The original documents are located in Box 21, folder “Long Island Beach Cleanup” of the James M. Cannon Files at the Gerald R. Ford Presidential Library.

NOAA TR ERL 321-MESA 2

MESA

MARINE ECOSYSTEMS ANALYSIS PROGRAM

MARCH 1975

Ocean Dumping in the New York Bight

noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / Environmental Research Laboratories

U.S. DEPARTMENT OF COMMERCE
Frederick B. Dent, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

ENVIRONMENTAL RESEARCH LABORATORIES
Wilmot N. Hess, Director

NOAA TECHNICAL REPORT ERL 321-MESA 2

Ocean Dumping in the New York Bight

BOULDER, COLO.
March 1975

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402

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CHAPTER 1. SUMMARY

The New York Bight extends seaward over 15,000 square miles (39,000 km^2) from Long Island and New Jersey to the edge of the continental shelf, some 80-100 nautical miles (150-180 km) offshore. Wastes from 20 million people are discharged to the Bight. These wastes arrive by a variety of routes: ocean dumping, outfall sewers, air pollution, river discharge, land runoff, thermal discharges, vessel wastes, and occasional spills. Although impacts of these wastes on the marine environment are not clearly understood, there is evidence that the waters, bottom sediments, and living resources are under stress.

In 1973 the amount of raw and digested sewage sludge was 150 million ft^3 (4.3 x 10^6 m^3). An average of 260 million ft^3 (7.4 x 10^6 m^3) per year of dredge spoils were dumped each year between 1965 and 1970. During the same period an average of 72 million ft^3 (2.0 x 10^6 m^3) per year of waste acid and an average of 16 million ft^3 (0.5 x 10^6 m^3) per year of construction and demolition debris were dumped into the New York Bight. The hazards of this dumping are not known, however above normal incidence of fin-rot disease in fish in the area and the closing of the area to shellfishing are indications that something is wrong. The amount of sludge that moves northward to the vicinity of Long Island Beaches is unknown; there is no evidence of massive shoreward movement of the sludge, or of imminent bacteriological hazard to the beaches. Meanwhile it is recommended that interim use of alternative dump sites be avoided and that land-based disposal alternatives be developed.

Before final decisions can be made to solve the problems identified, further studies of various alternative solutions are required.

CHAPTER 2. INTRODUCTION

The New York Bight extends seaward over 15,000 mi^2 (39,000 km^2) from Long Island and New Jersey to the edge of the continental shelf, some 80 to 100 n mi (150-180 km) offshore. Wastes from 20 million people are discharged to the Bight. These wastes arrive by a variety of routes: ocean dumping, outfall sewers, air pollution, river discharges, land runoff, thermal discharges, vessel wastes, and occasional spills. Although impacts of these wastes on the marine environment are not clearly understood, there is evidence that the waters, bottom sediments, and living resources are under stress.

The Marine EcoSystems Analysis (MESA) New York Bight Project has been assigned the task of conducting "research regarding the effects of dumping" into the coastal waters of the Bight as part of the responsibilities of the National Oceanic and Atmospheric Administration (NOAA) under Title II of Public Law 92-532 (The Marine Protection, Research, and Sanctuaries Act of 1972). The Project has developed a multiphased program to determine the fate and effects of pollutants, particularly those from ocean dumping, in the New York Bight ecosystem:

Phase 1. - Describing the marine environment in the vicinity of present and proposed dumping activities in the New York Bight Apex and two offshore alternative dump site areas (see Fig. 1);

Phase 2. - Assessing the impacts of ocean dumping in the New York Bight to date and predicting consequences of continued or modified disposal practices; and

Phase 3. - Designing an environmental surveillance and prediction program to identify future changes in the marine environment resulting from sludge dumping and other waste disposal practices.

Initial efforts have been primarily directed toward completing Phase 1.

Acknowledgments

Charles G. Gunnerson, Director, MESA Program Office, and R. L. Swanson, Manager, New York Bight MESA Project, are responsible for preparation of this report, which is based upon information in NOAA Technical Report ERL 332-MESA-3 prepared by the staff of the Atlantic Oceanographic and Meteorological Laboratories (AOML) and edited by R. L. Charnell, and upon unpublished reports and data from the Middle Atlantic Coastal Fisheries Center of NOAA's National Marine Fisheries Service. Contributors to one or more sections of the report include George A. Berberian, Adriana Y. Contillo, Robert L. Charnell, David E. Drake, George L. Freeland, John T. Graikowski, Richard A. Greig, Donald V. Hansen, Patrick Hatcher, John A. Holston, Karen L. Jamruz, Larry Keister, George H. Keller, William J. Lavelle, Dennis A. Mayer, J. Kneeland McNulty, George F. Merrill, Robert Murchelano, Terry A. Nelsen, Joel S. O'Connor, Charles A. Parker, John B. Pearce, Richard Permenter, Nicholas A. Prahl, Robert C. Roush, Douglas A. Segar, Carl J. Sindermann, Harold M. Stanford, William Stubblefield, Donald J. P. Swift, James P. Thomas, Maxine Weiselberg, and John J. Ziskowski.

The officers and crew of NOAA Ship FERREL and the staffs of the Oceanographic Division, National Ocean Survey, Office of Marine Technology, National Ocean Survey also carried out major responsibilities in the activities which are reported herein.

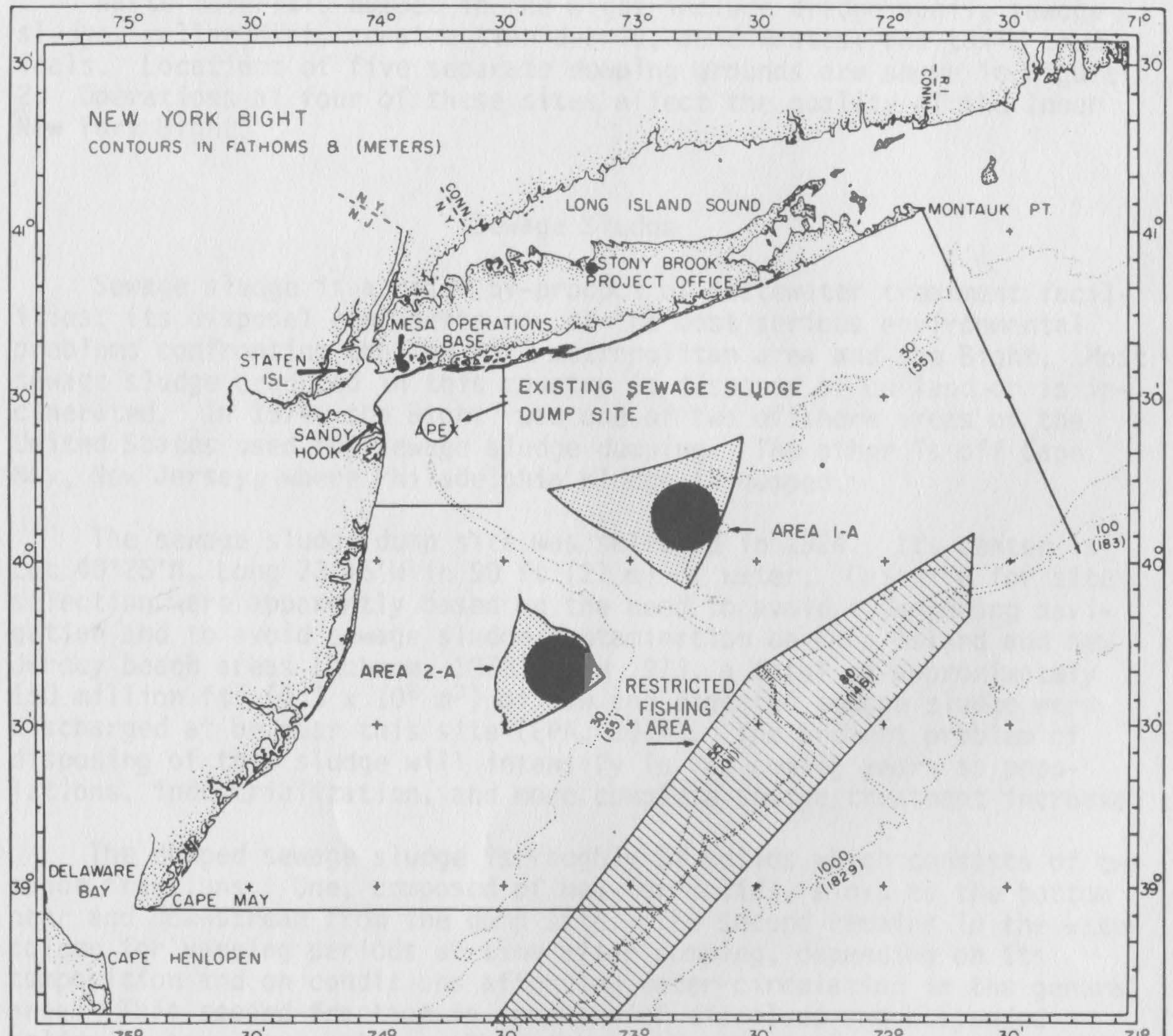

Figure 1. Existing and proposed alternative sewage dump sites. The shaded area along the continental shelf is important to fisheries.

CHAPTER 3. PRESENT OCEAN DUMPING PRACTICES IN THE NEW YORK BIGHT

Ocean dumping is the disposal of waste materials transported from coastal ports aboard barges or ships. The quantity of dumped materials is enormous, exceeding that of natural materials introduced by rivers. In fact, waste solids dumped from the New York area alone exceed the combined sediment discharge of all rivers emptying into the Atlantic between the U.S.-Canadian border and Chesapeake Bay.

Waste materials dumped in the Bight include dredge spoil, sewage sludge, cellar dirt, construction debris, acid wastes, and toxic chemicals. Locations of five separate dumping grounds are shown in Figure 2. Operations at four of these sites affect the quality of the Inner New York Bight.

Sewage Sludge

Sewage sludge is a major by-product of wastewater treatment facilities; its disposal represents one of the most serious environmental problems confronting the New York metropolitan area and the Bight. Most sewage sludge produced in this country is disposed of on land or is incinerated. In 1974, the Bight was one of two offshore areas of the United States used for sewage sludge dumping. The other is off Cape May, New Jersey, where Philadelphia sludge is dumped.

The sewage sludge dump site was selected in 1924. Its center is Lat 40°25'N, Long 73°45'W in 90 ft (27 m) of water. Criteria for site selection were apparently based on the need to avoid endangering navigation and to avoid sewage sludge contamination on Long Island and New Jersey beach areas (Achrem, 1973). In 1973, a total of approximately 150 million ft^3 (4.3×10^6 m^3) of raw and digested sewage sludge were discharged at or near this site (EPA, 1974). The present problem of disposing of this sludge will intensify in the coming years as populations, industrialization, and more complete sewage treatment increase.

The dumped sewage sludge is roughly 5% solids which consists of two major fractions. One, composed of heavier solids, sinks to the bottom near and downstream from the dump site. The second remains in the water column for varying periods of time after dumping, depending on its composition and on conditions affecting water circulation in the general area. This second fraction is composed of dissolved and suspended solids in the water column. Both fractions contain toxic heavy metals and pathogenic materials.

