cm	0.12	0.08	0.70	0.09	0.18	0.08	0.05	0.00	0.00	0.13	0.05	0.16	0.03	0.01	0.03	0.00
L8749	17-18 cm	0.12	0.07	0.72	0.23	0.28	0.13	0.04	0.00	0.00	0.16	0.08	0.19	0.01	0.01	0.03	0.00
L8751	19-20 cm	0.15	0.06	0.79	0.33	0.34	0.12	0.05	0.00	0.00	0.18	0.07	0.16	0.04	0.01	0.03	0.00
L8753	21-22 cm	0.18	0.06	0.62	0.29	0.36	0.11	0.07	0.00	0.00	0.09	0.09	0.14	0.04	0.02	0.03	0.00
L8755	23-24 cm	0.43	0.08	1.60	0.09	0.40	0.21	0.11	0.00	0.00	0.00	0.24	0.25	0.07	0.03	0.09	0.00
L8757	25-26 cm	0.13	0.04	0.68	0.11	0.43	0.10	0.06	0.00	0.00	0.12	0.04	0.06	0.03	0.01	0.04	0.00
L8759	27-28 cm	0.14	0.04	0.59	0.10	0.38	0.08	0.05	0.00	0.00	0.11	0.04	0.05	0.04	0.01	0.05	0.00
L8761	29-30 cm	0.11	0.02	0.55	0.06	0.20	0.00	0.05	0.00	0.00	0.08	0.02	0.02	0.03	0.01	0.05	0.00
L8763	31-32 cm	0.29	0.07	1.32	0.07	0.27	0.12	0.08	0.00	0.00	0.03	0.07	0.11	0.06	0.03	0.14	0.01
L8765	33-34 cm	0.06	0.02	0.32	0.07	0.05	0.00	0.04	0.00	0.00	0.02	0.03	0.01	0.00	0.01	0.02	0.00
L8767	35-36 cm	0.04	0.01	0.14	0.01	0.02	0.00	0.03	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.01	0.00
L8769	37-38 cm	0.04	0.01	0.12	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.01	0.00
L8771	39-40 cm	0.04	0.01	0.07	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00
L8773	41-42 cm	0.03	0.03	0.11	0.14	0.04	0.05	0.03	0.00	0.00	0.02	0.00	0.10	0.00	0.01	0.02	0.00
L8775	43-44 cm	0.02	0.01	0.07	0.09	0.04	0.09	0.02	0.00	0.00	0.02	0.00	0.11	0.00	0.01	0.02	0.00
L8777	45-46 cm	0.04	0.01	0.05	0.04	0.02	0.08	0.02	0.00	0.00	0.01	0.00	0.14	0.00	0.01	0.03	0.00
L8779	47-48 cm	0.02	0.01	0.06	0.04	0.05	0.08	0.03	0.00	0.00	0.01	0.00	0.08	0.00	0.01	0.01	0.00
L8781	49-50 cm	0.01	0.01	0.05	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.07	0.00	0.01	0.00	0.00
L8783	51-52 cm	0.03	0.02	0.06	0.16	0.02	0.18	0.02	0.00	0.00	0.01	0.00	0.02	0.00	0.01	0.02	0.00
L8785	53-54 cm	0.04	0.02	0.07	0.05	0.01	0.06	0.02	0.00	0.00	0.01	0.00	0.09	0.00	0.01	0.02	0.00
L8787	55-56 cm	0.03	0.03	0.04	0.02	0.02	0.03	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.02	0.00
L8789	57-58 cm	0.04	0.03	0.06	0.03	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.07	0.00	0.02	0.01	0.00
L8791	59-60 cm	0.19	0.02	0.15	0.00	0.03	0.00	0.06	0.00	0.00	0.01	0.04	0.01	0.05	0.04	0.06	0.01
L8793	61-62 cm	0.02	0.02	0.04	0.03	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.03	0.00	0.01	0.01	0.00
L8797	65-66 cm	0.03	0.01	0.03	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00
L8801	69-70 cm	0.01	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
L8805	73-74 cm	0.02	0.01	0.03	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
L8809	77-78 cm	0.00	0.01	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
L8813	81-82 cm	0.06	0.03	0.16	0.00	0.05	0.08	0.03	0.00	0.00	0.00	0.01	0.07	0.01	0.01	0.02	0.00

Mississippi Delta Core
Pesticide/PCB

File No.	Section	Hepta Epoxide	Oxychlordane	Gamma Chlordane	Alpha Chlordane	Trans Nonachlor	Cis Nonachlor	Aldrin	Dieldrin	Endrin	Mirex	2,4'DDE	4,4'DDE	2,4'DDD	4,4'DDD	2,4'DDT	4,4'DDT	PCB 8
L8732	0 - 1 cm	0.05	0.03	0.10	0.02	0.02	0.06	0.00	0.11	0.00	0.02	0.00	0.69	0.09	0.41	0.12	0.34	0.03
L8733	1 - 2 cm	0.06	0.02	0.07	0.01	0.02	0.03	0.00	0.06	0.03	0.01	0.00	0.49	0.06	0.27	0.05	0.19	0.03
L8734	2 - 3 cm	0.03	0.02	0.07	0.01	0.02	0.04	0.00	0.06	0.06	0.00	0.00	0.47	0.04	0.26	0.08	0.17	0.02
L8735	3 - 4 cm	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.06	0.02	0.00	0.00	0.35	0.02	0.17	0.03	0.09	0.05
L8737	5 - 6 cm	0.00	0.01	0.01	0.02	0.01	0.03	0.00	0.06	0.01	0.00	0.00	0.32	0.02	0.18	0.03	0.12	0.04
L8739	7 - 8 cm	0.00	0.01	0.03	0.03	0.03	0.08	0.02	0.46	0.04	0.02	0.14	0.88	0.09	0.76	0.14	0.55	0.57
L8741	9-10 cm	0.00	0.02	0.04	0.03	0.02	0.08	0.00	0.41	0.03	0.00	0.18	0.67	0.11	0.89	0.18	0.52	0.69
L8743	11-12 cm	0.01	0.00	0.01	0.01	0.01	0.03	0.00	0.06	0.01	0.00	0.00	0.26	0.03	0.27	0.03	0.14	0.17
L8745	13-14 cm	0.01	0.01	0.01	0.01	0.00	0.02	0.00	0.06	0.02	0.00	0.00	0.29	0.03	0.27	0.01	0.11	0.09
L8747	15-16 cm	0.01	0.00	0.01	0.02	0.01	0.03	0.00	0.05	0.01	0.00	0.00	0.26	0.03	0.29	0.02	0.11	0.15
L8749	17-18 cm	0.00	0.00	0.01	0.01	0.01	0.03	0.00	0.05	0.02	0.00	0.00	0.26	0.04	0.29	0.03	0.11	0.16
L8751	19-20 cm	0.01	0.00	0.01	0.01	0.00	0.04	0.00	0.05	0.02	0.00	0.00	0.28	0.05	0.33	0.03	0.11	0.20
L8753	21-22 cm	0.01	0.00	0.01	0.01	0.00	0.03	0.00	0.04	0.04	0.00	0.01	0.20	0.03	0.29	0.02	0.08	0.20
L8755	23-24 cm	0.00	0.02	0.01	0.00	0.01	0.05	0.00	0.54	0.01	0.00	0.00	0.28	0.10	0.88	0.07	0.27	0.63
L8757	25-26 cm	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.02	0.05	0.00	0.00	0.22	0.04	0.32	0.03	0.07	0.08
L8759	27-28 cm	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.02	0.01	0.00	0.00	0.19	0.03	0.30	0.02	0.05	0.05
L8761	29-30 cm	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.03	0.00	0.00	0.18	0.04	0.26	0.02	0.05	0.03
L8763	31-32 cm	0.01	0.01	0.00	0.01	0.00	0.04	0.01	0.13	0.08	0.00	0.07	0.24	0.07	0.73	0.05	0.16	0.04
L8765	33-34 cm	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.09	0.03	0.16	0.02	0.03	0.02
L8767	35-36 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.04	0.01	0.06	0.01	0.02	0.03
L8769	37-38 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.03	0.01	0.05	0.01	0.02	0.02
L8771	39-40 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.01	0.03	0.01	0.01	0.01
L8773	41-42 cm	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.04	0.01	0.03	0.01	0.01	0.00
L8775	43-44 cm	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.02	0.00	0.03	0.01	0.01	0.00
L8777	45-46 cm	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.01	0.02	0.01	0.00	0.00
L8779	47-48 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.02	0.00	0.01	0.00
L8781	49-50 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.02	0.00	0.01	0.00	0.01	0.00
L8783	51-52 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.02	0.00	0.01	0.01	0.02	0.00
L8785	53-54 cm	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.03	0.00	0.01	0.01	0.01	0.00
L8787	55-56 cm	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00
L8789	57-58 cm	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.02	0.00
L8791	59-60 cm	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.08	0.01	0.00	0.02	0.03	0.01	0.07	0.00	0.01	0.01
L8793	61-62 cm	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00
L8797	65-66 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01
L8801	69-70 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
L8805	73-74 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
L8809	77-78 cm	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
L8813	81-82 cm	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.06	0.02	0.00	0.09	0.03	0.01	0.03	0.00	0.01	0.00

Mississippi Delta Core
Pesticide/PCB

File No.	Section	PCB 18	PCB 28	PCB 52	PCB 44	PCB 66	PCB 101	PCB 87	PCB 110	PCB 151	PCB 118/108	PCB 153	PCB 105	PCB 138	PCB 187/182/159	PCB 128	PCB 180	PCB 170	PCB 201	PCB 195	PCB 206
L8732	0 - 1 cm	0.03	0.23	0.17	0.05	0.28	0.17	0.09	0.87	0.06	0.22	0.33	0.12	0.48	0.17	0.31	0.26	1.21	0.09	0.05	0.04
L8733	1 - 2 cm	0.03	0.20	0.13	0.04	0.24	0.13	0.06	0.78	0.04	0.17	0.25	0.05	0.58	0.15	0.26	0.18	6.04	0.05	0.01	0.02
L8734	2 - 3 cm	0.03	0.18	0.16	0.08	0.23	0.24	0.12	0.78	0.03	0.21	0.39	0.14	0.49	0.12	0.29	0.21	2.90	0.04	0.03	0.03
L8735	3 - 4 cm	0.01	0.12	0.22	0.02	0.18	0.13	0.03	0.38	0.02	0.10	0.29	0.05	0.32	0.09	0.24	0.17	0.08	0.02	0.02	0.05
L8737	5 - 6 cm	0.03	0.26	0.16	0.04	0.25	0.26	0.04	0.46	0.03	0.14	0.38	0.05	0.32	0.15	0.32	0.20	0.11	0.03	0.04	0.10
L8739	7 - 8 cm	0.15	0.63	0.57	0.31	0.94	0.61	0.17	1.88	0.31	0.84	1.30	0.31	1.31	0.51	0.34	0.86	1.54	0.30	0.16	0.24
L8741	9-10 cm	0.18	0.78	0.77	0.33	0.98	0.77	0.24	3.16	0.12	0.83	1.47	0.52	1.35	0.57	0.34	0.87	1.96	0.32	0.18	0.17
L8743	11-12 cm	0.08	0.51	0.37	0.08	0.54	0.54	0.08	0.84	0.07	0.25	0.69	0.12	0.55	0.26	0.30	0.30	0.01	0.08	0.04	0.05
L8745	13-14 cm	0.10	0.63	0.43	0.12	0.66	0.55	0.10	0.98	0.06	0.32	0.77	0.14	0.56	0.12	0.37	0.34	0.00	0.09	0.04	0.14
L8747	15-16 cm	0.08	0.66	0.51	0.14	0.67	0.63	0.21	1.04	0.09	0.34	0.84	0.13	0.62	0.31	1.30	0.33	0.00	0.09	0.04	0.15
L8749	17-18 cm	0.13	0.70	0.68	0.17	0.84	0.67	0.10	1.27	0.11	0.44	0.92	0.18	0.68	0.38	1.49	0.21	0.04	0.11	0.04	0.19
L8751	19-20 cm	0.18	0.78	0.83	0.21	0.93	0.76	0.13	1.34	0.13	0.52	1.05	0.19	0.81	0.41	1.97	0.38	0.02	0.12	0.04	0.19
L8753	21-22 cm	0.18	0.65	0.78	0.22	0.78	0.64	0.13	1.29	0.12	0.40	0.82	0.16	0.89	0.32	1.95	0.32	0.30	0.12	0.05	0.18
L8755	23-24 cm	0.21	0.89	1.32	0.47	1.30	1.03	0.24	3.12	0.41	1.00	1.50	0.45	1.57	0.65	0.32	0.74	2.13	0.26	0.25	0.17
L8757	25-26 cm	0.08	0.46	0.59	0.15	0.62	0.59	0.09	1.04	0.12	0.35	0.73	0.15	0.61	0.30	0.73	0.24	0.05	0.09	0.04	0.12
L8759	27-28 cm	0.04	0.45	0.42	0.10	0.40	0.54	0.14	0.87	0.08	0.27	0.71	0.10	0.56	0.24	0.20	0.21	0.10	0.09	0.03	0.09
L8761	29-30 cm	0.04	0.31	0.30	0.07	0.35	0.39	0.10	0.67	0.07	0.24	0.58	0.08	0.39	0.19	0.11	0.20	0.18	0.06	0.02	0.07
L8763	31-32 cm	0.06	0.09	0.42	0.17	0.27	0.50	0.06	1.24	0.09	0.48	0.90	0.25	0.94	0.30	0.00	0.47	1.39	0.22	0.07	0.08
L8765	33-34 cm	0.01	0.09	0.09	0.02	0.09	0.22	0.01	0.31	0.02	0.09	0.28	0.04	0.19	0.09	0.06	0.10	0.02	0.06	0.02	0.11
L8767	35-36 cm	0.01	0.03	0.03	0.00	0.03	0.10	0.15	0.15	0.01	0.04	0.10	0.02	0.07	0.03	0.06	0.05	0.17	0.01	0.01	0.04
L8769	37-38 cm	0.00	0.02	0.03	0.00	0.02	0.08	0.00	0.12	0.01	0.03	0.09	0.02	0.09	0.03	0.04	0.05	0.04	0.02	0.02	0.08
L8771	39-40 cm	0.00	0.01	0.02	0.00	0.01	0.05	0.00	0.09	0.00	0.02	0.03	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.01	0.06
L8773	41-42 cm	0.00	0.01	0.03	0.01	0.02	0.04	0.00	0.22	0.00	0.01	0.04	0.01	0.06	0.02	0.08	0.06	0.86	0.03	0.03	0.07
L8775	43-44 cm	0.00	0.01	0.02	0.00	0.01	0.03	0.01	0.03	0.00	0.01	0.01	0.00	0.01	0.01	0.04	0.03	0.15	0.01	0.03	0.07
L8777	45-46 cm	0.00	0.01	0.02	0.00	0.02	0.01	0.01	0.02	0.00	0.02	0.01	0.01	0.01	0.01	0.03	0.03	0.09	0.01	0.04	0.07
L8779	47-48 cm	0.00	0.01	0.03	0.00	0.01	0.02	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.05	0.01	0.05	0.01	0.02	0.13
L8781	49-50 cm	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.05	0.03	0.08	0.01	0.03	0.03
L8783	51-52 cm	0.00	0.00	0.02	0.00	0.01	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.08	0.02	0.36	0.00	0.01	0.02
L8785	53-54 cm	0.00	0.00	0.02	0.00	0.00	0.03	0.07	0.03	0.00	0.00	0.00	0.00	0.01	0.01	0.08	0.01	0.23	0.00	0.00	0.01
L8787	55-56 cm	0.00	0.00	0.02	0.00	0.01	0.02	0.00	0.03	0.00	0.00	0.00	0.00	0.02	0.00	0.04	0.00	1.21	0.01	0.00	0.01
L8789	57-58 cm	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.00	1.79	0.00	0.00	0.00
L8791	59-60 cm	0.00	0.00	0.02	0.02	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.01	0.30	0.01	0.00	0.06	2.25	0.00	0.00	0.11
L8793	61-62 cm	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.72	0.00	0.00	0.00
L8797	65-66 cm	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.00	0.00	0.00
L8801	69-70 cm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00
L8805	73-74 cm	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.04	0.00	0.00	0.00
L8809	77-78 cm	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00
L8813	81-82 cm	0.00	0.00	0.03	0.00	0.00	0.02	0.00	0.03	0.01	0.00	0.00	0.01	0.06	0.00	0.00	0.01	0.60	0.00	0.00	0.00

Mississippi Delta Core
Pesticide/PCB

File No.	Section	PCB 209
L8732	0 - 1 cm	0.25
L8733	1 - 2 cm	0.17
L8734	2 - 3 cm	0.13
L8735	3 - 4 cm	0.04
L8737	5 - 6 cm	0.31
L8739	7 - 8 cm	0.42
L8741	9-10 cm	0.42
L8743	11-12 cm	0.09
L8745	13-14 cm	0.16
L8747	15-16 cm	0.18
L8749	17-18 cm	0.12
L8751	19-20 cm	0.13
L8753	21-22 cm	0.35
L8755	23-24 cm	0.47
L8757	25-26 cm	0.23
L8759	27-28 cm	0.18
L8761	29-30 cm	0.12
L8763	31-32 cm	0.40
L8765	33-34 cm	0.48
L8767	35-36 cm	0.25
L8769	37-38 cm	0.37
L8771	39-40 cm	0.20
L8773	41-42 cm	0.30
L8775	43-44 cm	0.33
L8777	45-46 cm	0.16
L8779	47-48 cm	0.32
L8781	49-50 cm	0.14
L8783	51-52 cm	0.10
L8785	53-54 cm	0.09
L8787	55-56 cm	0.10
L8789	57-58 cm	0.03
L8791	59-60 cm	0.11
L8793	61-62 cm	0.06
L8797	65-66 cm	0.00
L8801	69-70 cm	0.00
L8805	73-74 cm	0.01
L8809	77-78 cm	0.00
L8813	81-82 cm	0.00

Appendix II

NOAA HISTORICAL TRENDS

Tampa Bay (FL) Core Data

PAHs Data

NOAA - GENERAL INFORMATION - Historical Trends-Tampa, FL

INVEST#:	Section #1	Section #3	Section #5	Section #7	Section #9
ID:					
LABSAMNO:	C22083	C22085	C22087	C22089	C22091
SAMPLE TYPE:	SAMP	SAMP	SAMP	SAMP	SAMP
COLLECTION DATE:	07/07/95	07/07/95	07/07/95	07/07/95	07/07/95
RECEIPT DATE:	09/11/95	09/11/95	09/11/95	09/11/95	09/11/95
QCBATCH:	M2414	M2414	M2414	M2414	M2414
EXTRACTION DATE:	10/19/95	10/19/95	10/19/95	10/19/95	10/19/95
METHOD:	GCMS	GCMS	GCMS	GCMS	GCMS
ANALYSIS DATE:	11/17/95	11/17/95	11/17/95	11/17/95	11/17/95
MATRIX:	Sediment	Sediment	Sediment	Sediment	Sediment
SUBMAT:					
WETWT:	16.05	18.79	20.06	20.13	18.48
DRYWT:	10.82	13.91	14.11	13.71	11.05
WTUNITS:	GRAMS DRY	GRAMS DRY	GRAMS DRY	GRAMS DRY	GRAMS DRY
PCTSOLIDS:	67.4%	74.0%	70.3%	68.1%	59.8%
Surrogate Recoveries					
PAH's:					
NAPHD8:	78.0 D	101.0 D	108.9 D	117.8 D	110.9 D
ACEND10:	84.8 D	82.0 D	104.2 D	109.9 D	101.7 D
PHEND10:	97.7 D	113.8 D	96.9 D	112.6 D	114.0 D
CHRYD12:	99.4 D	106.8 D	109.0 D	121.5 D	112.0 D
PERYD12:	107.8 D	84.7 D	96.4 D	101.5 D	94.1 D

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends-Tampa, FL

INVEST#:	Section #1		Section #3		Section #5		Section #7		Section #9	
ID:										
LABSAMNO:	C22083		C22085		C22087		C22089		C22091	
UNIT:	ng/g		ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	93.8		63.0		62.2		79.4		69.8	
C1-NAPHTHALENES	133.7		95.0		26.5		65.6		60.0	
C2-NAPHTHALENES	ND		ND		ND		ND		ND	
C3-NAPHTHALENES	ND		ND		ND		ND		ND	
C4-NAPHTHALENES	ND		ND		ND		ND		ND	
BIPHENYL	30.0		18.7		22.9		32.5		29.5	
ACENAPHTHYLENE	49.6		28.5		12.0		40.5		39.5	
ACENAPHTHENE	33.5		66.7		49.4		56.5		60.3	
FLUORENE	30.9		40.3		59.3		87.6		30.4	
C1-FLUORENES	ND		ND		ND		ND		ND	
C2-FLUORENES	ND		ND		ND		ND		ND	
C3-FLUORENES	ND		ND		ND		ND		ND	
PHENANTHRENE	332.2		847.2		1350.5		1323.2		867.7	
ANTHRACENE	23.5		71.6		72.3		91.7		86.3	
C1-PHEN_ANTHR	181.4		287.2		430.6		397.4		339.9	
C2-PHEN_ANTHR	163.9		228.5		338.7		202.2		247.9	
C3-PHEN_ANTHR	ND		ND		141.4		ND		ND	
C4-PHEN_ANTHR	ND		ND		ND		ND		ND	
DIBENZOTHIO	19.7		55.4		52.9		80.6		47.3	
C1-DIBEN	ND		ND		ND		ND		ND	
C2-DIBEN	ND		ND		ND		ND		ND	
C3-DIBEN	ND		ND		ND		ND		ND	
FLUORANTHENE	887.1		2024.4		3254.7		3042.4		2481.1	
PYRENE	710.3		1519.1		2421.3		2259.1		1855.4	
C1-FLUORAN_PYR	253.7		511.2		715.3		709.7		506.9	
BENaANTHRACENE	310.6		784.2		1010.9		1096.8		969.6	
CHRYSENE	456.8		1018.9		1455.0		1345.2		1335.1	
C1-CHRYSENES	157.1		253.8		1147.6		407.8		399.3	
C2-CHRYSENES	97.9		108.4		222.5		150.6		83.6	
C3-CHRYSENES	ND		ND		23.1		16.1		22.4	
C4-CHRYSENES	ND		115.8		162.0		155.8		164.0	
BENbFLUORAN	674.1		1405.5		2194.8		2105.4		1951.0	
BENkFLUORAN	252.3		540.0		767.7		798.8		759.4	
BENePYRENE	324.5		685.5		938.4		938.5		911.1	
BENaPYRENE	382.7		850.1		1258.3		1213.6		1184.9	
PERYLENE	87.8		221.2		313.3		222.3		252.7	
I123cdPYRENE	249.9		576.1		862.9		911.8		860.8	
DBahANTHRA	50.7		104.2		159.2		164.3		156.3	
BghiPERYLENE	280.2		572.1		852.3		860.0		825.7	
TOTAL PAH's	6267.5		13092.4		20377.8		18855.4		16597.5	

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends-Tampa, FL

INVEST#:	Section #1		Section #3		Section #5		Section #7		Section #9	
ID:										
LABSAMNO:	C22083		C22085		C22087		C22089		C22091	
UNIT:	ng/g		ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	53.3		36.8		14.4		33.3		18.6	
1-METHYLNAPH	80.4		58.3		12.1		32.3		41.4	
2,6-DIMETHNAPH	25.1		64.7		31.9		26.5		30.1	
1,6,7-TRIMETHNAPH	20.0		39.2		39.5		26.8		53.1	
1-METHYLPHEN	30.2		69.4		112.6		101.4		59.1	
Surrogate Recoveries										
NAPHD8:	78.0	D	101.0	D	108.9	D	117.8	D	110.9	D
ACEND10:	84.8	D	82.0	D	104.2	D	109.9	D	101.7	D
PHEND10:	97.7	D	113.8	D	96.9	D	112.6	D	114.0	D
CHRYD12:	99.4	D	106.8	D	109.0	D	121.5	D	112.0	D
PERYD12:.	107.8	D	84.7	D	96.4	D	101.5	D	94.1	D

NOAA - GENERAL INFORMATION - Historical Trends-Tampa, FL

INVEST#:	Section #11	Section #13	Section #15	Section #17	Section #19
ID:					
LABSAMNO:	C22093	C22095	C22097	C22099	C22101
SAMPLE TYPE:	SAMP	SAMP	SAMP	SAMP	SAMP
COLLECTION DATE:	07/07/95	07/07/95	07/07/95	07/07/95	07/07/95
RECEIPT DATE:	09/11/95	09/11/95	09/11/95	09/11/95	09/11/95
QCBATCH:	M2414	M2414	M2414	M2414	M2414
EXTRACTION DATE:	10/19/95	10/19/95	10/19/95	10/19/95	10/19/95
METHOD:	GCMS	GCMS	GCMS	GCMS	GCMS
ANALYSIS DATE:	11/17/95	11/17/95	11/17/95	11/17/95	11/17/95
MATRIX:	Sediment	Sediment	Sediment	Sediment	Sediment
SUBMAT:					
WETWT:	17.36	15.72	20.16	20.54	20.61
DRYWT:	11.46	11.02	13.67	15.34	16.01
WTUNITS:	GRAMS DRY	GRAMS DRY	GRAMS DRY	GRAMS DRY	GRAMS DRY
PCTSOLIDS:	66.0%	70.1%	67.8%	74.7%	77.7%
Surrogate Recoveries					
PAH's:					
NAPHD8:	104.6 D	107.3 D	109.8 D	107.5 D	106.1 D
ACEND10:	86.8 D	93.8 D	89.3 D	80.8 D	99.6 D
PHEND10:	108.8 D	118.5 D	110.8 D	98.7 D	105.1 D
CHRYD12:	110.8 D	109.2 D	109.3 D	109.2 D	113.1 D
PERYD12:	101.8 D	95.5 D	93.5 D	90.7 D	98.3 D