The sewage sludge dump site is not the only source of sewage material entering the Bight; others include river outflows, sewage treatment plants, raw sewage outfalls, industrial outfalls, and storm water runoff and overflows (Klein, et al., 1974).

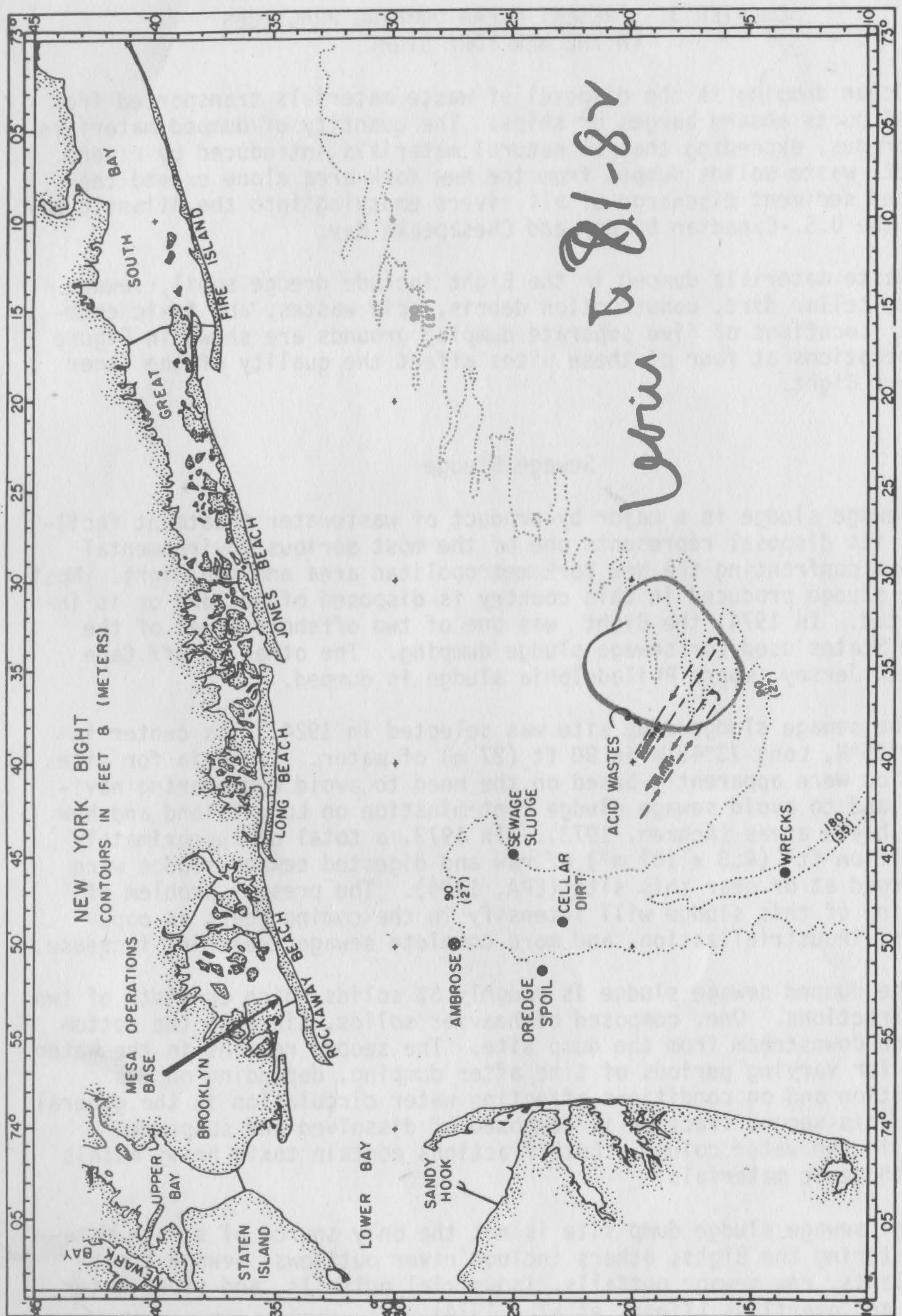

Figure 2. Major ocean dump sites in the New York Bight.

Dredge Spoil

The center of the dredge spoil (mud) dumping ground is located at Lat 40°24'N, Long 73°52'W. The present site has been used for more than 33 years. Materials discharged there consist of dredge spoil from vessel berths, anchorage grounds and channels. Clean earth and fly-ash from conventional electric power generating stations are also disposed at this site (Achrem, 1973). Between 1965 and 1970 an average 260 million ft^3 (7.4 x 10^6 m^3) of dredge spoil were dumped each year. This volume is expected to increase as harbor facilities continue to expand. Enough has been dumped to cause shoaling of some 30 ft (10 m). Some dredge spoil is highly contaminated with organic materials and heavy metals.

Waste Acid

There are two sites designated for the disposal of waste acid. One is used during winter, and the other during summer. During winter, a dumping vessel initiates disposal of half its load on a southeasterly course from Lat 40°20'N, Long 73°43'W. After making a U-turn, the remainder is dumped on a northwesterly course. A similar procedure is followed in summer, with the point of initiation being at Lat 40°20'N, Long 73°40'W.

Waste acid has been dumped at this site since 1948. The average yearly amount dumped between 1965 and 1970 was 72 million ft^3 (2.04 x 10^6 m^3) containing an estimated 5% dissolved solids (Pararas-Carayannis, 1973) with a large amount of iron compounds (Achrem, 1973).

Cellar Dirt

The cellar dirt dump site is used to dispose of earth from excavations, and stone, tile, brick, concrete, masonry material, pipe, wood and other debris associated with the construction industry. The present site is centered at Lat 40°23'N, Long 73°49'W, and has also been utilized for more than 33 years. The average yearly volume dumped during 1965-1970 was 16 million ft^3 (4.53 x 10^5 m^3) (Pararas-Carayannis, 1973).

CHAPTER 4. PREVIOUS STUDIES ON OCEAN DUMPING IN THE NEW YORK BIGHT

Ocean dumping has seriously stressed the marine environment. Shellfish beds have been closed to fishing and fin rot disease in benthic fishes has increased.

In March 1968, invited scientists, representatives of the Army Corps of Engineers and Smithsonian Institution, convened "to design studies which might provide results of value in determing the effects of current waste disposal practices in the New York Bight". This action eventually led to the publication generally referred to as the Sandy Hook Report, entitled *The Effects of Waste Disposal in the New York Bight* (National Marine Fisheries Service, 1972). The study and report led to increased public awareness and articles in the New York Times. The first recommendation of the report that a "five year study" be established to "assemble all information necessary for an adequate evaluation of dumping practices off New York Harbor" led to NOAA's MESA New York Bight Project beginning in May 1973.

The problems of ocean waste disposal, with particular regard to sewage sludge, have continued. Scientific and public concern has intensified recently (see New York Times, December 11, 1973; Newsday, December 12, 1973, and March 5, 1974). The major concern now is the potential hazard to beaches adjacent to the New York Bight.

In March 1974, the EPA Region II office requested that NOAA/MESA recommend areas, based on historical information and on-going studies, as alternative sewage sludge dump sites, should the present designated site prove to be adversely affecting the quality of the beaches. Because of the anticipated increase in the quantities of sewage sludge to result from the upgrading of sewage treatment plants, EPA announced that the present site will cease to be used in 1976. Two potential alternate locations within the Bight, based partially on NOAA's advice, were indicated in the announcement. EPA is now preparing an environmental impact statement on relocating the site. The advance announcement was made to provide sufficient lead time to allow for the proper planning necessary to increase facilities for moving the sewage sludge farther out to sea. EPA simultaneously announced their intention to phase out ocean dumping in the New York Bight by 1981 (EPA, 1974). To this end, EPA has withdrawn eight industrial permits, 47 industrial dumpers have been phased out, and 12 have been required to phase out by June 1975 (EPA, 1974).

Numerous debates and hearings have been held over the past year about potential impacts of sewage sludge dumping in the Bight. The most recent public hearing was held by the Senate Public Works Committee's Subcommittee on Environmental Pollution on August 2, 1974. There is little doubt from the testimony of the scientists at the hearing that ocean disposal of sewage sludge and dredge spoil, combined with other waste materials in runoff, effluent discharges, etc., have stressed the environment both offshore and near the beaches.

CHAPTER 5. OCEANOGRAPHY OF THE NEW YORK BIGHT

Geological Oceanography

The major sea floor features of the New York Bight have formed in response to glacial eustatic changes in sea level that have taken place over the past four million years. The last significant event, which occurred at the end of the Pleistocene glacial epoch, began approximately 75,000 years ago when the Laurentide Ice Sheet advanced from its Canadian center to a line passing lengthwise through what is now Long Island, and continuing westward across northern New Jersey. During the time of maximum glacial advance, sea level worldwide was at least 410 ft (125 m) below its present level. The New York Bight then was subjected to subaerial erosional processes. Stream erosion, amplified by runoff of glacial melt water, dissected the uppermost, semi-consolidated sedimentary strata, forming ancestral Northern New Jersey, Long Island, and the Hudson Shelf Valley (see Fig. 3).

At the conclusion of the last ice advance approximately 15,000 years ago, glacial melting produced a rapid rise in sea level which quickly covered the gradually sloping surface of the shelf. Clean sand from the retreating shoreface and the shelf surface blanketed the New York Bight. This sand blanket is undergoing continuing transport in response to storm-generated currents. Seismic reflection profiles show drowned river valleys (the Hudson in particular) only partially buried and filled with Holocene (Recent) sediments. River mouths were drowned, thereby creating present estuarine environments which act as sediment traps for sediments from both the river and the ocean.

These events provide an explanation for the present general nature of the sea floor of the New York Bight. Geological investigations in and around Bight areas currently used for ocean dumping are being made to better understand the nature of the subtrate and how it may be affected by dumped materials, or how it may affect the fate of dumped materials. Additionally, other areas in the Bight are being studied to determine their suitability as possible future dump sites. The following types of information are being acquired by the Project to aid in this effort:

- Detailed bathymetry by conventional sonic techniques;
- Micro-topography by side scan sonar;
- Sediment composition and grain size by analysis of grab samples and core samples;
- Delineation of subsurface structure and stratigraphy by seismic reflection profiling and vibracoring;

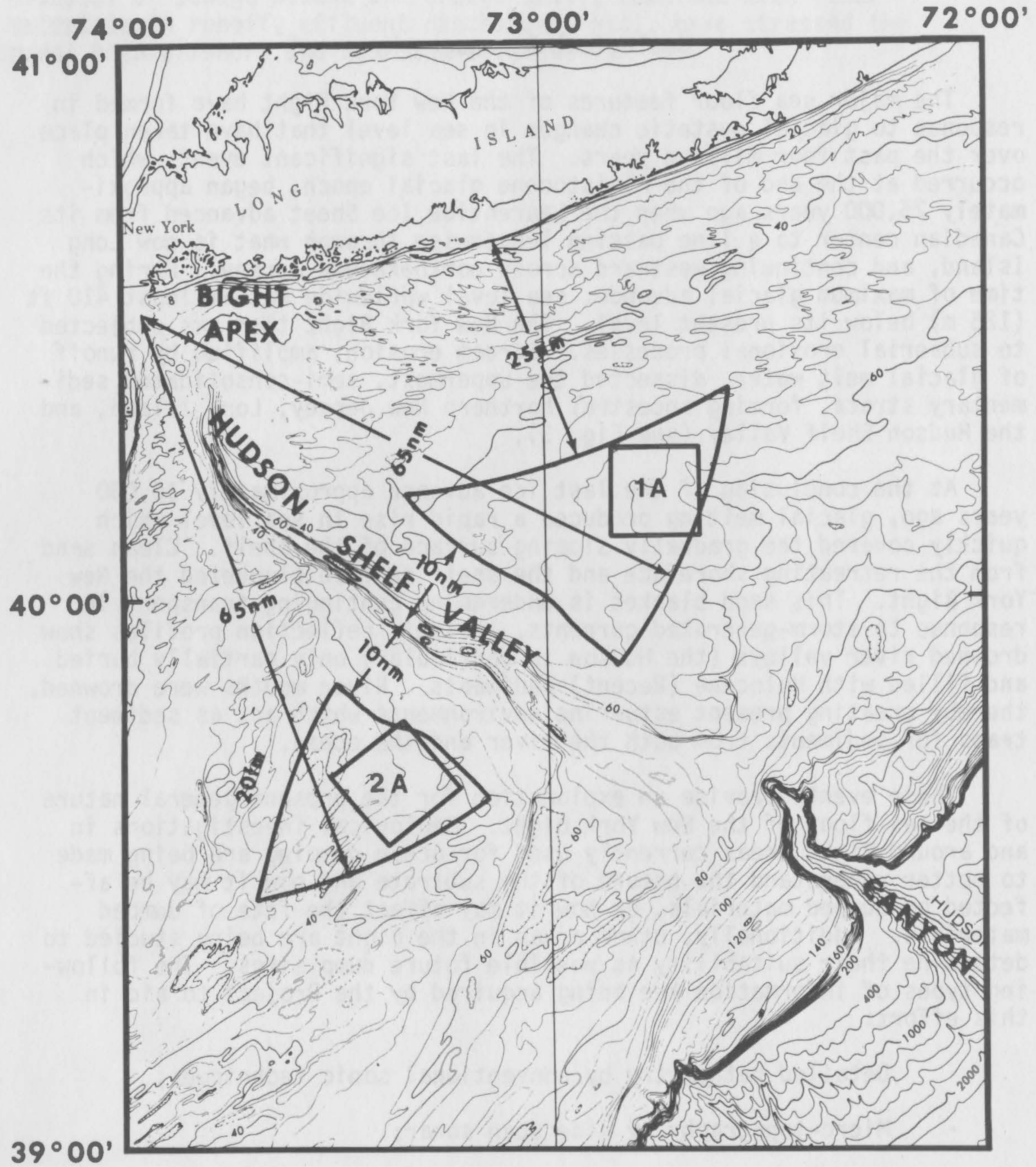

Figure 3. Index map, New York Bight. Contour interval is 4 meters. Portions of proposed dump site areas examined are blocked out.

- Observation of substrate by photography;
- Sand transport by radioisotope tracing techniques supported by current measurements; and
- Direct observation, by submersible diving.

Ocean dumping is the main source of modern sediments introduced to the Bight. The 30 ft (10 m) accumulation of dredge spoil in approximately 33 years has resulted in the bull's eye pattern shown on Figure 4. This pattern indicates that the dumping activity has taken place at the properly designated site, and that transport of coarse sediments away from the site by natural processes does not keep up with the rate of dumping. The supply exceeeds the demand.

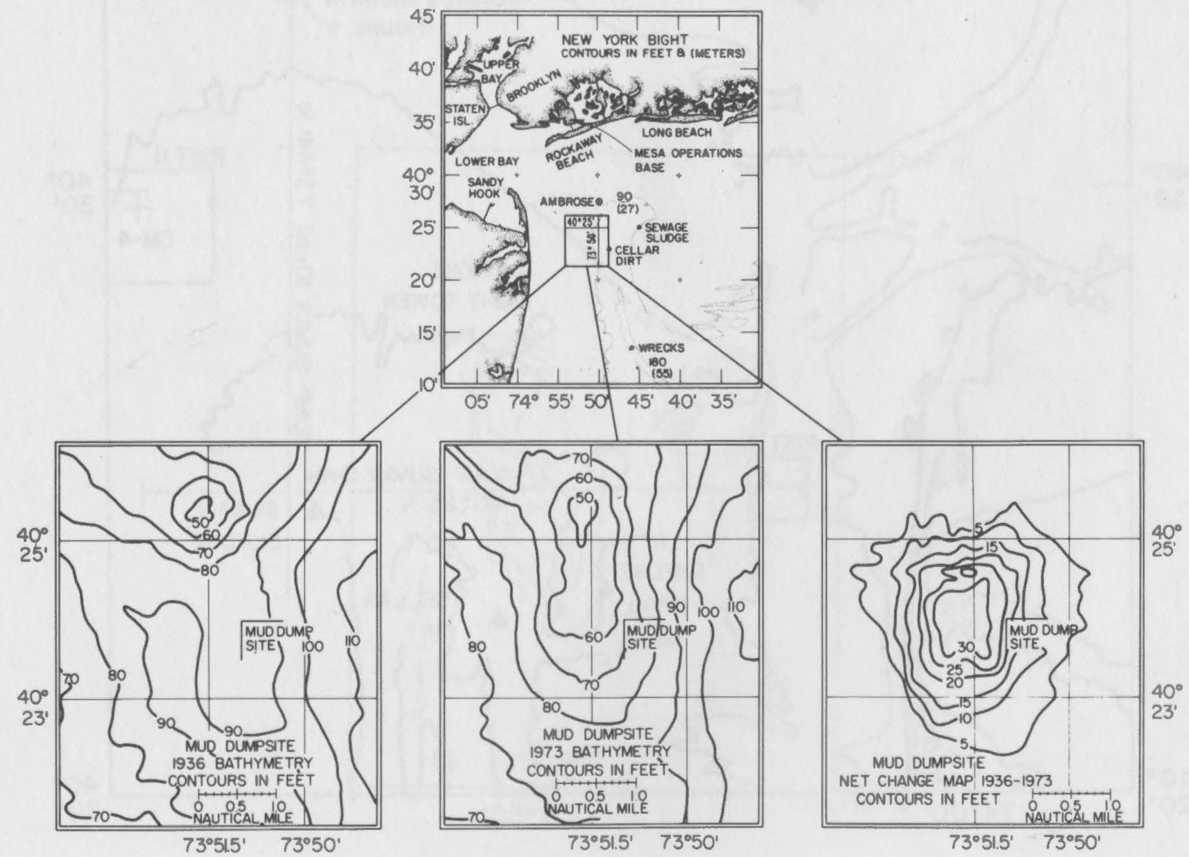

Figure 4. Bathymetric change at the dredge spoil (mud) dump site.

Two field projects have been initiated to assess the mobility of the coarser noncohesive portion (sand) of substrate materials. The first of the two studies is a Radioisotope Sand Tracing (RIST) experiment which has been completed in two areas in the Bight Apex (see Fig. 5). The dispersal of sand tagged with gold-98, an isotope having a half life of 2.7 days, is shown in Figure 6. During a 10-day survey period, there were no major storms capable of setting the whole water column in motion and moving large amounts of bedload material. Limited sediment movement to the north-northwest is consistent with low velocities of currents observed about 3 ft (100 cm) above the bottom during the same period.

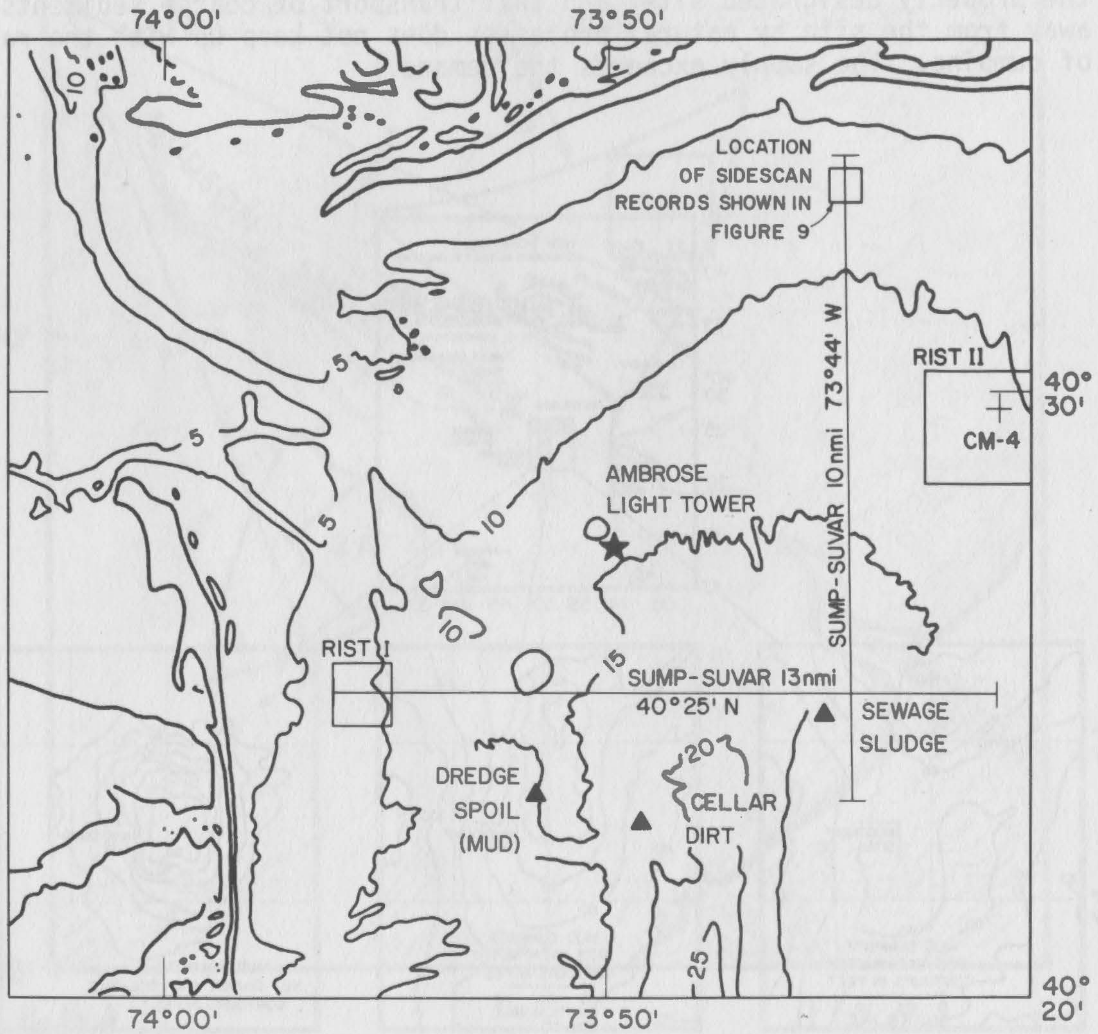

Figure 5. Index map of the Bight Apex showing RIST (radioisotrope sand tracer), SUMP (substrate monitoring program), and SUVAR (substrate variability) experiment locations. Contours are in fm.