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends-Tampa, FL

INVEST#:	Section #11		Section #13		Section #15		Section #17		Section #19	
ID:										
LABSAMNO:	C22093		C22095		C22097		C22099		C22101	
UNIT:	ng/g		ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	75.2		61.6		67.1		38.5		51.0	
C1-NAPHTHALENES	42.3		29.2		53.5		32.4		63.4	
C2-NAPHTHALENES		ND		ND		ND		ND		ND
C3-NAPHTHALENES		ND		ND		ND		ND		ND
C4-NAPHTHALENES		ND		ND		ND		ND		ND
BIPHENYL	20.1		15.0		18.5		9.6		11.7	
ACENAPHTHYLENE	43.7		14.8		24.3		17.9		19.3	
ACENAPHTHENE	32.2		50.9		59.1		38.4		56.6	
FLUORENE	42.9		78.5		38.0		37.8		23.1	
C1-FLUORENES		ND		ND		ND		ND		ND
C2-FLUORENES		ND		ND		ND		ND		ND
C3-FLUORENES		ND		ND		ND		ND		ND
PHENANTHRENE	745.1		1205.3		533.1		818.7		356.0	
ANTHRACENE	50.0		49.6		39.1		73.0		36.2	
C1-PHEN_ANTHR	262.6		377.8		229.6		324.2		143.2	
C2-PHEN_ANTHR	171.1		200.2		95.2		124.9		88.3	
C3-PHEN_ANTHR	117.8		96.9			ND		ND		ND
C4-PHEN_ANTHR		ND		ND		ND		ND		ND
DIBENZOTHIO	34.1		59.0		24.6		38.3		21.8	
C1-DIBEN		ND		ND		ND		ND		ND
C2-DIBEN		ND		ND		ND		ND		ND
C3-DIBEN		ND		ND		ND		ND		ND
FLUORANTHENE	1987.1		2775.7		1436.5		2091.7		897.8	
PYRENE	1513.3		1988.4		1111.8		1697.7		686.4	
C1-FLUORAN_PYR	478.7		583.3		256.2		907.2		100.5	
BENaANTHRACENE	776.6		1052.2		544.9		819.6		308.4	
CHRYSENE	1101.2		1499.6		781.8		1002.8		430.8	
C1-CHRYSENES	337.0		428.4		293.8		565.7		152.6	
C2-CHRYSENES	140.5		160.1		142.6		183.0		61.3	
C3-CHRYSENES	15.1		9.5		16.5		30.5			ND
C4-CHRYSENES	191.2		195.7		105.5		207.3		88.8	
BENbFLUORAN	1783.3		2298.9		1130.7		1928.5		714.5	
BENkFLUORAN	607.5		718.3		460.5		580.8		202.1	
BENePYRENE	740.1		974.2		532.8		767.4		289.4	
BENaPYRENE	991.6		1318.2		682.5		1063.1		389.8	
PERYLENE	213.4		240.9		146.6		203.3		109.9	
I123cdPYRENE	668.3		997.4		452.4		661.2		257.9	
DBahANTHRA	130.4		182.1		82.3		138.6		44.3	
BghiPERYLENE	669.7		910.0		478.4		654.7		258.3	
TOTAL PAH's	13982.0		18571.6		9838.1		15056.9		5863.5	

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends-Tampa, FL

INVEST#:	Section #11		Section #13		Section #15		Section #17		Section #19	
ID:										
LABSAMNO:	C22093		C22095		C22097		C22099		C22101	
UNIT:	ng/g		ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	16.7		10.6		25.7		17.0		27.9	
1-METHYLNAPH	25.6		18.5		27.8		15.4		35.5	
2,6-DIMETHNAPH	31.3		33.7		36.6		24.3		76.0	
1,6,7-TRIMETHNAPH	11.4		16.5		21.3		9.2		33.1	
1-METHYLPHEN	60.0		90.8		55.0		64.7		37.9	
Surrogate Recoveries										
NAPHD8:	104.6	D	107.3	D	109.8	D	107.5	D	106.1	D
ACEND10:	86.8	D	93.8	D	89.3	D	80.8	D	99.6	D
PHEND10:	108.8	D	118.5	D	110.8	D	98.7	D	105.1	D
CHRYD12:	110.8	D	109.2	D	109.3	D	109.2	D	113.1	D
PERYD12:	101.8	D	95.5	D	93.5	D	90.7	D	98.3	D

NOAA - GENERAL INFORMATION - Historical Trends-Tampa, FL

INVEST#:	Section #22	Section #24	Section #26	Section #28	Section #30
ID:					
LABSAMNO:	C22104	C22106	C22108	C22110	C22112
SAMPLE TYPE:	SAMP	SAMP	SAMP	SAMP	SAMP
COLLECTION DATE:	07/07/95	07/07/95	07/07/95	07/07/95	07/07/95
RECEIPT DATE:	09/11/95	09/11/95	09/11/95	09/11/95	09/11/95
QCBATCH:	M2414	M2414	M2414	M2414	M2414
EXTRACTION DATE:	10/19/95	10/19/95	10/19/95	10/19/95	10/19/95
METHOD:	GCMS	GCMS	GCMS	GCMS	GCMS
ANALYSIS DATE:	11/17/95	11/04/95	11/04/95	11/04/95	11/04/95
MATRIX:	Sediment	Sediment	Sediment	Sediment	Sediment
SUBMAT:					
WETWT:	20.15	20.15	20.24	20.22	20.30
DRYWT:	15.91	16.68	16.66	16.82	16.38
WTUNITS:	GRAMS DRY	GRAMS DRY	GRAMS DRY	GRAMS DRY	GRAMS DRY
PCTSOLIDS:	78.9%	82.8%	82.3%	83.2%	80.7%
Surrogate Recoveries					
PAH's:					
NAPHD8:	96.4 D	87.1	82.3	80.2	87.9
ACEND10:	72.7 D	90.5	87.7	90.3	92.0
PHEND10:	96.4 D	99.3	97.9	100.8	100.6
CHRYD12:	64.1 D	112.2	107.2	111.3	103.2
PERYD12:	50.0 D	91.4	92.6	88.3	91.9

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends-Tampa, FL

INVEST#:	Section #22		Section #24		Section #26		Section #28		Section #30	
ID:										
LABSAMNO:	C22104		C22106		C22108		C22110		C22112	
UNIT:	ng/g		ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	51.6		1.7		1.9		1.9		2.2	
C1-NAPHTHALENES	19.6		1.0	J	1.5	J	2.2		2.1	J
C2-NAPHTHALENES		ND	1.1		1.6		2.2		2.6	
C3-NAPHTHALENES		ND	2.8		2.7		3.0		3.1	
C4-NAPHTHALENES		ND	0.9	J	1.4		1.5		1.3	
BIPHENYL	27.8		0.3	J	0.3	J	0.4		0.5	
ACENAPHTHYLENE	22.3		6.6		4.0		11.9		12.4	
ACENAPHTHENE	49.3		1.2		1.9		0.9		1.1	
FLUORENE	16.4		1.7		2.0		1.8		2.2	
C1-FLUORENES		ND	1.4		1.6		2.0		2.4	
C2-FLUORENES		ND	3.5		4.3		3.9		5.3	
C3-FLUORENES		ND	4.3		4.2		6.3		6.2	
PHENANTHRENE	137.3		57.5		69.7		28.0		41.2	
ANTHRACENE	34.5		14.6		10.7		18.4		20.3	
C1-PHEN_ANTHR	80.4		27.5		33.2		17.8		28.4	
C2-PHEN_ANTHR	65.3		22.0		22.0		13.4		22.6	
C3-PHEN_ANTHR		ND	14.2		11.7		9.9		14.7	
C4-PHEN_ANTHR		ND	6.1		4.4		8.8		8.3	
DIBENZOTHIO	9.9		2.4		3.0		1.4		2.0	
C1-DIBEN		ND	2.3		2.8		1.7		2.8	
C2-DIBEN		ND	3.0		3.0		2.4		5.0	
C3-DIBEN		ND	3.6		2.5		3.2		4.0	
FLUORANTHENE	372.2		223.2		232.5		94.8		183.5	
PYRENE	302.4		185.0		181.9		86.2		164.2	
C1-FLUORAN_PYR	187.8		78.9		67.3		43.5		84.4	
BENaANTHRACENE	198.7		80.9		88.5		38.2		66.4	
CHRYSENE	312.3		126.9		115.7		51.1		108.0	
C1-CHRYSENES	144.0		44.0		45.0		26.1		46.5	
C2-CHRYSENES	99.0		22.4		22.0		25.7		33.8	
C3-CHRYSENES	6.6		1.1		1.1		1.6		1.8	
C4-CHRYSENES	108.9		11.3		12.4		10.4		14.5	
BENbFLUORAN	1169.6		229.1		194.4		156.1		253.3	
BENkFLUORAN	424.6		90.1		76.0		57.2		81.7	
BENePYRENE	476.9		92.5		81.0		57.1		86.7	
BENaPYRENE	625.9		128.8		117.4		87.3		134.0	
PERYLENE	128.2		20.0		18.3		12.3		18.5	
I123cdPYRENE	262.0		83.9		84.2		53.5		80.3	
DBahANTHRA	66.1		20.8		20.4		14.8		22.0	
BghiPERYLENE	275.4		65.7		62.4		43.4		66.0	
TOTAL PAH's	5674.7		1684.2		1610.7		1002.1		1636.1	

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends-Tampa, FL

INVEST#:	Section #22		Section #24		Section #26		Section #28		Section #30	
ID:										
LABSAMNO:	C22104		C22106		C22108		C22110		C22112	
UNIT:	ng/g		ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	7.5		0.6	J	0.8	J	1.1		1.3	
1-METHYLNAPH	12.0		0.4	J	0.6	J	1.1		0.8	J
2,6-DIMETHNAPH	62.8		0.4	J	0.6		0.6		0.8	
1,6,7-TRIMETHNAPH	61.0		0.5	J	0.7		0.4	J	0.8	
1-METHYLPHEN	14.5		7.0		8.4		4.7		6.9	
Surrogate Recoveries										
NAPHD8:	96.4	D	87.1		82.3		80.2		87.9	
ACEND10:	72.7	D	90.5		87.7		90.3		92.0	
PHEND10:	96.4	D	99.3		97.9		100.8		100.6	
CHRYD12:	64.1	D	112.2		107.2		111.3		103.2	
PERYD12:	50.0	D	91.4		92.6		88.3		91.9	

NOAA - GENERAL INFORMATION - Historical Trends-Tampa, FL

INVEST#:	Section #33	Section #37	Section #41	Section #45	Section #48
ID:					
LABSAMNO:	C22115	C22119	C22123	C22127	C22130
SAMPLE TYPE:	SAMP	SAMP	SAMP	SAMP	SAMP
COLLECTION DATE:	07/07/95	07/07/95	07/07/95	07/07/95	07/07/95
RECEIPT DATE:	09/11/95	09/11/95	09/11/95	09/11/95	09/11/95
QCBATCH:	M2414	M2414	M2414	M2414	M2414
EXTRACTION DATE:	10/19/95	10/19/95	10/19/95	10/19/95	10/19/95
METHOD:	GCMS	GCMS	GCMS	GCMS	GCMS
ANALYSIS DATE:	11/04/95	11/04/95	11/04/95	11/04/95	11/17/95
MATRIX:	Sediment	Sediment	Sediment	Sediment	Sediment
SUBMAT:					
WETWT:	18.60	20.11	20.19	20.06	20.25
DRYWT:	15.33	15.98	16.06	16.28	16.60
WTUNITS:	GRAMS DRY	GRAMS DRY	GRAMS DRY	GRAMS DRY	GRAMS DRY
PCTSOLIDS:	82.4%	79.5%	79.5%	81.2%	82.0%
Surrogate Recoveries					
PAH's:					
NAPHD8:	86.4	95.5	89.1	93.2	111.4 D
ACEND10:	87.9	97.6	90.7	96.4	80.6 D
PHEND10:	104.2	100.2	102.9	100.3	102.8 D
CHRYD12:	101.7	99.8	108.3	112.8	110.1 D
PERYD12:	87.5	84.5	106.0	79.8	90.3 D

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends-Tampa, FL

INVEST#:	Section #33		Section #37		Section #41		Section #45		Section #48	
ID:										
LABSAMNO:	C22115		C22119		C22123		C22127		C22130	
UNIT:	ng/g		ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	2.2		2.6		2.2		1.5		29.9	
C1-NAPHTHALENES	2.2	J	2.4		2.2		0.9	J	40.2	
C2-NAPHTHALENES	1.8		2.0		1.7		0.7	J		ND
C3-NAPHTHALENES	2.9		2.4		2.9		0.4	J		ND
C4-NAPHTHALENES	2.8		1.0	J	0.6	J	0.2	J		ND
BIPHENYL	0.4		0.4		0.5		0.2	J	13.1	
ACENAPHTHYLENE	9.8		6.9		14.4		2.3		46.2	
ACENAPHTHENE	0.8		0.6	J	1.2		0.5	J	47.3	
FLUORENE	1.6		1.6		4.8		0.9		23.9	
C1-FLUORENES	2.8		1.7		4.6		1.1			ND
C2-FLUORENES	4.7		3.3		7.5		2.5			ND
C3-FLUORENES	6.6		6.7		14.4		3.4			ND
PHENANTHRENE	23.5		18.2		53.6		25.1		347.6	
ANTHRACENE	13.9		9.6		45.7		5.3		45.2	
C1-PHEN_ANTHR	19.3		20.0		12.6		14.1		157.1	
C2-PHEN_ANTHR	22.6		18.4		35.4		10.5		38.8	
C3-PHEN_ANTHR	13.5		12.0		28.0		6.0			ND
C4-PHEN_ANTHR	20.3		6.5		19.0		3.2			ND
DIBENZOTHIO	1.2		1.2		2.3		1.1		40.3	
C1-DIBEN	2.4		2.7		3.6		1.3			ND
C2-DIBEN	7.5		3.6		5.6		1.5			ND
C3-DIBEN	5.4		4.1		7.3		2.3			ND
FLUORANTHENE	97.0		55.1		155.7		99.4		742.8	
PYRENE	91.3		62.7		163.6		86.9		550.7	
C1-FLUORAN_PYR	55.9		54.2		31.9		37.0		239.7	
BENaANTHRACENE	47.2		31.9		87.0		41.3		216.6	
CHRYSENE	67.9		47.1		248.8		51.4		324.8	
C1-CHRYSENES	33.4		35.0		17.7		19.6		92.8	
C2-CHRYSENES	30.6		20.5		98.3		10.2		44.0	
C3-CHRYSENES	1.4		1.0		2.9		0.3	J	17.1	
C4-CHRYSENES	10.6		6.6		6.1		5.5		42.0	
BENbFLUORAN	193.3		106.6		406.6		87.5		366.2	
BENkFLUORAN	50.3		30.4		155.4		35.2		301.3	
BENePYRENE	59.4		37.0		178.1		38.2		184.3	
BENaPYRENE	97.2		58.3		228.0		56.4		247.6	
PERYLENE	14.3		7.7		30.2		10.1		70.8	
I123cdPYRENE	58.0		34.2		102.3		38.0		134.1	
DBahANTHRA	16.1		9.3		33.7		9.7		27.4	
BghiPERYLENE	46.4		29.9		78.1		31.3		137.7	
TOTAL PAH's	1138.2		755.2		2293.9		742.8		4569.3	