A second RIST experiment, near the Long Island shore (see Fig. 5) made use of an isotope of ruthenium-103, which has a half-life of 39.4 days. Monitoring surveys were conducted during a three-month period. Figure 7 shows the limited dispersal of material after 20 days of exposure to currents of up to 0.8 kt (40 cm/sec). By contrast, a RIST study in November 1974 showed sediment movement of 3600 feet (1200 m) during a single storm.

Additional data on substrate characteristics are being obtained from a quarterly sampling program (SUbstrate Monitoring Program—SUMP), which measures variability in grain size of the surface sediments. Two transects in the Bight Apex are monitored on a quarterly basis (see Fig. 5). Sample analyses have shown that grain size distribution along the two transects remains relatively stable with time (see Fig. 8).

Evidence for small scale changes in topography is found in side scan sonar records taken in the New York Bight (see Fig. 9) Records taken in January 1974 show features interpreted as sand waves or large-scale, current-induced ripples. By May 1974, the records indicate

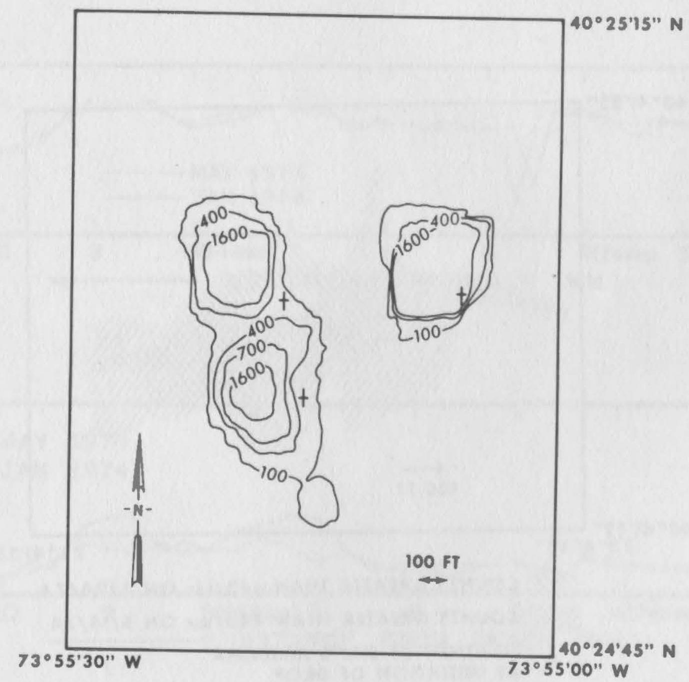

Figure 6. Dispersal pattern of gold-labeled tracer sand at end of Nov. 1973 experiment. Crosses show ship position at time of drop. See figure 5 for supplementary location information.

degraded and nearly obliterated sand waves. It follows that current-induced bedforms develop during winter months in response to frequently occurring high energy storm events. During summer months, the longer duration between high energy events allows time for sand waves or other current-induced bedforms to become degraded.

Smaller bedforms such as sand waves, sand ribbons, and ripple marks undergo frequent change. In contrast, accumulation of material at the dredge spoil dump site over the past 33 years is good evidence for stability of larger scale bathymetric features. The bathymetry of the New York Bight Apex is shown in Figure 10.

Concentrations of suspended solids including organic remains and mineral particles are naturally high and quite variable within 5.5 n mi (10 km) of both the Long Island and New Jersey shores (see Fig. 11). These are supplied by the Hudson River estuary, by shelf currents moving along Long Island, by tidal exchange with shallow lagoons behind Long Island's barrier islands, and by *in situ* plankton production. Microscopic analysis shows that suspended solids at all water depths within 8 n mi (15 km) of Long Island during the fall of 1973 contained the trace amounts of processed cellulose (assumed to be disintegrated toilet

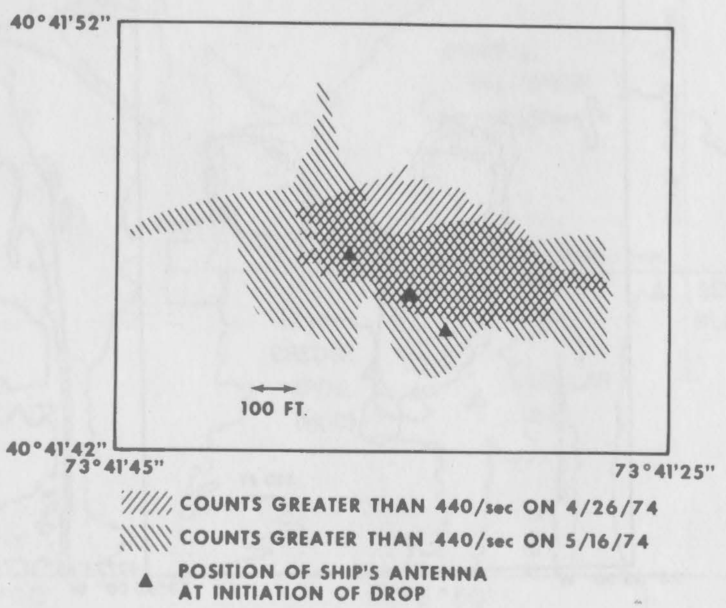

Figure 7. Tracer dispersal patterns for two RIST surveys. Ruthenium labeled sand was used for this Spring 1974 experiment. See figure 5 for supplementary location information.

paper) and black soot particles which are characteristic of suspended solids collected from near-bottom waters at the sewage sludge dump site. It is clear that any sewage study sludge particles which move in suspension during transport northward toward Long Island are diluted by natural particles.

Concentrations of suspended solids in the lower third of the water column surrounding the dredge spoil and sewage sludge dump sites are 30 to 50% higher than background. To date, however, geological efforts have been unable to separate quantitatively the dredge spoil, sewage sludge, and natural suspended material. Geochemical methods are being tested in an effort to distinguish these components of the total suspended solids one from another. Similar difficulites exist in identification of component sources in the isolated, thin, small patches of mud which occur in the nearshore zone between Long Island beaches and present dump sites. Geochemical studies based on heavy metal ratios, organic compound ratios, or other chemical labels, are being made to determine if the mud patches near the Long Island shore are natural.

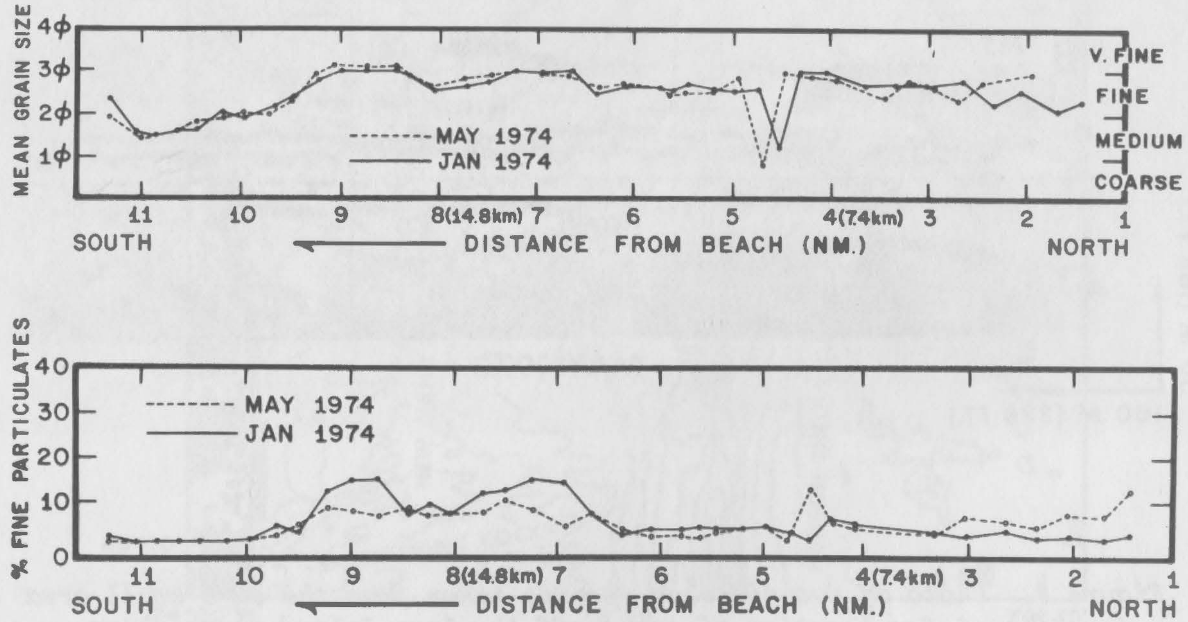

Figure 8. Mean grain size of surficial sediments from two different surveys of a north-south transect from the sewage sludge dump site to the Long Island Shore. Below: Percent fine particulate matter for same surveys. See fig. 5 for supplementary location information.

Meanwhile, a simple but relatively effective technique is being employed to aid in determining what portion of bottom muds are composed of sludge particles. Bottom samples from Christiaensen Basin and from mud patches at various distances from the Long Island and New Jersey shores north and west of the dump site are separated into coarse and fine fractions, filter onto membrane filters and microscopically examined for