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends-Tampa, FL

INVEST#:	Section #33		Section #37		Section #41		Section #45		Section #48	
ID:										
LABSAMNO:	C22115		C22119		C22123		C22127		C22130	
UNIT:	ng/g		ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	1.2		1.4		1.4		0.5	J	27.4	
1-METHYLNAPH	1.0	J	1.0	J	0.8	J	0.4	J	12.8	
2.6-DIMETHNAPH	0.7		0.8		1.0		0.3	J	32.9	
1.6.7-TRIMETHNAPH	0.8		0.6	J	0.9		0.1	J	51.5	
1-METHYLPHEN	5.4		5.2		9.6		3.6		43.5	
Surrogate Recoveries										
NAPHD8:	86.4		95.5		89.1		93.2		111.4	D
ACEND10:	87.9		97.6		90.7		96.4		80.6	D
PHEND10:	104.2		100.2		102.9		100.3		102.8	D
CHRYD12:	101.7		99.8		108.3		112.8		110.1	D
PERYD12:	87.5		84.5		106.0		79.8		90.3	D

Organochlorine Data

NOAA Historical Trends - Tampa, FL

Client Sample ID	0-1	2-3	4-5	6-7
Original Sample				
GERG ID	C22083	C22085	C22087	C22089
Sample Type	Sample	Sample	Sample	Sample
Dry Weight (g)	10.82	13.91	14.11	13.71
Wet Weight (g)	16.05	18.79	20.06	20.13
Matrix	Sediment	Sediment	Sediment	Sediment
% solid	67	74	70	68
% Lipid				
Page Number	M2414	M2414	M2414	M2414
Receive Date	9/11/95	9/11/95	9/11/95	9/11/95
Extraction Date	10/19/95	10/19/95	10/19/95	10/19/95
Analysis Date	11/6/95	11/6/95	11/6/95	11/7/95
PCB103 % recovery	84	107	80	96
PCB198 % recovery	119	113	111	117
DBOFB % recovery	117	101	84	91
Total Chlordane's	11.87	5.81	3.61	4.11
Total DDT's	10.60	2.37	5.01	4.66
Total HCH's	0.10	2.46	0.45	0.29
Total PCB's	28.40	16.70	23.81	22.34

Pesticides based on ng/g, dry wt.

Hexachlorobenzene		ND		ND		ND		ND
Alpha HCH		ND		ND		ND		ND
Beta HCH	0.08	J	0.50		0.45			ND
Gamma HCH		ND		ND		ND		ND
Delta HCH	0.02	J	1.96			ND	0.29	
Heptachlor	0.15		0.07		0.05	J		ND
Heptachlor Epoxide	0.30		0.57			ND		ND
Oxychlordane		ND	0.99			ND		ND
Gamma Chlordane	3.16		1.09			ND		ND
Alpha Chlordane	3.03		1.64		2.26		2.48	
Trans-Nonachlor	3.56		0.84		0.63		0.76	
Cis-Nonachlor	1.67		0.60		0.67		0.86	
Aldrin	0.94		2.35		1.54		1.84	
Dieldrin	0.08			ND		ND		ND
Endrin		ND		ND		ND		ND
Mirex	0.58		0.20		0.60		0.48	
2,4' DDE	0.09	J		ND		ND		ND
4,4' DDE	2.93		0.57		1.27		0.78	
2,4' DDD	1.95		0.48		1.40		1.38	
4,4' DDD	3.90		0.93		2.06		1.63	
2,4' DDT	0.25			ND		ND		ND
4,4' DDT	1.48		0.39		0.28		0.87	
Endosulfan II		ND		ND		ND		ND

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	0-1		2-3		4-5		6-7	
Original Sample								
GERG ID	C22083		C22085		C22087		C22089	
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND		ND	0.00	J		ND
PCB18/17		ND	0.04	J	0.13	J	0.04	J
PCB28	0.67		0.01	J	0.73			ND
PCB52	0.71		1.58		2.00		1.07	
PCB44	0.38		2.79		1.20		0.78	
PCB66		ND		ND		ND		ND
PCB101/90	1.29		0.20		0.12	J	0.99	
PCB118	0.97		1.50		2.73		2.38	
PCB153/132	0.67		0.03	J		ND	0.48	
PCB105		ND	0.20			ND		ND
PCB138 /160		ND		ND	0.18		0.16	
PCB187	0.72		0.02	J	0.02	J	0.60	
PCB128	0.01	J	0.22			ND	0.57	
PCB180	6.19			ND	1.11		0.70	
PCB170/190	39.07	I	47.96	I	96.65	I	71.85	I
PCB195/208	0.18			ND	0.63		0.75	
PCB206	0.07	J	0.03	J	0.10		0.07	
PCB209	0.12	J		ND	0.91		0.63	

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	8-10		11-12		13-14		15-16	
Original Sample								
GERG ID	C22091		C22093		C22095		C22097	
Sample Type	Sample		Sample		Sample		Sample	
Dry Weight (g)	11.05		11.46		11.02		13.68	
Wet Weight (g)	18.48		17.36		15.72		20.16	
Matrix	Sediment		Sediment		Sediment		Sediment	
% solid	60		66		70		68	
% Lipid								
Page Number	M2414		M2414		M2414		M2414	
Receive Date	9/11/95		9/11/95		9/11/95		9/11/95	
Extraction Date	10/19/95		10/19/95		10/19/95		10/19/95	
Analysis Date	11/7/95		11/7/95		11/7/95		11/7/95	
PCB103 % recovery	90		93		93		68	
PCB198 % recovery	114		134	Q	134	Q	62	
DBOFB % recovery	87		99		98		70	
Total Chlordane's	7.84		6.98		7.37		4.50	
Total DDT's	6.03		7.33		10.15		2.75	
Total HCH's	0.32		1.93		1.15		0.10	
Total PCB's	19.50		25.59		26.15		16.52	
Pesticides based on ng/g, dry wt.								
Hexachlorobenzene		ND	0.11			ND		ND
Alpha HCH		ND		ND		ND		ND
Beta HCH	0.32		0.80		1.15		0.10	J
Gamma HCH		ND		ND		ND		ND
Delta HCH		ND	1.13			ND		ND
Heptachlor	0.19		0.15		0.21		0.07	
Heptachlor Epoxide		ND		ND		ND		ND
Oxychlordane	1.63		1.35		1.85		0.77	
Gamma Chlordane	1.09		1.16		0.93		0.91	
Alpha Chlordane	2.77		2.48		2.63		1.33	
Trans-Nonachlor	1.26		0.98		0.86		0.77	
Cis-Nonachlor	0.89		0.85		0.88		0.66	
Aldrin	2.31		0.81		3.02		0.76	
Dieldrin	3.21			ND		ND		ND
Endrin	0.30			ND		ND	0.42	
Mirex	0.66		0.76		0.54		0.00	J
2,4' DDE	0.17		0.14			ND	0.13	
4,4' DDE	1.50		1.55		1.59		1.03	
2,4' DDD	1.96		2.04		2.92		0.35	
4,4' DDD	1.77		1.37		2.43		1.00	
2,4' DDT		ND		ND		ND		ND
4,4' DDT	0.64		2.24		3.21		0.24	
Endosulfan II	0.10		0.09		0.01	J	0.24	

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	8-10		11-12		13-14		15-16	
Original Sample								
GERG ID	C22091		C22093		C22095		C22097	
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5	0.10	J		ND		ND	0.03	J
PCB18/17	0.01	J		ND		ND		ND
PCB28		ND		ND		ND	0.03	J
PCB52	0.98		0.42	J	0.78		0.63	
PCB44	0.47		1.81		1.49		1.91	
PCB66		ND		ND		ND		ND
PCB101/90	0.99		0.81		0.38		0.10	J
PCB118	2.11		2.23		2.79		1.78	
PCB153/132	0.58		0.71		0.53		0.27	
PCB105		ND	0.27		0.15			ND
PCB138 /160	0.26		1.15		0.99		0.05	J
PCB187		ND	0.47		0.84		0.27	
PCB128	0.46		0.45		0.49		0.39	
PCB180	0.80		1.05		1.00		0.13	
PCB170/190	74.21	I	69.29	I	89.93	I	56.72	I
PCB195/208	0.52		0.47		0.59		0.41	
PCB206	0.07		0.03	J	0.04	J	0.00	J
PCB209	0.54		0.81		0.87		0.53	

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	18-19		20-21		23-24		26-27	
Original Sample								
GERG ID	C22099		C22101		C22104		C22106	
Sample Type	Sample		Sample		Sample		Sample	
Dry Weight (g)	15.34		15.66		15.91		16.68	
Wet Weight (g)	20.54		20.61		20.15		20.15	
Matrix	Sediment		Sediment		Sediment		Sediment	
% solid	75		76		79		83	
% Lipid								
Page Number	M2414		M2414		M2414		M2414	
Receive Date	9/11/95		9/11/95		9/11/95		9/11/95	
Extraction Date	10/19/95		10/19/95		10/19/95		10/19/95	
Analysis Date	11/7/95		11/7/95		11/7/95		11/7/95	
PCB103 % recovery	95		63		74		92	
PCB198 % recovery	131	Q	78		86		94	
DBOFB % recovery	99		68		105		110	
Total Chlordane's	3.91		3.63		5.65		166.76	
Total DDT's	3.39		3.13		6.69		96.14	
Total HCH's	1.22		0.06		0.23		0.02	
Total PCB's	20.30		12.63		12.10		14.17	
Pesticides based on ng/g, dry wt.								
Hexachlorobenzene		ND	0.15			ND		ND*
Alpha HCH		ND		ND		ND		ND*
Beta HCH	0.36		0.06	J		ND		ND*
Gamma HCH		ND		ND		ND		ND*
Delta HCH	0.86			ND	0.23		0.02	J*
Heptachlor	0.04	J	0.04	J	0.00	J	0.14	*
Heptachlor Epoxide		ND		ND	0.18		0.01	J*
Oxychlordane		ND	0.79		0.48		0.38	*
Gamma Chlordane	0.74		0.52		1.75		41.23	d*
Alpha Chlordane	1.72		1.37		1.34		41.46	d*
Trans-Nonachlor	0.56		0.50		1.06		62.77	d*
Cis-Nonachlor	0.85		0.42		0.85		20.76	d*
Aldrin	0.93		0.50		0.29		0.47	*
Dieldrin		ND		ND		ND	0.29	*
Endrin		ND		ND	0.22			ND*
Mirex	0.31		0.14		0.23		0.04	J*
2,4' DDE	0.15		0.09			ND		ND*
4,4' DDE	0.86		0.83		1.20		0.92	*
2,4' DDD		ND	0.48		1.99		26.04	d*
4,4' DDD	1.34		0.88		3.22		69.18	d*
2,4' DDT		ND		ND		ND		ND*
4,4' DDT	1.04		0.86		0.29			ND*
Endosulfan II	0.11			ND	0.38		0.17	*

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	18-19		20-21		23-24		26-27	
Original Sample								
GERG ID	C22099		C22101		C22104		C22106	
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND		ND		ND	0.00	J
PCB18/17		ND		ND		ND		ND
PCB28	0.36			ND	0.23		2.65	
PCB52	0.27	J	0.40	J	0.18	J	0.28	J
PCB44	2.01		0.40		0.41		0.37	
PCB66		ND		ND	0.52		0.10	
PCB101/90	0.39		0.66		0.35			ND
PCB118	2.05		1.36		1.03		1.33	
PCB153/132	0.27		0.33		0.32		0.29	
PCB105	0.13		0.14		0.06		0.20	
PCB138 /160	0.82			ND	0.40			ND
PCB187	0.26		0.34		0.29		0.06	J
PCB128	0.04	J	0.17			ND		ND
PCB180	0.42		0.29		0.39		0.06	
PCB170/190	54.09	I	37.73	I	22.01	I	4.00	I
PCB195/208	0.62		0.28			ND	0.02	J
PCB206	0.05	J		ND	0.10		0.00	J
PCB209	0.58		0.40		0.25		0.10	