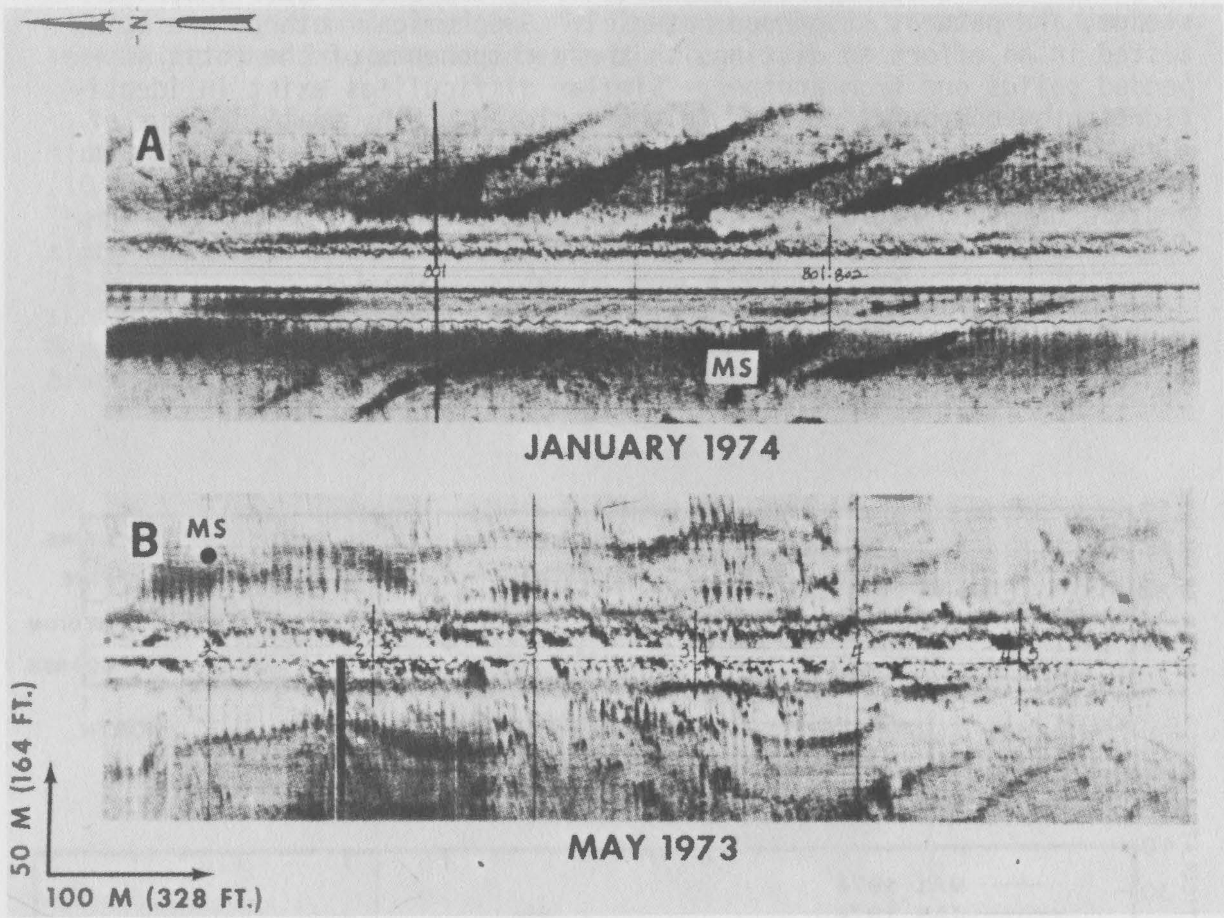

Figure 9. Photo of two sidescan records taken from the same small area (see fig. 5 for location of area) off the Long Island south shore. Apparent degraded sand waves, visibile in January as light (medium sand) streaks between dark (coarse gravelly sand) streaks, have been obliterated by a poorly defined sinuous pattern by May 1974. Positioning error on the sample is ± 15 m.

artificial contaminants. The results of these analyses are shown in Table 1. The data indicate that, with the exception of sediments in the Christiaensen Basin, bottom muds sampled are predominantly natural in origin, and contain at most 3% artificial particles (processed cellulose and soot). The slightly higher values (3.3%) on the New Jersey platform are attributed to Hudson River outflow.

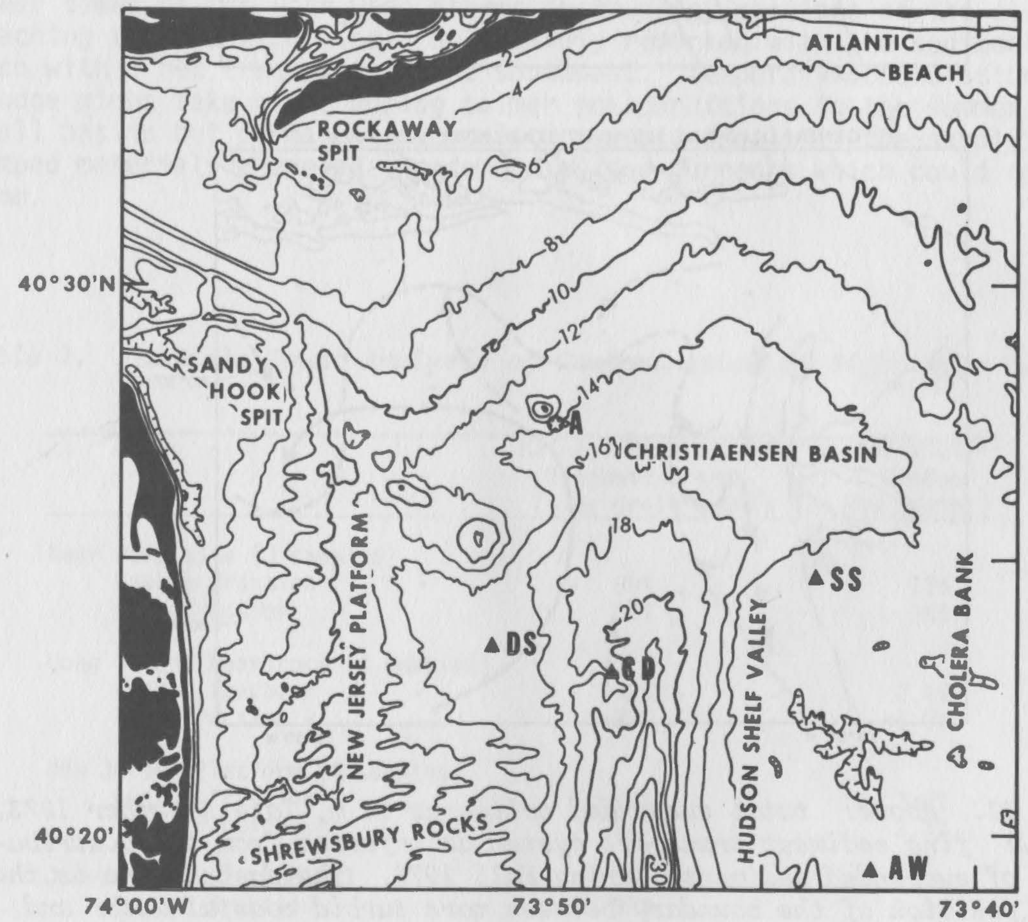

Figure 10. Bathymetry of the New York Bight Apex (from ESSA bathymetric map 0808N55) and names used in the text. "A" is Ambrose Light; "SS" is sewage sludge dump site; "DS" is dredge spoil dump sites; "CD" is cellar dirt dump site; and "AW" is acid waste dump site.

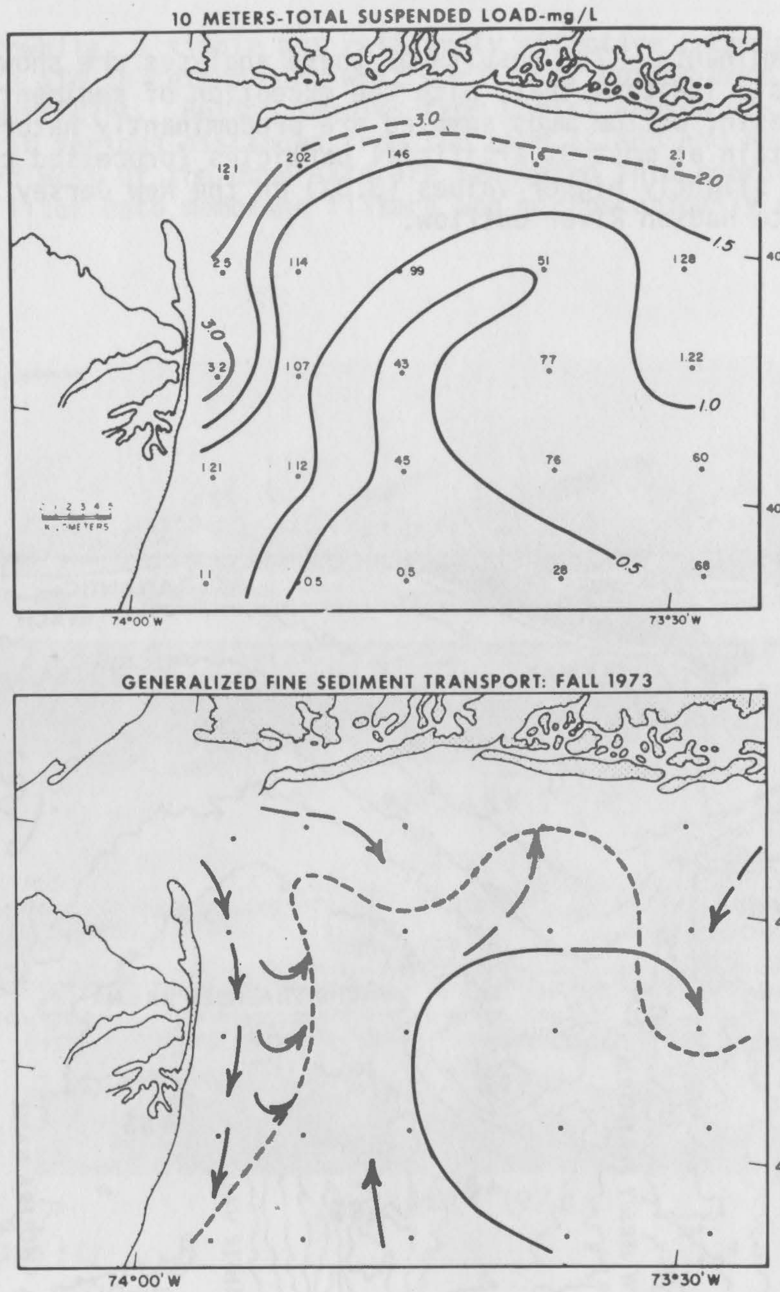

Figure 11. Above: total suspended solids at 10 m, late November 1973. Below: fine sediment transport system as inferred from the distribution of suspended sediments during Fall 1973. The dashed line is the mean position of the boundary between more turbid coastal water and less turbid off-shore water. Turbid, brackish, surface effluent from the harbor flows down the New Jersey shore. The clockwise gyre is driven by southwesterly drift of off-shore shelf water, and, on bottom, by the influx of saline water into the harbor. Regional currents which appear to be persistent are indicated by solid arrows.

The Christiaensen Basin is a potential sink for settleable portions of sewage sludge dumped anywhere in the Inner Bight. If ocean dumping is to continue, movement of dump sites to a location outside the Inner Bight will probably prevent deposition of fine waste materials in the Christiaensen Basin or close to Long Island shores.

Project studies of the suitability of two alternative areas for ocean dumping sites (see Fig. 1) have shown sand on the bottom of both areas. Approximately one-third of the samples taken in each area contain a small percentage of gravel. Three samples contained more than five percent mud. Bedforms (ripples, sand ribbons, and sand waves) indicate that storms periodically affect the micro-relief of the substrate there and move sediments to the southwest. This information indicates that sewage sludge dumped at either of the alternative sites would be flushed to the southwest from the area during the winter and at other times of the year when storms occur. Any portions of the sludge reaching the sea floor would be actively reworked with the sediments, also with a net transport to the southwest. Temporary accumulation of sludge might take place during calmer sea conditions in the summer in small basins but permanent accumulation would result if the supply of dumped materials exceeded the demand of the currents which could remove them.

Table 1. Particle Count Analysis of Contamination of Bight Apex Muds.

	Natural Mineral and Biogenic Grains	Artificial* Grains
	(% by grain counts per 250 grains)	
Near Dump site (3 samples)		
Coarse fraction	89%	11%
Fine fraction	84%	16%
Long Island Nearshore (4 samples)		
Coarse fraction	98%	2.4%
Fine fraction	>99%	<1.0%
New Jersey Platform (4 samples)		
Coarse fraction	97%	3.2%
Fine fraction	97%	3.3%
Jones Inlet (2 samples)		
Coarse fraction	98%	2.2%
Fine fraction	99%	1.4%

*Processed cellulose fibers (mainly toilet paper) and soot-like particles. The latter are a significant component of sediments on the northwest side of the sewage sludge dump site, but may be derived from other waste released into the New York Bight.