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	28-29		30-31		32-34		36-37	
Original Sample								
GERG ID	C22108		C22110		C22112		C22115	
Sample Type	Sample		Sample		Sample		Sample	
Dry Weight (g)	16.66		16.82		16.38		15.33	
Wet Weight (g)	20.24		20.22		20.30		18.60	
Matrix	Sediment		Sediment		Sediment		Sediment	
% solid	82		83		81		82	
% Lipid								
Page Number	M2414		M2414		M2414		M2414	
Receive Date	9/11/95		9/11/95		9/11/95		9/11/95	
Extraction Date	10/19/95		10/19/95		10/19/95		10/19/95	
Analysis Date	11/7/95		11/7/95		11/7/95		11/7/95	
PCB103 % recovery	91		83		96		81	
PCB198 % recovery	106		95		92		93	
DBOFB % recovery	117		122		144	Q	176	Q
Total Chlordane's	10.09		15.73		7.30		131.52	
Total DDT's	1.91		294.83		4.38		14.71	
Total HCH's	0.01		0.02		0.04		0.04	
Total PCB's	5.04		11.96		7.90		16.50	
Pesticides based on ng/g, dry wt.								
Hexachlorobenzene		ND		ND*		ND		ND
Alpha HCH		ND		ND*		ND		ND
Beta HCH		ND	0.01	J*	0.02	J		ND
Gamma HCH		ND	0.01	J*		ND		ND
Delta HCH	0.01	J		ND*	0.02	J	0.04	J
Heptachlor		ND	0.05	*	0.62		0.03	J
Heptachlor Epoxide	0.00	J		ND*		ND		ND
Oxychlordane	0.20			ND*	0.45		1.28	
Gamma Chlordane	2.01		6.06	*	1.85		36.23	d
Alpha Chlordane	1.51		4.38	*	1.71		28.01	d
Trans-Nonachlor	4.66		3.87	*	1.60		49.28	d
Cis-Nonachlor	1.71		1.36	*	1.07		16.69	d
Aldrin	0.06	J	0.01	J*		ND		ND
Dieldrin	0.13		0.54	*	0.01	J	0.01	J
Endrin		ND	0.32	*	0.26			ND
Mirex	0.04	J	0.05	J*	0.15		0.04	J
2,4' DDE	0.01	J	0.01	J*	0.02	J		ND
4,4' DDE	0.88		1.12	*	1.46		0.11	
2,4' DDD	0.39		76.49	d*	0.75		6.28	
4,4' DDD	0.63		216.15	d*	2.02		8.05	
2,4' DDT		ND		ND*		ND	0.21	
4,4' DDT		ND	1.06	*	0.12		0.07	J
Endosulfan II	0.00	J		ND*		ND		ND

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	28-29		30-31		32-34		36-37	
Original Sample								
GERG ID	C22108		C22110		C22112		C22115	
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND	0.04	J		ND		ND
PCB18/17		ND	0.16	J		ND	0.11	J
PCB28	0.19		0.98		0.50			ND
PCB52	0.13	J	0.32	J	0.20	J		ND
PCB44		ND	0.97			ND		ND
PCB66		ND	0.32			ND		ND
PCB101/90	0.37		0.66		0.52		4.53	
PCB118	0.20		0.40		0.47		0.71	
PCB153/132	0.17		0.22		0.44		0.42	
PCB105	0.02	J	0.04	J		ND		ND
PCB138 /160		ND	0.07		0.16		0.19	
PCB187	0.07		0.07	J	0.12		0.09	
PCB128	0.02	J	0.07	J	0.07	J	0.10	J
PCB180	0.12		0.12		0.11		0.09	
PCB170/190	4.08	I	2.83	I	3.37	I	3.46	I
PCB195/208		ND	0.01	J		ND	0.01	J
PCB206	0.00	J		ND	0.02	J	0.02	J
PCB209	0.00	J		ND		ND	0.25	

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
• Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	40-42		45-46		49-50		52-53	
Original Sample								
GERG ID	C22119		C22123		C22127		C22130	
Sample Type	Sample		Sample		Sample		Sample	
Dry Weight (g)	15.98		16.06		16.28		16.60	
Wet Weight (g)	20.11		20.19		20.06		20.25	
Matrix	Sediment		Sediment		Sediment		Sediment	
% solid	79		80		81		82	
% Lipid								
Page Number	M2414		M2414		M2414		M2414	
Receive Date	9/11/95		9/11/95		9/11/95		9/11/95	
Extraction Date	10/19/95		10/19/95		10/19/95		10/19/95	
Analysis Date	11/8/95		11/8/95		11/8/95		11/8/95	
PCB103 % recovery	91		88		101		81	
PCB198 % recovery	99		93		105		84	
DBOFB % recovery	192	Q	124		117		95	
Total Chlordane's	59.11		3.83		0.91		0.99	
Total DDT's	9.01		2.96		0.94		0.75	
Total HCH's	0.05						0.06	
Total PCB's	9.44		7.14		2.83		5.33	
Pesticides based on ng/g, dry wt.								
Hexachlorobenzene		ND		ND		ND		ND
Alpha HCH		ND		ND		ND		ND
Beta HCH		ND		ND		ND	0.06	J
Gamma HCH	0.02	J		ND		ND		ND
Delta HCH	0.04	J		ND		ND		ND
Heptachlor	1.49		0.00	J	0.07			ND
Heptachlor Epoxide		ND		ND		ND	0.02	J
Oxychlordane	1.63			ND		ND		ND
Gamma Chlordane	18.40		1.34		0.26			ND
Alpha Chlordane	15.75		1.19		0.20		0.58	
Trans-Nonachlor	14.85		0.76		0.15		0.17	
Cis-Nonachlor	6.99		0.53		0.23		0.21	
Aldrin		ND		ND		ND	0.02	J
Dieldrin	0.12		0.03	J	0.00	J		ND
Endrin	0.71			ND	0.04	J		ND
Mirex	0.08	J	0.04	J		ND		ND
2,4' DDE	0.03	J	0.03	J		ND	0.03	J
4,4' DDE	1.80		0.97		0.33		0.25	
2,4' DDD	2.55		0.60		0.17		0.13	J
4,4' DDD	4.54		1.32		0.44		0.34	
2,4' DDT		ND		ND		ND		ND
4,4' DDT	0.09		0.04	J		ND		ND
Endosulfan II		ND		ND		ND	0.04	J

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

NOAA Historical Trends - Tampa, FL

Client Sample ID	40-42		45-46		49-50		52-53	
Original Sample								
GERG ID	C22119		C22123		C22127		C22130	
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND		ND		ND		ND
PCB18/17		ND		ND		ND		ND
PCB28		ND	0.32			ND		ND
PCB52		ND	0.18	J		ND		ND
PCB44		ND	0.24		0.01	J	0.09	J
PCB66		ND		ND		ND		ND
PCB101/90	1.26		0.39		0.04	J	0.23	
PCB118	1.19		0.45		0.15		0.73	
PCB153/132	0.37		0.15		0.02	J		ND
PCB105		ND	0.06			ND		ND
PCB138 /160	0.17		0.06	J		ND		ND
PCB187	0.12		0.09			ND	0.07	J
PCB128	0.06	J	0.19			ND	0.01	J
PCB180	0.13		0.07		0.07		0.06	
PCB170/190	1.52	I	4.59	I	1.34	I	21.41	I
PCB195/208		ND	0.03	J		ND	0.12	
PCB206		ND	0.03	J	0.00	J	0.13	
PCB209		ND		ND		ND		ND

I Analytical Interference
J <MDL
Q Recovery Outside QC
ND Non Detect
NA Not Applicable
d Dilution
* Analyte Confirmed by GC/MS

Appendix III

NOAA HISTORICAL TRENDS

Galveston Bay (TX) Core Data

PAHs Data

NOAA - GENERAL INFORMATION - Historical Trends - Galveston, TX

DEPTH INTERVAL (cm)	0-2		2-4		4-6		6-8	
ID:								
LABSAMNO:	C22983		C22984		C22985		C22986	
SAMPLE TYPE:	SAMP		SAMP		SAMP		SAMP	
RECEIPT DATE:	12/8/95		12/8/95		12/8/95		12/8/95	
QCBATCH:	M2456		M2456		M2456		M2456	
EXTRACTION DATE:	01/24/96		01/24/96		01/24/96		01/24/96	
METHOD:	GCMS		GCMS		GCMS		GCMS	
ANALYSIS DATE:	02/12/96		02/12/96		02/13/96		02/13/96	
MATRIX:	Sediment		Sediment		Sediment		Sediment	
SUBMAT:								
WETWT:	20.09		20.17		20.12		20.17	
DRYWT:	3.07		6.07		6.51		11.40	
WTUNITS:	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY
PCTSOLIDS:	15.3		30.1		32.3		56.5	
VOL:								
VOLUNITS:								
Surrogate Recoveries								
PAH's:								
NAPHD8:	76.7		85.6		79.6		83.2	
ACEND10:	77.2		83.4		76.3		85.2	
PHEND10:	76.2		77.9		80.3		85.8	
CHRYD12:	58.1		72.6		66.5		69.7	
PERYD12:	54.7		55.1		60.8		56.6	

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends - Galveston, TX

INVEST#:	0-2		2-4		4-6		6-8	
ID:								
LABSAMNO:	C22983		C22984		C22985		C22986	
UNIT:	ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	8.28		4.12		5.65		4.53	
C1-NAPHTHALENES	5.20	J	4.11	J	2.25	J	6.23	
C2-NAPHTHALENES	10.48		5.13		6.20		5.43	
C3-NAPHTHALENES	9.72		2.39	J	3.80		4.24	
C4-NAPHTHALENES	13.73		1.96	J	3.59		2.92	
BIPHENYL	1.94	J	0.91	J	1.11		1.85	
ACENAPHTHYLENE	1.89	J	0.99	J	1.62		1.28	
ACENAPHTHENE	1.44	J	0.41	J	1.10	J	0.59	J
FLUORENE	2.33	J	0.61	J	1.17	J	1.00	
C1-FLUORENES	4.92	J	2.27	J	1.97	J	1.01	J
C2-FLUORENES		ND	6.55			ND	4.68	
C3-FLUORENES		ND	10.51		12.64		7.84	
PHENANTHRENE	7.58		3.77		7.11		5.06	
ANTHRACENE	2.33	J	1.01	J	2.05		1.08	
C1-PHEN_ANTHR	9.26		4.80		5.84		4.89	
C2-PHEN_ANTHR	8.95		5.75		5.18		4.33	
C3-PHEN_ANTHR	13.44		6.97		7.92		5.37	
C4-PHEN_ANTHR	23.52		4.52		6.96		4.82	
DIBENZOTHIO	1.45	J	0.60	J	0.80	J	0.66	
C1-DIBEN	4.42	J	2.14	J	2.48		1.56	
C2-DIBEN	6.78		3.68		4.88		2.12	
C3-DIBEN	11.12		4.13		5.95		3.47	
FLUORANTHENE	12.51		8.77		19.69		10.42	
PYRENE	15.70		11.66		21.43		12.15	
C1-FLUORAN_PYR	13.39		8.72		11.56		7.71	
BENaANTHRACENE	7.14		4.69		13.17		5.79	
CHRYSENE	12.75		7.22		13.99		6.86	
C1-CHRYSENES	10.82		6.00		8.21		5.64	
C2-CHRYSENES	10.35		6.80		8.72		5.21	
C3-CHRYSENES	2.85	J	0.84	J	1.12	J	0.85	J
C4-CHRYSENES		ND		ND		ND	1.01	
BENbFLUORAN	17.68		9.83		17.85		11.64	
BENkFLUORAN	5.96		3.46		3.97		2.81	
BENePYRENE	12.49		6.48		9.08		6.77	
BENaPYRENE	8.87		5.64		10.20		5.98	
PERYLENE	17.59		8.84		12.09		7.23	
I123cdPYRENE	9.19		5.26		7.27		5.33	
DBahANTHRA	3.19		5.67		1.84		2.21	
BghiPERYLENE	11.06		6.25		8.10		6.73	
TOTAL PAH's	320.3	J	183.5	J	258.6		179.3	J

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends - Galveston, TX

INVEST#:	0-2		2-4		4-6		6-8	
ID:								
LABSAMNO:	C22983		C22984		C22985		C22986	
UNIT:	ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	3.62	J	2.38	J	1.15	J	3.67	
1-METHYLNAPH	1.58	J	1.73	J	1.10	J	2.56	
2,6-DIMETHNAPH	2.42	J	1.20	J	0.94	J	1.74	
1,6,7-TRIMETHNAPH	0.80	J	0.43	J	0.34	J	0.61	J
1-METHYLPHEN	1.49	J	0.88	J	1.54		1.34	
Surrogate Recoveries								
NAPHD8:	76.7		85.6		79.6		83.2	
ACEND10:	77.2		83.4		76.3		85.2	
PHEND10:	76.2		77.9		80.3		85.8	
CHRYD12:	58.1		72.6		66.5		69.7	
PERYD12:	54.7		55.1		60.8		56.6	

NOAA - GENERAL INFORMATION - Historical Trends - Galveston, TX

DEPTH INTERVAL (cm)	8-10		10-12		12-14		14-16	
ID:								
LABSAMNO:	C22987		C22988		C22989		C22990	
SAMPLE TYPE:	SAMP		SAMP		SAMP		SAMP	
RECEIPT DATE:	12/8/95		12/8/95		12/8/95		12/8/95	
QCBATCH:	M2456		M2456		M2456		M2456	
EXTRACTION DATE:	01/24/96		01/24/96		01/24/96		01/24/96	
METHOD:	GCMS		GCMS		GCMS		GCMS	
ANALYSIS DATE:	02/13/96		02/13/96		02/13/96		02/13/96	
MATRIX:	Sediment		Sediment		Sediment		Sediment	
SUBMAT:								
WETWT:	18.17		20.07		20.73		20.04	
DRYWT:	7.55		4.91		9.00		8.58	
WTUNITS:	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY
PCTSOLIDS:	41.5		24.5		43.4		42.8	
VOL:								
VOLUNITS:								
Surrogate Recoveries								
PAH's:								
NAPHD8:	84.3		83.0		89.9		87.7	
ACEND10:	82.0		92.4		88.1		84.4	
PHEND10:	82.0		80.3		85.9		86.7	
CHRYD12:	64.3		72.4		78.8		71.3	
PERYD12:	66.3		61.4		67.6		61.7	

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends - Galveston, TX

INVEST#:	8-10		10-12		12-14		14-16	
ID:								
LABSAMNO:	C22987		C22988		C22989		C22990	
UNIT:	ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	4.29		7.12		3.71		3.56	
C1-NAPHTHALENES	3.96	J	6.15	J	1.99	J	2.14	J
C2-NAPHTHALENES	5.71		6.58		3.70		3.05	
C3-NAPHTHALENES	5.57		11.62		4.84		3.98	
C4-NAPHTHALENES	4.61		10.72		5.50		0.00	ND
BIPHENYL	0.85		2.18		0.98		0.78	
ACENAPHTHYLENE	2.06		3.43		1.68		1.11	
ACENAPHTHENE	0.85	J	1.58	J	0.66	J	0.56	J
FLUORENE	1.19	J	1.94		0.80	J	0.96	J
C1-FLUORENES	2.02	J	4.14		1.36	J	2.71	
C2-FLUORENES	6.53		10.61		6.30		4.34	
C3-FLUORENES	9.87		12.49		7.95		6.04	
PHENANTHRENE	6.86		13.81		3.58		2.95	
ANTHRACENE	1.75		3.71		1.42		1.58	
C1-PHEN_ANTHR	6.36		11.83		3.73		3.69	
C2-PHEN_ANTHR	7.68		14.05		5.02		2.97	
C3-PHEN_ANTHR	7.51		13.39		5.36		3.41	
C4-PHEN_ANTHR	5.58		10.57		3.96		6.61	
DIBENZOTHIO	0.59	J	1.79		0.61	J	0.52	J
C1-DIBEN	1.90	J	3.70		1.86		1.18	J
C2-DIBEN	3.72		6.68		2.14		1.92	
C3-DIBEN	5.32		6.72		3.78		3.49	
FLUORANTHENE	16.98		35.47		8.79		5.17	
PYRENE	20.20		40.00		11.13		6.45	
C1-FLUORAN_PYR	11.13		28.58		7.61		6.83	
BENaANTHRACENE	11.51		18.97		6.11		6.03	
CHRYSENE	11.82		25.51		8.49		7.23	
C1-CHRYSENES	9.30		15.10		5.90		4.62	
C2-CHRYSENES	9.81		14.74		5.35		5.12	
C3-CHRYSENES	1.56		3.17		1.18		1.23	
C4-CHRYSENES	2.00		2.07	J	2.22		1.56	
BENbFLUORAN	19.24		31.60		12.04		9.99	
BENkFLUORAN	7.50		11.34		4.62		4.10	
BENePYRENE	11.54		17.73		6.61		5.78	
BENaPYRENE	11.95		19.69		7.52		5.51	
PERYLENE	10.54		16.34		8.03		6.48	
I123cdPYRENE	9.22		13.98		5.48		4.40	
DBahANTHRA	2.17		3.38		1.36		1.38	
BghiPERYLENE	11.93		17.12		6.24		4.24	
TOTAL PAH's	273.2	J	479.6		179.6	J	143.7	J

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends - Galveston, TX

INVEST#:	8-10		10-12		12-14		14-16	
ID:								
LABSAMNO:	C22987		C22988		C22989		C22990	
UNIT:	ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	2.59		4.24		1.26	J	1.52	J
1-METHYLNAPH	1.37	J	1.91	J	0.73	J	0.62	J
2,6-DIMETHNAPH	1.50		2.23		0.72	J	1.29	
1,6,7-TRIMETHNAPH	0.80	J	1.21	J	0.40	J	0.50	J
1-METHYLPHEN	1.02		3.17		0.78	J	0.54	J
Surrogate Recoveries								
NAPHD8:	84.3		83.0		89.9		87.7	
ACEND10:	82.0		92.4		88.1		84.4	
PHEND10:	82.0		80.3		85.9		86.7	
CHRYD12:	64.3		72.4		78.8		71.3	
PERYD12:	66.3		61.4		67.6		61.7	

NOAA - GENERAL INFORMATION - Historical Trends - Galveston, TX

DEPTH INTERVAL (cm)	16-18		18-20		20-22		22-24	
ID:								
LABSAMNO:	C22991		C22992		C22993		C22994	
SAMPLE TYPE:	SAMP		SAMP		SAMP		SAMP	
RECEIPT DATE:	12/8/95		12/8/95		12/8/95		12/8/95	
QCBATCH:	M2456		M2456		M2456		M2456	
EXTRACTION DATE:	01/24/96		01/24/96		01/24/96		01/24/96	
METHOD:	GCMS		GCMS		GCMS		GCMS	
ANALYSIS DATE:	02/13/96		02/13/96		02/13/96		02/13/96	
MATRIX:	Sediment		Sediment		Sediment		Sediment	
SUBMAT:								
WETWT:	20.57		20.55		20.34		20.01	
DRYWT:	7.99		8.49		7.83		7.52	
WTUNITS:	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY
PCTSOLIDS:	38.9		41.3		38.5		37.6	
VOL:								
VOLUNITS:								
Surrogate Recoveries								
PAH's:								
NAPHD8:	79.7		86.8		85.8		92.7	
ACEND10:	81.2		78.9		88.4		82.1	
PHEND10:	78.7		79.7		83.1		79.5	
CHRYD12:	61.0		69.9		69.4		69.8	
PERYD12:	68.4		55.8		55.2		56.5	

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends - Galveston, TX

INVEST#:	16-18		18-20		20-22		22-24	
ID:								
LABSAMNO:	C22991		C22992		C22993		C22994	
UNIT:	ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	3.56		3.77		3.69		3.34	
C1-NAPHTHALENES	1.94	J	1.97	J	2.08	J	2.13	J
C2-NAPHTHALENES	3.10		2.62		3.62		2.60	
C3-NAPHTHALENES	1.93	J	5.13		1.83	J	4.35	
C4-NAPHTHALENES	3.21		2.98		2.34	J	3.70	
BIPHENYL	0.76		0.60	J	0.62	J	0.54	J
ACENAPHTHYLENE	0.68	J	0.65	J	0.78	J	0.66	J
ACENAPHTHENE	0.32	J	0.38	J	0.52	J	0.66	J
FLUORENE	0.58	J	0.67	J	0.58	J	0.44	J
C1-FLUORENES	2.50		1.67	J	1.80	J	2.59	
C2-FLUORENES	3.38		5.16		3.86		3.53	
C3-FLUORENES	12.88		8.43		10.02		9.13	
PHENANTHRENE	2.78		2.02		2.01		1.57	
ANTHRACENE	0.89	J	0.62	J	0.84	J	0.46	J
C1-PHEN_ANTHR	3.28		2.83		5.07		2.21	
C2-PHEN_ANTHR	2.78		2.75		2.89		3.32	
C3-PHEN_ANTHR	3.83		2.92		4.51		3.88	
C4-PHEN_ANTHR	5.56		2.39		4.99		3.84	
DIBENZOTHIO	0.40	J	0.33	J	0.51	J	0.30	J
C1-DIBEN	2.09		0.92	J	1.56	J	2.27	
C2-DIBEN	1.99		2.12		2.24		2.13	
C3-DIBEN	2.24		2.19		4.46		4.10	
FLUORANTHENE	3.29		2.99		2.84		1.92	
PYRENE	3.92		3.65		3.39		2.85	
C1-FLUORAN_PYR	5.25		3.62		4.93		4.86	
BENaANTHRACENE	2.73		2.07		2.12		1.41	
CHRYSENE	3.06		2.84		3.22		1.54	
C1-CHRYSENES	3.29		1.99		2.85		1.85	
C2-CHRYSENES	4.32		2.75		5.30		3.05	
C3-CHRYSENES	1.40		0.95	J	0.85	J	1.24	J
C4-CHRYSENES		ND	0.70	J		ND	0.51	J
BENbFLUORAN	5.27		4.23		4.38		2.75	
BENkFLUORAN	2.11		1.21		1.85		1.17	
BENePYRENE	3.44		2.68		3.11		2.04	
BENaPYRENE	3.12		2.35		2.69		1.35	
PERYLENE	3.91	J	2.92	J	3.17	J	2.45	J
I123cdPYRENE	2.84		2.14		2.43		1.57	
DBahANTHRA	0.60	J	0.76		0.67	J	0.40	J
BghiPERYLENE	3.34		2.40		2.39		1.74	
TOTAL PAH's	112.6		93.4	J	107.0	J	90.5	

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends - Galveston, TX

INVEST#:	16-18		18-20		20-22		22-24	
ID:								
LABSAMNO:	C22991		C22992		C22993		C22994	
UNIT:	ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	1.21	J	1.37	J	1.50	J	1.34	J
1-METHYLNAPH	0.73	J	0.60	J	0.58	J	0.79	J
2,6-DIMETHNAPH	0.77	J	1.04	J	0.93	J	0.83	J
1,6,7-TRIMETHNAPH	0.48	J	0.37	J	0.77	J	0.39	J
1-METHYLPHEN	0.56	J	0.59	J	0.59	J	0.40	J
Surrogate Recoveries								
NAPHD8:	79.7		86.8		85.8		92.7	
ACEND10:	81.2		78.9		88.4		82.1	
PHEND10:	78.7		79.7		83.1		79.5	
CHRYD12:	61.0		69.9		69.4		69.8	
PERYD12:	68.4		55.8		55.2		56.5	

NOAA - GENERAL INFORMATION - Historical Trends - Galveston, TX

DEPTH INTERVAL (cm)	24-26		26-28		28-30		30-32	
ID:								
LABSAMNO:	C22995		C22996		C22997		C22998	
SAMPLE TYPE:	SAMP		SAMP		SAMP		SAMP	
RECEIPT DATE:	12/8/95		12/8/95		12/8/95		12/8/95	
QCBATCH:	M2456		M2456		M2456		M2456	
EXTRACTION DATE:	01/24/96		01/24/96		01/24/96		01/24/96	
METHOD:	GCMS		GCMS		GCMS		GCMS	
ANALYSIS DATE:	02/13/96		02/13/96		02/13/96		02/13/96	
MATRIX:	Sediment		Sediment		Sediment		Sediment	
SUBMAT:								
WETWT:	20.04		20.62		20.16		20.45	
DRYWT:	7.11		8.32		8.60		8.09	
WTUNITS:	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY
PCTSOLIDS:	35.5		40.3		42.7		39.6	
VOL:								
VOLUNITS:								
Surrogate Recoveries								
PAH's:								
NAPHD8:	89.9		86.1		77.6		90.4	
ACEND10:	90.4		85.2		79.5		84.6	
PHEND10:	83.2		86.0		76.7		85.8	
CHRYD12:	74.2		64.3		64.3		68.8	
PERYD12:	56.8		58.1		52.9		54.7	