If the northern alternative area (Area 1-A) were used as a dump site, some fraction of the wastes probably would reach the Hudson Shelf Valley, be incorporated into the muds, and perhaps be transported with the mud up and/or down the valley. The southern alternative area (Area 2-A) is down-current of the Hudson Shelf Valley, so that sewage sludge dumped there would have a greater probability of dispersal.

Physical Oceanography

Solid waste dumped into New York Bight separates into floating, suspended, and bottom materials which are affected by surface, mid-depth, and bottom currents, respectively. Some of the solid materials go into solution while some of the suspended solids aggregate and settle to the bottom. Emphasis has been directed to the Bight Apex (Fig. 1). Here outflow from the Hudson and Raritan estuaries moves along the shore to the south. Seaward is a clockwise gyral circulation modified locally by tidal and wind-driven currents and regionally by large scale circulation over the shelf. The sewage sludge dump site is located within the western, northerly moving portion of the gyre. Physical oceanographic questions to be answered are:

- Do wastes once introduced into the Inner Bight tend to accumulate in the Inner Bight?
- What is the probability of waste material reaching the beaches or waters used directly or indirectly by man?; and
- If the dump site were moved further offshore, would the material remain seaward of the gyre?

General Shelf Circulation in the New York Bight

Topography of the 80 to 100 n mi (150 to 180 km)-wide continental shelf of the New York Bight is simple with gently curving isobaths roughly paralleling the coastlines of Long Island and New Jersey. The most notable topographic feature is the Hudson Shelf Valley which begins near New York Harbor, deepens as it crosses the shelf, and becomes the Hudson River Canyon down the continental slope.

Water temperatures over the shelf vary seasonally and are similar to, but lag by a few weeks, temperatures in nearshore waters. Salinities are variable over the shelf, particularly in nearshore areas affected by the runoff. In fall, cooling of surface waters and wind mixing create a vertically homogeneous water structure over both the

Inner Bight and the shelf. These conditions continue through winter. During spring and summer, solar heating creates a warm upper layer separated from the lower water layer by a strong thermocline over the shelf. Subsurface evidence of slope waters can be seen near the shelf/slope boundary near 300 ft (100 m) depth throughout the year.

Figure 12 shows the changes in thermal structure during spring 1974. Surface warming in March was limited to the nearshore 35 n mi (60 km). By May, this warming and accompanying thermocline extended offshore to the edge of the shelf.

Currents over the shelf move southwesterly generally parallel to the shore. Bumpus (1974) reported a weak net flow of the order of 0.1 kt (5 cm/sec). This net circulation pattern is strongly affected by tides and winds. Quantitative effects of stratification upon wind-driven surface current are being studied by the Project. During stratified summer 1974 conditions, southwesterly net water flow was observed

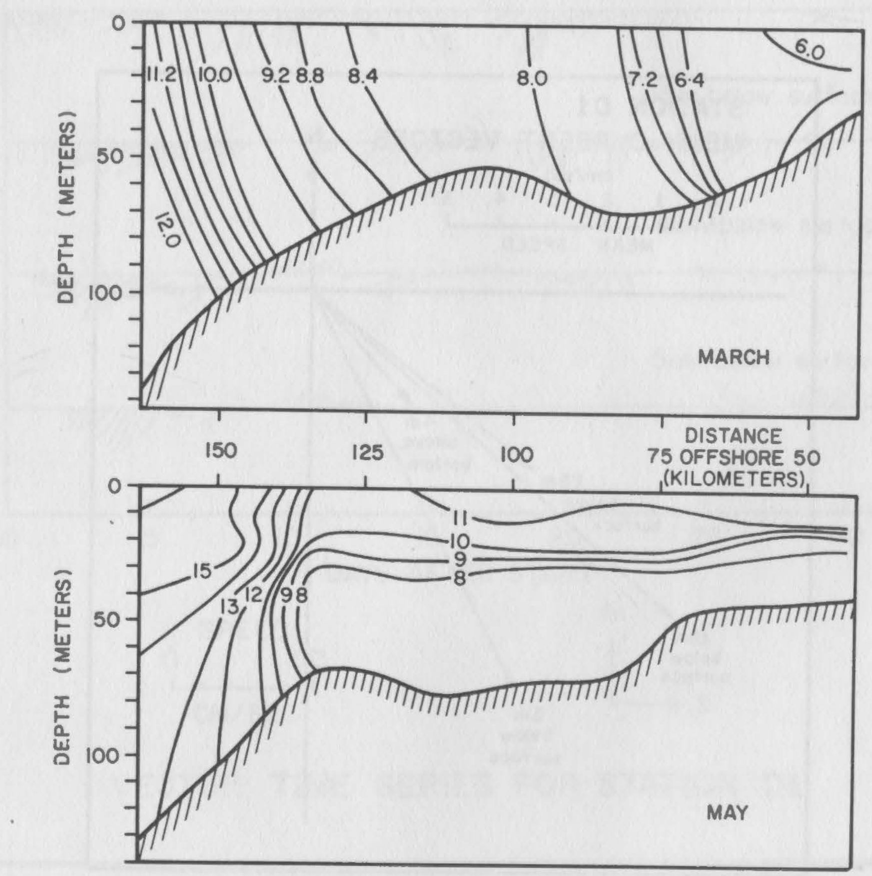

Figure 12. Water temperatures (in °C) along axis of the Hydson Shelf Valley, obtained during spring 1974. Tracklines were parallel, but not identical.

throughout the water column at the northern alternative dump site (see Fig. 13). Variability in this flow was present at all levels of currents (see Fig. 14), presumably caused by the coupling of circulation with regional wind patterns.

Recent studies by Beardsley and Butman (1974) show that large net transport can occur when wind stress acts along the shelf to the southwest. This condition occurs periodically thoughout winter as intense storms known as "Nor'easters" which last a few days and cause short-lived current pulses with speeds of the order of 1 knot (50 cm/sec), some ten times the normal drift. These pulses may account for as much as two-thirds of the net shelf transport during winter. Wind stress from the southwest was found, during their study, to produce little change in longshore flow.

Wind-driven upwelling and downwelling have been inferred from current meter records from within 10 n mi (18.5 km) of the south shore

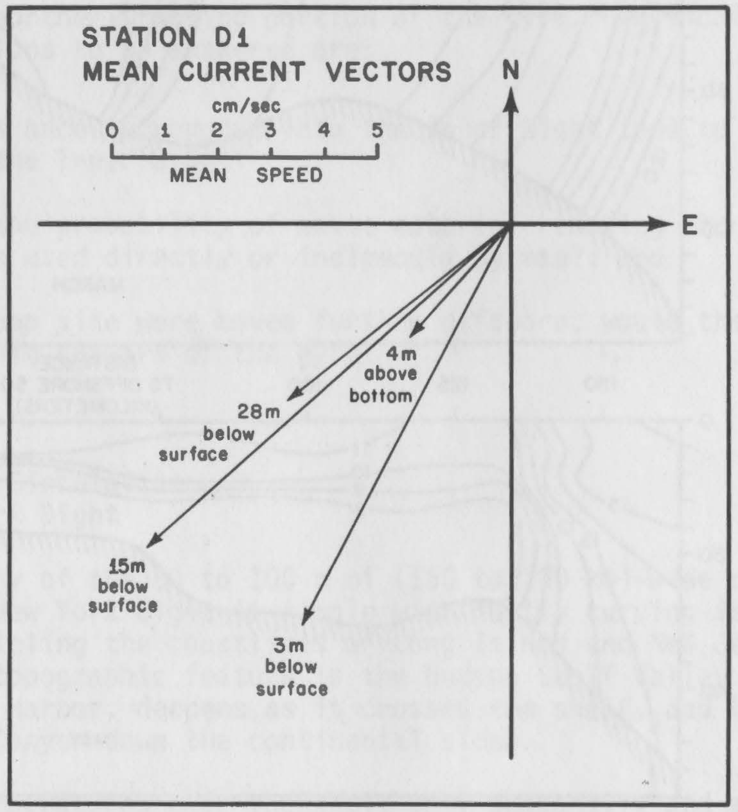

Figure 13. Vertical structure of currents at Station D1, located within alternative dump site area 1-A. Depth to bottom is 55 m.

of Long Island (Hardy and Wilson, personal communication); their importance in bottom transport remains to be determined.

Water Characteristics in the Inner Bight

As previously noted, waters of the Inner Bight exhibit two distinct oceanographic regimes—nonstratified conditions during winter, and two-layer, stratified conditions for the other three-fourths of the year, with transition periods between.

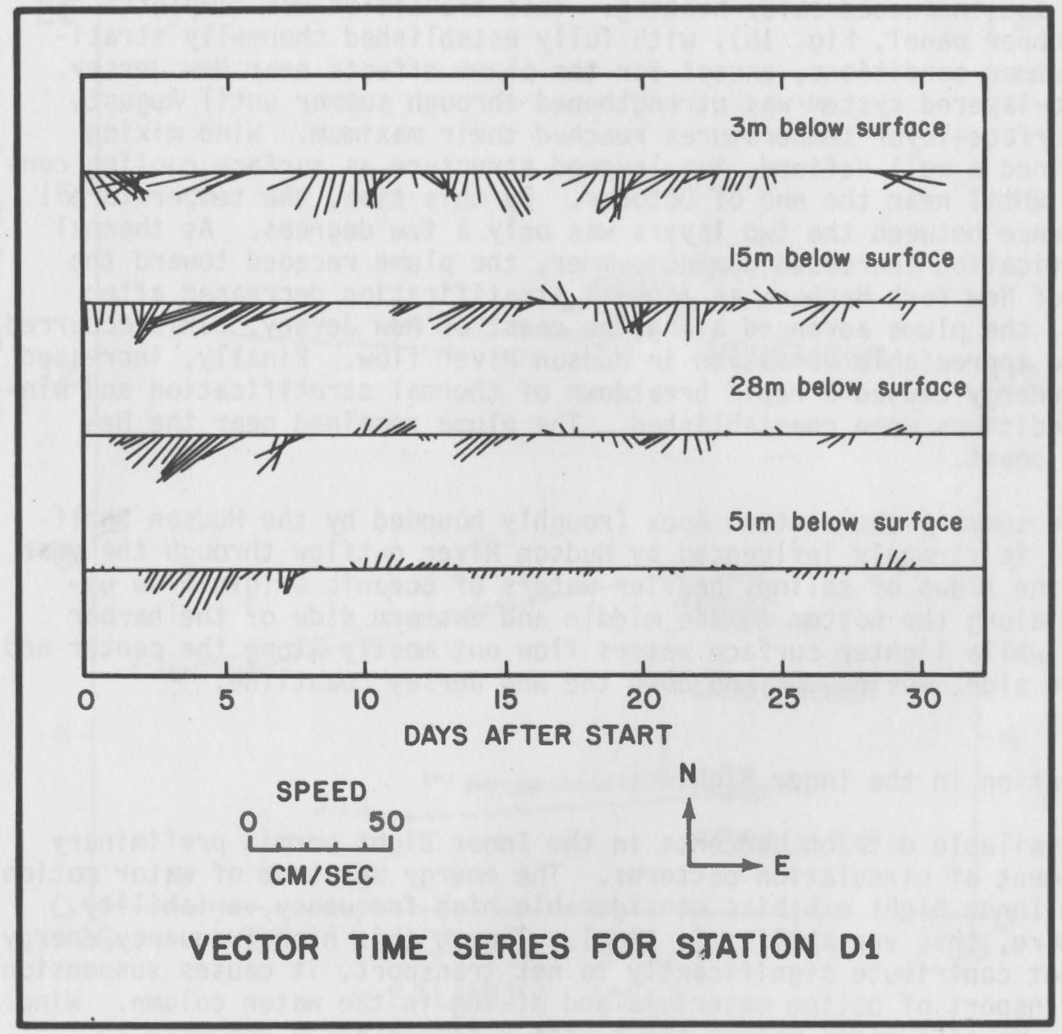

Figure 14. Variations of currents at Station D1 located within alternative dump site area 1-A. The bottom current meter, at a depth of 51 m, was 4 m above the sea floor.