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends - Galveston, TX

INVEST#:	24-26		26-28		28-30		30-32	
ID:								
LABSAMNO:	C22995		C22996		C22997		C22998	
UNIT:	ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	4.62		3.89		4.15		3.78	
C1-NAPHTHALENES	2.43	J	1.85	J	2.57	J	2.63	J
C2-NAPHTHALENES	4.03		3.11		3.20		3.49	
C3-NAPHTHALENES	5.67		3.45		3.44		3.86	
C4-NAPHTHALENES	5.77		3.71		3.66		4.44	
BIPHENYL	0.41	J	0.53	J	1.19		0.83	
ACENAPHTHYLENE	1.11		1.68		1.59		1.24	
ACENAPHTHENE	0.41	J	0.47	J	0.96	J	0.65	J
FLUORENE	0.79	J	0.69	J	0.97	J	0.86	J
C1-FLUORENES	2.77		2.52		2.68		2.59	
C2-FLUORENES	6.58		5.89		6.37		7.49	
C3-FLUORENES	13.14		9.63		11.97		11.76	
PHENANTHRENE	2.60		3.02		4.05		2.80	
ANTHRACENE	0.75	J	1.15		1.94		0.94	
C1-PHEN_ANTHR	3.28		3.73		4.38		3.67	
C2-PHEN_ANTHR	4.18		4.10		7.47		3.66	
C3-PHEN_ANTHR	4.76		4.93		6.79		3.57	
C4-PHEN_ANTHR	4.22		7.49		6.65		7.62	
DIBENZOTHIO	0.55	J	0.63	J	0.59	J	0.43	J
C1-DIBEN	2.76		1.07	J	2.23		1.81	J
C2-DIBEN	2.46		1.41	J	2.66		2.20	
C3-DIBEN	4.62		3.94		5.91		3.04	
FLUORANTHENE	2.71		3.13		4.79		3.61	
PYRENE	3.72		4.26		6.80		5.00	
C1-FLUORAN_PYR	7.75		4.48		10.76		5.76	
BENaANTHRACENE	2.07		2.41		3.63		2.87	
CHRYSENE	2.84		3.51		4.43		3.73	
C1-CHRYSENES	3.41		3.29		3.66		3.42	
C2-CHRYSENES	4.11		7.10		7.06		3.56	
C3-CHRYSENES	1.93		2.37		1.66		0.87	J
C4-CHRYSENES		ND	2.30			ND		ND
BENbFLUORAN	4.61		5.17		7.68		6.12	
BENkFLUORAN	2.16		2.20		2.79		2.00	
BENePYRENE	2.80		3.37		4.73		4.07	
BENaPYRENE	3.20		3.54		4.38		3.99	
PERYLENE	2.58	J	3.19	J	6.46		3.50	J
I123cdPYRENE	2.72		3.51		4.14		3.51	
DBahANTHRA	0.81	J	1.00		1.01		0.88	
BghiPERYLENE	2.87		3.39		4.37		3.66	
TOTAL PAH's	128.2	J	127.1	J	163.8		129.9	J

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends - Galveston, TX

INVEST#:	24-26		26-28		28-30		30-32	
ID:								
LABSAMNO:	C22995		C22996		C22997		C22998	
UNIT:	ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	1.62	J	1.24	J	1.74	J	1.35	J
1-METHYLNAPH	0.81	J	0.61	J	0.83	J	1.28	J
2,6-DIMETHNAPH	0.72	J	0.70	J	0.85	J	0.70	J
1,6,7-TRIMETHNAPH	0.63	J	0.57	J	0.65	J	0.33	J
1-METHYLPHEN	0.56	J	0.94		1.30		0.75	J
Surrogate Recoveries								
NAPHD8:	89.9		86.1		77.6		90.4	
ACEND10:	90.4		85.2		79.5		84.6	
PHEND10:	83.2		86.0		76.7		85.8	
CHRYD12:	74.2		64.3		64.3		68.8	
PERYD12:	56.8		58.1		52.9		54.7	

NOAA - GENERAL INFORMATION - Historical Trends - Galveston, TX

DEPTH INTERVAL (cm)	32-34		34-36		38-40		42-44	
ID:								
LABSAMNO:	C22999		C23000		C23002		C23004	
SAMPLE TYPE:	SAMP		SAMP		SAMP		SAMP	
RECEIPT DATE:	12/8/95		12/8/95		12/8/95		12/8/95	
QCBATCH:	M2456		M2456		M2456		M2456	
EXTRACTION DATE:	01/24/96		01/24/96		01/24/96		01/24/96	
METHOD:	GCMS		GCMS		GCMS		GCMS	
ANALYSIS DATE:	02/13/96		02/13/96		02/13/96		02/13/96	
MATRIX:	Sediment		Sediment		Sediment		Sediment	
SUBMAT:								
WETWT:	20.73		20.12		20.51		20.42	
DRYWT:	8.17		9.59		9.19		11.85	
WTUNITS:	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY	GRAMS	DRY
PCTSOLIDS:	39.4		47.7		44.8		58.0	
VOL:								
VOLUNITS:								
Surrogate Recoveries								
PAH's:								
NAPHD8:	91.4		80.9		81.0		85.8	
ACEND10:	82.0		84.8		74.9		83.1	
PHEND10:	76.2		78.9		69.9		77.2	
CHRYD12:	66.6		68.2		61.5		62.8	
PERYD12:	46.8		51.1		52.2		55.1	

NOAA - AROMATIC HYDROCARBON DATA - Historical Trends - Galveston, TX

INVEST#:	32-34		34-36		38-40		42-44	
ID:								
LABSAMNO:	C22999		C23000		C23002		C23004	
UNIT:	ng/g		ng/g		ng/g		ng/g	
PNA Analyte	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
NAPHTHALENE	4.30		3.63		3.65		3.49	
C1-NAPHTHALENES	3.09	J	1.72	J	2.37	J	2.19	J
C2-NAPHTHALENES	3.47		2.39		3.28		2.08	
C3-NAPHTHALENES	2.51		3.17		1.45	J	1.61	J
C4-NAPHTHALENES	3.81		2.83		3.95		2.06	
BIPHENYL	1.04		0.65		0.78		0.51	
ACENAPHTHYLENE	1.70		0.63	J	0.48	J	0.16	J
ACENAPHTHENE	1.00	J	0.22	J	0.40	J	0.17	J
FLUORENE	1.03	J	0.64	J	0.66	J	0.39	J
C1-FLUORENES	6.23		2.71		1.73	J	0.83	J
C2-FLUORENES	3.17		3.88		1.86	J	3.14	
C3-FLUORENES	9.56		5.89		1.74	J	4.24	
PHENANTHRENE	4.29		2.71		2.37		1.14	
ANTHRACENE	1.25		0.63	J	0.72	J	0.20	J
C1-PHEN_ANTHR	3.88		2.53		2.91		1.19	J
C2-PHEN_ANTHR	5.22		4.21		3.22		2.40	
C3-PHEN_ANTHR	5.18		6.44		3.46		2.69	
C4-PHEN_ANTHR	6.64		3.78		3.08		2.24	
DIBENZOTHIO	0.62	J	0.66	J	0.33	J	0.41	J
C1-DIBEN	1.99		1.53	J	1.34	J	0.87	J
C2-DIBEN	2.46		3.12		1.86		1.39	
C3-DIBEN	4.48		3.04		3.37		1.69	
FLUORANTHENE	0.09	J	3.52		2.33		0.53	
PYRENE	7.25		4.35		2.99		0.72	
C1-FLUORAN_PYR	7.19		5.84		3.85		1.21	
BENaANTHRACENE	3.93		2.75		1.85		0.48	J
CHRYSENE	4.51		3.10		2.13		0.48	
C1-CHRYSENES	4.56		3.08		1.89		0.64	J
C2-CHRYSENES	5.94		4.44		2.89		1.81	
C3-CHRYSENES	1.62		0.93	J	1.14	J	0.92	
C4-CHRYSENES		ND		ND		ND		ND
BENbFLUORAN	9.00		6.21		4.53		1.15	
BENkFLUORAN	2.15		1.48		1.49		0.39	
BENePYRENE	5.74		3.53		2.74		0.53	
BENaPYRENE	4.86		3.25		2.39		0.47	
PERYLENE	8.69		10.84		8.23		6.33	
I123cdPYRENE	4.85		3.13		2.28		0.62	
DBahANTHRA	0.99		0.71		0.36	J	0.19	J
BghiPERYLENE	4.95		3.16		2.50		0.48	
TOTAL PAH's	153.2	J	117.3		88.6	J	52.0	J

NOAA - AROMATIC HYDROCARBON DATA (CONT)- Historical Trends - Galveston, TX

INVEST#:	32-34		34-36		38-40		42-44	
ID:								
LABSAMNO:	C22999		C23000		C23002		C23004	
UNIT:	ng/g		ng/g		ng/g		ng/g	
Analyte (Cont)	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL	Conc	DB QUAL
2-METHYLNAPH	1.93	J	1.13	J	1.62	J	1.40	J
1-METHYLNAPH	1.16	J	0.59	J	0.75	J	0.79	J
2,6-DIMETHNAPH	1.39		0.67	J	0.82	J	1.15	
1,6,7-TRIMETHNAPH	0.75	J	0.38	J	1.27		0.29	J
1-METHYLPHEN	0.99		0.60	J	0.54	J	0.40	J
Surrogate Recoveries								
NAPHD8:	91.4		80.9		81.0		85.8	
ACEND10:	82.0		84.8		74.9		83.1	
PHEND10:	76.2		78.9		69.9		77.2	
CHRYD12:	66.6		68.2		61.5		62.8	
PERYD12:	46.8		51.1		52.2		55.1	

Organochlorine Data

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	0-2		2-4		4-6		6-8	
Original Sample								
GERG ID	C22983		C22984		C22985		C22986	
Sample Type	Sample		Sample		Sample		Sample	
Dry Weight (g)	3.07		6.07		6.51		11.40	
Wet Weight (g)	20.09		20.17		20.12		20.17	
Matrix	Sediment		Sediment		Sediment		Sediment	
% solid	15.3		30.1		32.3		56.5	
% Lipid	NA		NA		NA		NA	
Page Number	m2456ri		m2456ri		m2456ri		m2456ri	
Receive Date	12/8/95		12/8/95		12/8/95		12/8/95	
Extraction Date	1/24/96		1/24/96		1/24/96		1/24/96	
Analysis Date	2/28/96		2/28/96		2/28/96		2/28/96	
PCB103 % recovery	92.5		98.6		94.8		96.7	
PCB198 % recovery	95.9		102.1		97.5		98.9	
DBOFB % recovery	83.7		90.0		88.4		91.6	
Total Chlordane's	0.42		0.14		0.17		0.10	
Total DDT's	0.32		0.10		0.21		0.09	
Total HCH's	0.71		0.34		0.91		0.74	
Total PCB's	6.76		5.34		6.46		6.78	
Pesticides based on ng/g, dry wt.								
Hexachlorobenzene	0.56		0.25		0.33		0.23	
Alpha HCH		ND		ND		ND		ND
Beta HCH	0.65	J	0.34	J	0.70		0.59	
Gamma HCH		ND		ND	0.21		0.15	
Delta HCH	0.06	J		ND		ND		ND
Heptachlor		ND		ND		ND		ND
Heptachlor Epoxide	0.11	J	0.06	J	0.07	J	0.05	J
Oxychlordane		ND		ND		ND	0.02	J
Gamma Chlordane	0.05	J	0.02	J	0.03	J	0.02	J
Alpha Chlordane	0.23	J	0.05	J		ND		ND
Trans-Nonachlor	0.02	J		ND	0.05	J		ND
Cis-Nonachlor		ND		ND	0.02	J	0.01	J
Aldrin		ND		ND	0.03	J	0.02	J
Dieldrin		ND		ND		ND		ND
Endrin		ND		ND		ND		ND
Mirex		ND		ND		ND		ND
2,4' DDE		ND		ND		ND		ND
4,4' DDE	0.13	J	0.05	J	0.11	J	0.05	J
2,4' DDD		ND		ND	0.07	J		ND
4,4' DDD	0.19	J	0.04	J	0.03	J	0.02	J
2,4' DDT		ND		ND	0.00	J	0.01	J
4,4' DDT		ND		ND		ND		ND

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	0-2		2-4		4-6		6-8	
Original Sample								
GERG ID	C22983		C22984		C22985		C22986	
Endosulfan II		ND	0.05	J		ND		ND
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND		ND		ND		ND
PCB18/17		ND		ND		ND		ND
PCB28		ND	0.01	J	0.02	J	0.04	J
PCB52	0.32	J	0.14	J	0.13	J	0.15	J
PCB44	0.15	J	0.09	J	0.09	J	0.08	J
PCB66		ND	0.09	J	0.16	J	0.22	
PCB101/90	0.19	J	0.14	J	0.09	J	0.18	J
PCB118		ND	0.03	J	0.05	J	0.14	
PCB153/132		ND	0.10	J	0.09	J	0.31	
PCB105		ND	0.08	J	0.18		0.04	J
PCB138 /160	0.27	J	0.13	J	0.16		0.27	
PCB187	0.04	J	0.02	J	0.05	J	0.04	J
PCB128		ND		ND		ND		ND
PCB180	0.15	J	0.09	J	0.09	J	0.08	
PCB170/190	0.48	J	0.31	J	0.46		0.33	
PCB195/208		ND		ND	0.04	J	0.02	J
PCB206		ND		ND	0.06	J		ND
PCB209	0.49	J	0.21	J	0.29		0.18	

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	8-10		10-12		12-14		14-16	
Original Sample								
GERG ID	C22987		C22988		C22989		C22990	
Sample Type	Sample		Sample		Sample		Sample	
Dry Weight (g)	7.55		4.91		9.00		8.58	
Wet Weight (g)	18.17		20.07		20.73		20.04	
Matrix	Sediment		Sediment		Sediment		Sediment	
% solid	41.5		24.5		43.4		42.8	
% Lipid	NA		NA		NA		NA	
Page Number	m2456ri		m2456ri		m2456ri		m2456ri	
Receive Date	12/8/95		12/8/95		12/8/95		12/8/95	
Extraction Date	1/24/96		1/24/96		1/24/96		1/24/96	
Analysis Date	2/28/96		2/28/96		2/28/96		2/28/96	
PCB103 % recovery	96.4		98.7		98.4		98.6	
PCB198 % recovery	100.3		101.0		101.9		104.0	
DBOFB % recovery	88.3		93.7		94.9		94.3	
Total Chlordane's	0.12		0.28		0.08			
Total DDT's	0.21		0.44		0.20		0.10	
Total HCH's	1.90		1.67		0.92		0.48	
Total PCB's	8.00		13.85		12.81		4.99	
Pesticides based on ng/g, dry wt.								
Hexachlorobenzene	0.35		0.41		0.11	J	0.06	J
Alpha HCH		ND	0.10	J		ND		ND
Beta HCH	1.74		1.34		0.87		0.44	
Gamma HCH	0.16	J	0.23	J	0.05	J	0.03	J
Delta HCH		ND		ND		ND	0.01	J
Heptachlor		ND		ND		ND		ND
Heptachlor Epoxide	0.10		0.15		0.03	J		ND
Oxychlordane	0.01	J		ND		ND		ND
Gamma Chlordane	0.01	J	0.11	J	0.02	J		ND
Alpha Chlordane		ND		ND		ND		ND
Trans-Nonachlor		ND		ND		ND		ND
Cis-Nonachlor		ND	0.01	J	0.02	J		ND
Aldrin	0.02	J		ND	0.12	J		ND
Dieldrin		ND		ND		ND		ND
Endrin		ND		ND		ND		ND
Mirex		ND		ND		ND		ND
2,4' DDE		ND	0.06	J	0.01	J	0.02	J
4,4' DDE	0.12	J	0.20		0.07	J	0.04	J
2,4' DDD	0.06	J	0.12	J	0.05	J	0.03	J
4,4' DDD	0.03	J	0.07	J	0.05	J	0.02	J
2,4' DDT		ND		ND	0.01	J		ND
4,4' DDT		ND		ND	0.01	J		ND

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	8-10		10-12		12-14		14-16	
Original Sample								
GERG ID	C22987		C22988		C22989		C22990	
Endosulfan II	0.05	J		ND		ND		ND
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND		ND		ND		ND
PCB18/17		ND		ND		ND		ND
PCB28	0.28		0.48		0.21		0.02	J
PCB52	0.20	J	0.39	J	0.40	J	0.10	J
PCB44		ND	0.21	J	0.18		0.07	J
PCB66	0.27		0.62		0.54		0.13	
PCB101/90	0.18	J	0.36	J	0.53		0.07	J
PCB118	0.12	J	0.25		0.40		0.03	J
PCB153/132	0.40		0.74		0.72		0.06	J
PCB105	0.04	J	0.05	J	0.10		0.15	
PCB138 /160	0.21		0.36		0.52		0.12	J
PCB187	0.06	J	0.13	J	0.12	J	0.04	J
PCB128		ND		ND	0.05	J		ND
PCB180	0.10		0.17		0.18		0.07	J
PCB170/190	0.32	J	0.70		0.40		0.14	J
PCB195/208	0.06	J	0.11	J	0.09	J	0.05	J
PCB206	0.06	J	0.19		0.08	J	0.07	J
PCB209	0.35		0.55		0.33		0.16	J

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	16-18	18-20	20-22	22-24
Original Sample				
GERG ID	C22991	C22992	C22993	C22994
Sample Type	Sample	Sample	Sample	Sample
Dry Weight (g)	7.99	8.49	7.83	7.52
Wet Weight (g)	20.57	20.55	20.34	20.01
Matrix	Sediment	Sediment	Sediment	Sediment
% solid	38.8	41.3	38.5	37.6
% Lipid	NA	NA	NA	NA
Page Number	m2456ri	m2456ri	m2456ri	m2456ri
Receive Date	12/8/95	12/8/95	12/8/95	12/8/95
Extraction Date	1/24/96	1/24/96	1/24/96	1/24/96
Analysis Date	2/28/96	2/28/96	2/29/96	2/29/96
PCB103 % recovery	100.0	96.7	99.3	93.1
PCB198 % recovery	104.8	100.9	102.0	96.0
DBOFB % recovery	95.6	90.8	93.3	89.9
Total Chlordane's	0.02			0.02
Total DDT's	0.05			0.01
Total HCH's	0.30	0.12	0.32	0.22
Total PCB's	3.97	3.16	3.08	3.16
Pesticides based on ng/g, dry wt.				
Hexachlorobenzene	0.03 J	0.02 J	0.02 J	0.02 J
Alpha HCH	ND	ND	ND	ND
Beta HCH	0.30 J	0.12 J	0.32 J	0.22 J
Gamma HCH	ND	ND	ND	ND
Delta HCH	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND
Heptachlor Epoxide	ND	ND	ND	0.01 J
Oxychlordane	ND	ND	ND	ND
Gamma Chlordane	0.02 J	ND	ND	ND
Alpha Chlordane	0.01 J	ND	ND	ND
Trans-Nonachlor	ND	ND	ND	0.01 J
Cis-Nonachlor	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND
Endrin	ND	ND	ND	ND
Mirex	ND	ND	ND	ND
2,4' DDE	ND	ND	ND	ND
4,4' DDE	0.03 J	ND	ND	0.01 J
2,4' DDD	0.01 J	ND	ND	ND
4,4' DDD	ND	ND	ND	ND
2,4' DDT	ND	ND	ND	ND
4,4' DDT	ND	ND	ND	ND

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	16-18		18-20		20-22		22-24	
Original Sample								
GERG ID	C22991		C22992		C22993		C22994	
Endosulfan II		ND		ND		ND		ND
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND		ND		ND		ND
PCB18/17		ND		ND		ND		ND
PCB28	0.13	J		ND		ND		ND
PCB52	0.07	J	0.03	J	0.03	J	0.02	J
PCB44	0.07	J	0.05	J	0.06	J	0.06	J
PCB66	0.10	J		ND		ND		ND
PCB101/90	0.05	J		ND		ND	0.01	J
PCB118	0.01	J		ND		ND		ND
PCB153/132	0.08	J	0.09	J	0.09	J	0.10	J
PCB105	0.06	J	0.01	J	0.01	J	0.01	J
PCB138 /160	0.09	J	0.07	J	0.04	J	0.04	J
PCB187		ND		ND		ND		ND
PCB128		ND		ND		ND		ND
PCB180	0.03	J		ND		ND	0.02	J
PCB170/190		ND	0.12	J	0.14	J	0.15	J
PCB195/208	0.04	J	0.02	J		ND		ND
PCB206		ND		ND		ND		ND
PCB209	0.09	J	0.06	J	0.04	J	0.04	J

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	24-26		26-28		28-30		30-32	
Original Sample								
GERG ID	C22995		C22996		C22997		C22998	
Sample Type	Sample		Sample		Sample		Sample	
Dry Weight (g)	7.11		8.32		8.61		8.10	
Wet Weight (g)	20.04		20.62		20.16		20.45	
Matrix	Sediment		Sediment		Sediment		Sediment	
% solid	35.5		40.3		42.7		39.6	
% Lipid	NA		NA		NA		NA	
Page Number	m2456ri		m2456ri		m2456ri		m2456ri	
Receive Date	12/8/95		12/8/95		12/8/95		12/8/95	
Extraction Date	1/24/96		1/24/96		1/24/96		1/24/96	
Analysis Date	2/29/96		2/29/96		2/29/96		2/29/96	
PCB103 % recovery	97.2		92.8		86.0		94.9	
PCB198 % recovery	99.6		92.4		87.5		99.1	
DBOFB % recovery	92.2		90.0		85.2		89.9	
Total Chlordane's			0.01		0.01		0.04	
Total DDT's								
Total HCH's	0.37		0.24		0.42		0.21	
Total PCB's	3.26		3.11		3.08		3.01	
Pesticides based on ng/g, dry wt.								
Hexachlorobenzene	0.03	J	0.02	J	0.04	J	0.09	J
Alpha HCH		ND		ND		ND		ND
Beta HCH	0.37		0.24	J	0.42		0.21	J
Gamma HCH		ND		ND		ND		ND
Delta HCH		ND		ND		ND		ND
Heptachlor		ND		ND		ND		ND
Heptachlor Epoxide		ND		ND		ND		ND
Oxychlordane		ND		ND		ND		ND
Gamma Chlordane		ND	0.01	J	0.01	J		ND
Alpha Chlordane		ND		ND		ND		ND
Trans-Nonachlor		ND		ND		ND	0.04	J
Cis-Nonachlor		ND		ND		ND		ND
Aldrin		ND		ND	0.02	J		ND
Dieldrin		ND		ND		ND		ND
Endrin		ND		ND		ND		ND
Mirex		ND		ND		ND		ND
2,4' DDE		ND		ND		ND		ND
4,4' DDE		ND		ND		ND		ND
2,4' DDD		ND		ND		ND		ND
4,4' DDD		ND		ND		ND		ND
2,4' DDT		ND		ND		ND		ND
4,4' DDT		ND		ND		ND		ND

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	24-26		26-28		28-30		30-32	
Original Sample								
GERG ID	C22995		C22996		C22997		C22998	
Endosulfan II		ND		ND		ND		ND
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND		ND		ND		ND
PCB18/17		ND		ND		ND		ND
PCB28	0.03	J	0.05	J	0.03	J		ND
PCB52	0.03	J	0.02	J	0.04	J	0.03	J
PCB44	0.05	J	0.04	J	0.05	J	0.05	J
PCB66		ND		ND		ND		ND
PCB101/90		ND		ND		ND		ND
PCB118		ND		ND		ND		ND
PCB153/132	0.09	J	0.08	J	0.08	J	0.09	J
PCB105	0.01	J		ND		ND		ND
PCB138 /160	0.05	J	0.05	J	0.06	J	0.04	J
PCB187		ND		ND		ND		ND
PCB128		ND		ND		ND		ND
PCB180		ND		ND		ND		ND
PCB170/190	0.18	J	0.16	J	0.13	J	0.16	J
PCB195/208		ND		ND		ND	0.02	J
PCB206		ND		ND		ND		ND
PCB209	0.04	J	0.02	J	0.02	J		ND

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	32-34		34-36		38-40		42-44	
Original Sample								
GERG ID	C22999		C23000		C23002		C23004	
Sample Type	Sample		Sample		Sample		Sample	
Dry Weight (g)	8.17		9.59		9.19		11.85	
Wet Weight (g)	20.73		20.12		20.51		20.42	
Matrix	Sediment		Sediment		Sediment		Sediment	
% solid	39.4		47.7		44.8		58.0	
% Lipid	NA		NA		NA		NA	
Page Number	m2456ri		m2456ri		m2456ri		m2456ri	
Receive Date	12/8/95		12/8/95		12/8/95		12/8/95	
Extraction Date	1/24/96		1/24/96		1/24/96		1/24/96	
Analysis Date	2/29/96		2/29/96		2/29/96		2/29/96	
PCB103 % recovery	99.8		100.8		99.5		86.6	
PCB198 % recovery	105.2		102.3		105.5		96.6	
DBOFB % recovery	92.1		90.8		93.0		84.0	
Total Chlordane's			0.01				0.03	
Total DDT's			0.00				0.02	
Total HCH's	0.42		0.49		0.47		0.09	
Total PCB's	3.33		2.92		2.93		2.71	
Pesticides based on ng/g, dry wt.								
Hexachlorobenzene	0.02	J	0.02	J	0.04	J	0.02	J
Alpha HCH		ND		ND		ND		ND
Beta HCH	0.41		0.49		0.41			ND
Gamma HCH	0.01	J		ND	0.07	J	0.08	J
Delta HCH		ND		ND		ND	0.01	J
Heptachlor		ND		ND		ND		ND
Heptachlor Epoxide		ND		ND		ND		ND
Oxychlordane		ND		ND		ND		ND
Gamma Chlordane		ND	0.01	J		ND	0.00	J
Alpha Chlordane		ND		ND		ND		ND
Trans-Nonachlor		ND		ND		ND	0.02	J
Cis-Nonachlor		ND		ND		ND		ND
Aldrin		ND		ND		ND		ND
Dieldrin		ND		ND		ND		ND
Endrin		ND		ND		ND		ND
Mirex		ND		ND		ND		ND
2,4' DDE		ND		ND		ND	0.02	J
4,4' DDE		ND	0.00	J		ND		ND
2,4' DDD		ND		ND		ND		ND
4,4' DDD		ND		ND		ND		ND
2,4' DDT		ND		ND		ND		ND
4,4' DDT		ND		ND		ND		ND

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution

HISTORICAL TRENDS - Galveston, TX

Client Sample ID	32-34		34-36		38-40		42-44	
Original Sample								
GERG ID	C22999		C23000		C23002		C23004	
Endosulfan II	0.04	J		ND		ND		ND
Polychlorinated biphenyls based on ng/g, dry wt.								
PCB8/5		ND		ND		ND		ND
PCB18/17		ND		ND		ND		ND
PCB28	0.03	J		ND		ND		ND
PCB52	0.05	J	0.04	J	0.03	J	0.04	J
PCB44	0.06	J	0.05	J	0.05	J	0.04	J
PCB66		ND		ND		ND		ND
PCB101/90		ND		ND		ND		ND
PCB118		ND		ND		ND		ND
PCB153/132	0.08	J	0.06	J	0.07	J	0.06	J
PCB105		ND	0.01	J		ND		ND
PCB138 /160	0.08	J	0.04	J	0.03	J	0.03	J
PCB187		ND		ND		ND		ND
PCB128		ND		ND		ND		ND
PCB180		ND		ND		ND	0.03	J
PCB170/190	0.15	J	0.08	J	0.13	J		ND
PCB195/208	0.05	J	0.02	J		ND	0.01	J
PCB206		ND		ND		ND		ND
PCB209	0.02	J	0.02	J	0.02	J	0.02	J

I Analytical Interference
J <MDL
Q Results Outside QC
ND Non Detect
NA Not Applicable
d Dilution