During winter, the Apex water mass is well mixed and uniform in character. Surface cooling and vigorous wind mixing act throughout winter. The Hudson River plume is shown in Figure 15 where it appears as a salinity-stratified water mass along the New Jersey coastline.

With the onset of spring freshets, Apex waters begin to stratify as surface salinity decreases. The Hudson River plume enlarges and typically extends over the Apex west of the Hudson Shelf Valley. Temperature-salinity diagrams (Figs. 15 and 16) show that waters to the east of the Shelf Valley are typically more oceanic. Comparing Figure 16 with Figure 15 illustrates the change from winter to initial spring conditions. A shift from haline stratification to thermal stratification took place in May (middle panel of Fig. 16) because of lower river runoff and increased solar heating. This transition was completed by June (upper panel, Fig. 16), with fully established thermally stratified summer conditions, except for the plume effects near New Jersey. The two-layered system was strengthened through summer until August, when surface-layer temperatures reached their maximum. Wind mixing maintained a well defined, two-layered structure as surface cooling continued until near the end of October. By this time, the temperature difference between the two layers was only a few degrees. As thermal stratification increased during summer, the plume receded toward the mouth of New York Harbor; as thermal stratification decreased after August, the plume advanced along the coast of New Jersey. This occurred with no appreciable variation in Hudson River flow. Finally, increased storm energy caused a rapid breakdown of thermal stratification and winter conditions were reestablished. The plume remained near the New Jersey coast.

In summary the western Apex (roughly bounded by the Hudson Shelf Valley) is strongly influenced by Hudson River outflow through the year. Estuarine flows of saline, heavier waters of oceanic origin flow upstream along the bottom in the middle and eastern side of the harbor mouth, while lighter surface waters flow out mostly along the center and western side, moving out and down the New Jersey coastline.

Circulation in the Inner Bight

Available data on currents in the Inner Bight permit preliminary assessment of circulation patterns. The energy spectrum of water motion in the Inner Bight exhibits considerable high frequency variability. Nearshore, this variability is tidal. Though this high frequency energy does not contribute significantly to net transport, it causes suspension and transport of bottom materials and mixing in the water column. Wind readily moves surface waters about with a fairly rapid response to changing wind direction; during nonstratified conditions, even bottom waters respond (though to a lesser degree) because of downward transfer of momentum. However, during stratified conditions, momentum transfers to the bottom layer are inhibited by the degree of water column stability.

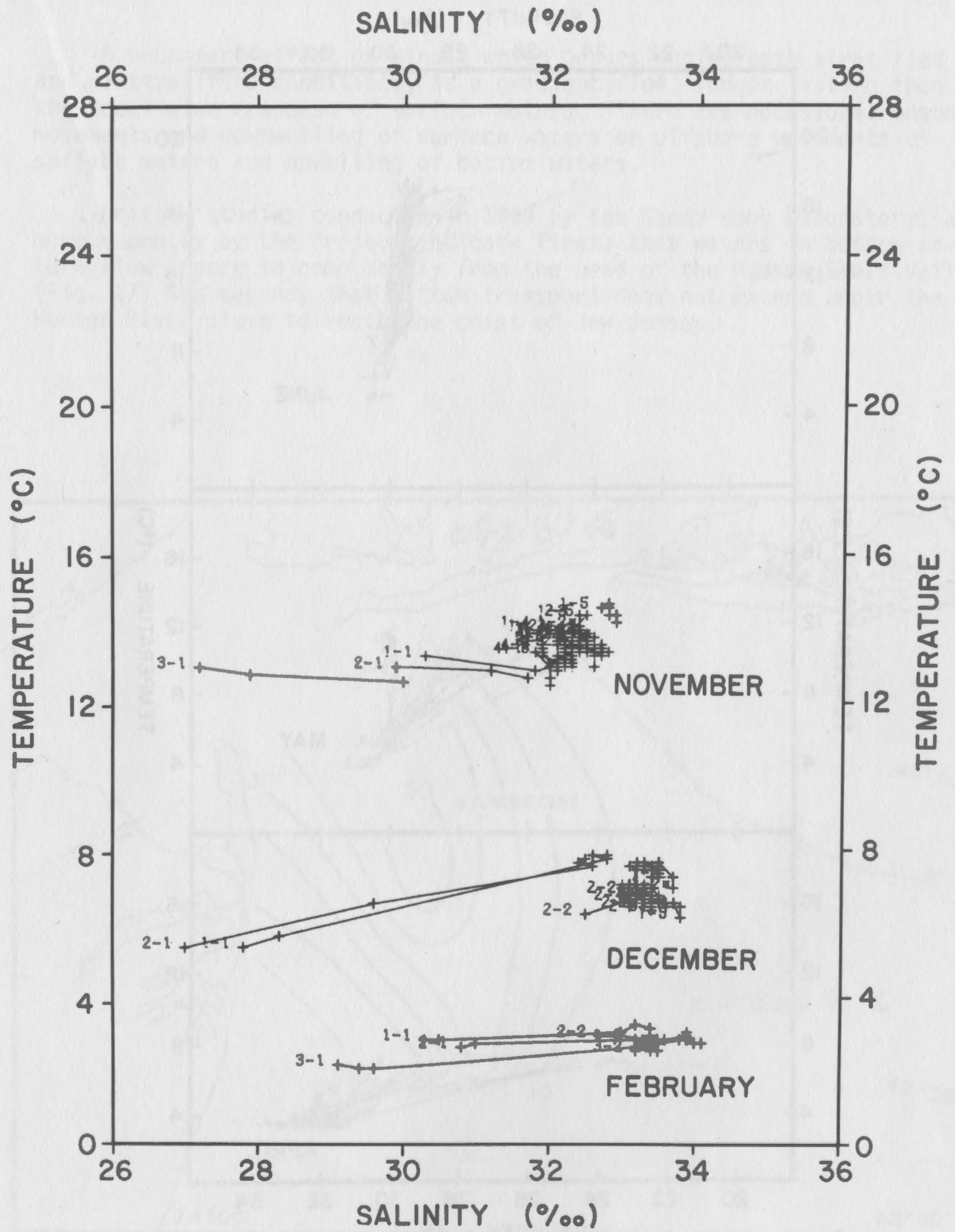

Figure 15. Composite temperature-salinity diagram in winter 1969 in the Apex. The clustered values represent most Apex meters, and those outside and to the left of the clusters show Lower Bay plume water.

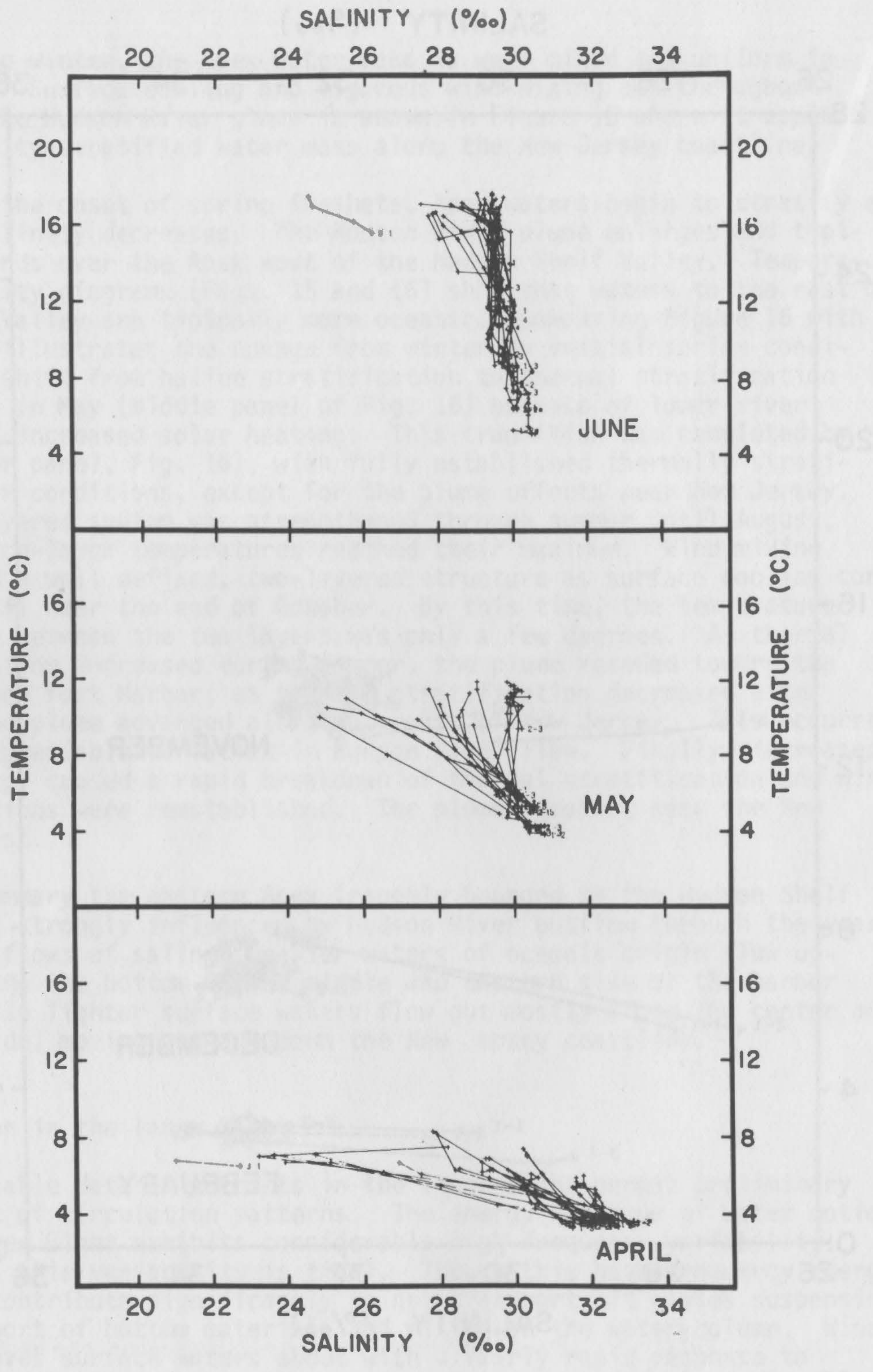

Figure 16. Composite temperature-salinity diagram for three surveys during 1969 in the Apex.

A secondary effect of winds, which occurs during both stratified and nonstratified conditions, is a gradient flow, longer lasting than the local wind response of surface waters. There are occasional onshore movements and downwelling of surface waters or offshore movements of surface waters and upwelling of bottom waters.

Drifter studies conducted in 1969 by the Sandy Hook Laboratory, and more recently by the Project indicate first, that waters in bottom return flow appear to come mostly from the head of the Hudson Shelf Valley (Fig. 17) and second, that bottom transport does not extend under the Hudson River plume to reach the coast of New Jersey.

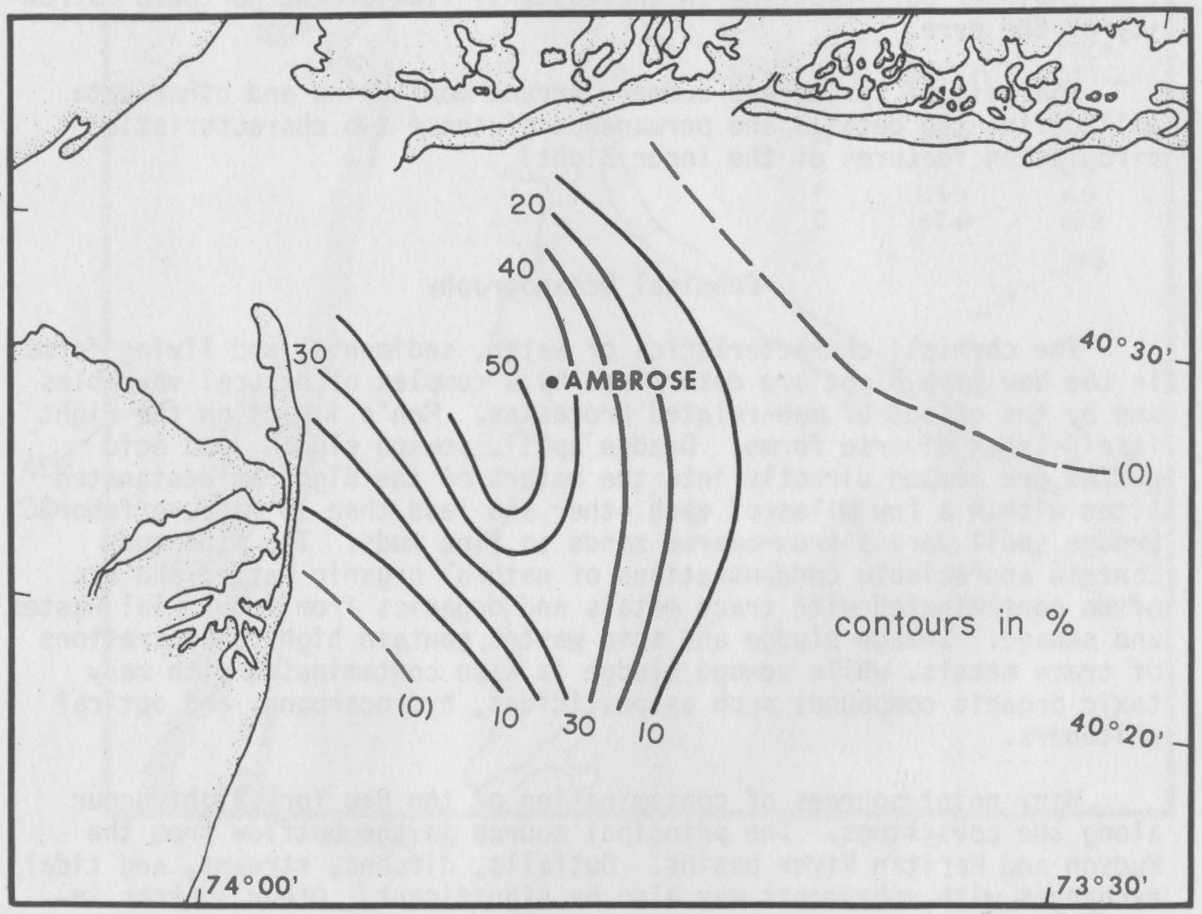

Figure 17. Percentage of seabed drifters recovered from the Hudson River estuary as a function of their initial location.

The possible existence of a clockwise gyral circulation of bottom waters came out of the work of Bumpus (1965) and from the Sandy Hook Laboratory's 1969 drifter study. Further measurements during fall 1973 were made. Figure 18 shows mean current vectors representing net movement in the lower portion of the water column over the 50 days of earlier operations. A current meter at Station ST-4, located near the present sewage sludge dump site, was operating for only 14 days and its mean vector, though consistent with the gyral circulation hypothesis, is based on less data than vectors for the other stations. Figure 19 presents a frequency histogram of current directions during nonstratified conditions in fall 1973 when fairly uniform current speeds and directions existed through the water column. Data for Station ST-4, at the sewage sludge dump site are included for comparison. Both figures indicate a northerly flow along the Hudson Shelf Valley toward the Christiaensen Basin. This flow appears to split, a portion feeding the Hudson estuary bottom return flow (which can be seen at Station D), and the remainder participating in the easterly flow at the northern extremity of the gyre.

Analysis of spring and summer current monitoring and other data will define the details and permanence of these two characteristic circulation features of the Inner Bight.

Chemical Oceanography

The chemical characteristics of water, sediments, and living forms in the New York Bight are determined by a complex of natural variables and by the effect of man-related processes. Man's impact on the Bight itself takes diverse forms. Dredge spoil, sewage sludge, and acid wastes are dumped directly into the waters of the Bight at designated sites within a few miles of each other and less than 15 miles offshore. Dredge spoil varies from coarse sands to fine muds. The fine muds contain appreciable concentrations of natural organic matter and are often contaminated with trace metals and organics from industrial wastes and sewage. Sewage sludge and acid wastes contain high concentrations of trace metals, while sewage sludge is also contaminated with many toxic organic compounds such as pesticides, hydrocarbons, and optical whiteners.

Many point sources of contamination of the New York Bight occur along the coastlines. The principal source is the outflow from the Hudson and Raritan River basins. Outfalls, ditches, streams, and tidal exchanges with embayments may also be significant. Other sources include vessel wastes, spills, precipitation and dustfall.

Contaminants from these sources are concentrated or dispersed, interact with organisms, dissolve, solidify, are buried, become exposed, or are transported from the Bight. The same processes act upon natural

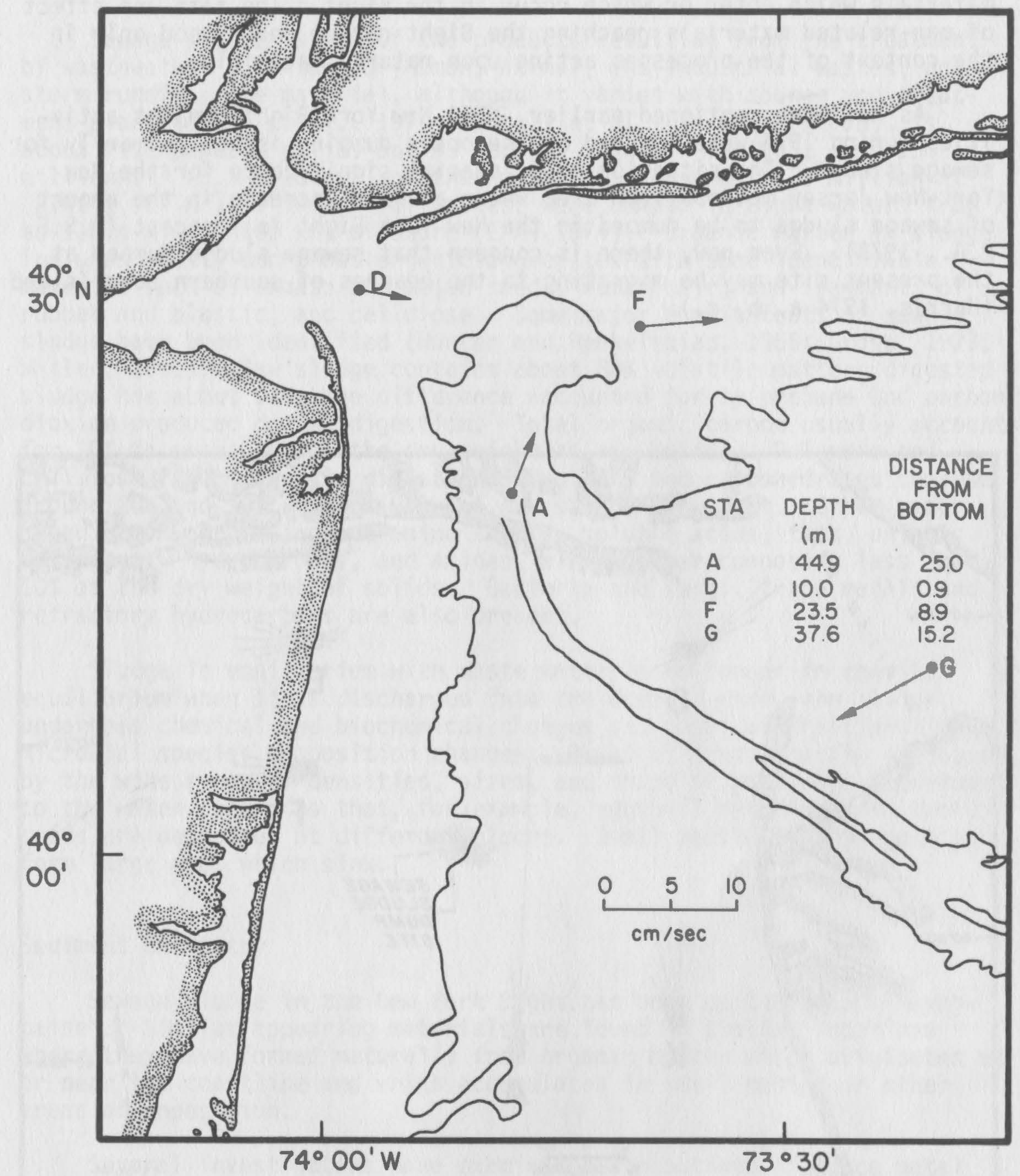

Figure 18. Mean near-bottom current vectors for observations during the period Aug-Sept 1973.

materials which enter or which occur in the Bight. The fate and effect of man-related materials reaching the Bight can be understood only in the context of the processes acting upon natural materials.

As has been mentioned earlier, MESA New York Bight Project activities during 1974 were focused on the ocean dumping issue, primarily for sewage sludge. The situation holds special significance for the New York-New Jersey metropolitan area where a sharp increase in the amount of sewage sludge to be dumped in the New York Bight is forecast (U.S.E.P.A., 1973). Even now, there is concern that sewage sludge dumped at the present site may be migrating to the beaches of southern Long Island (Harris, 1974 a, b, c,).

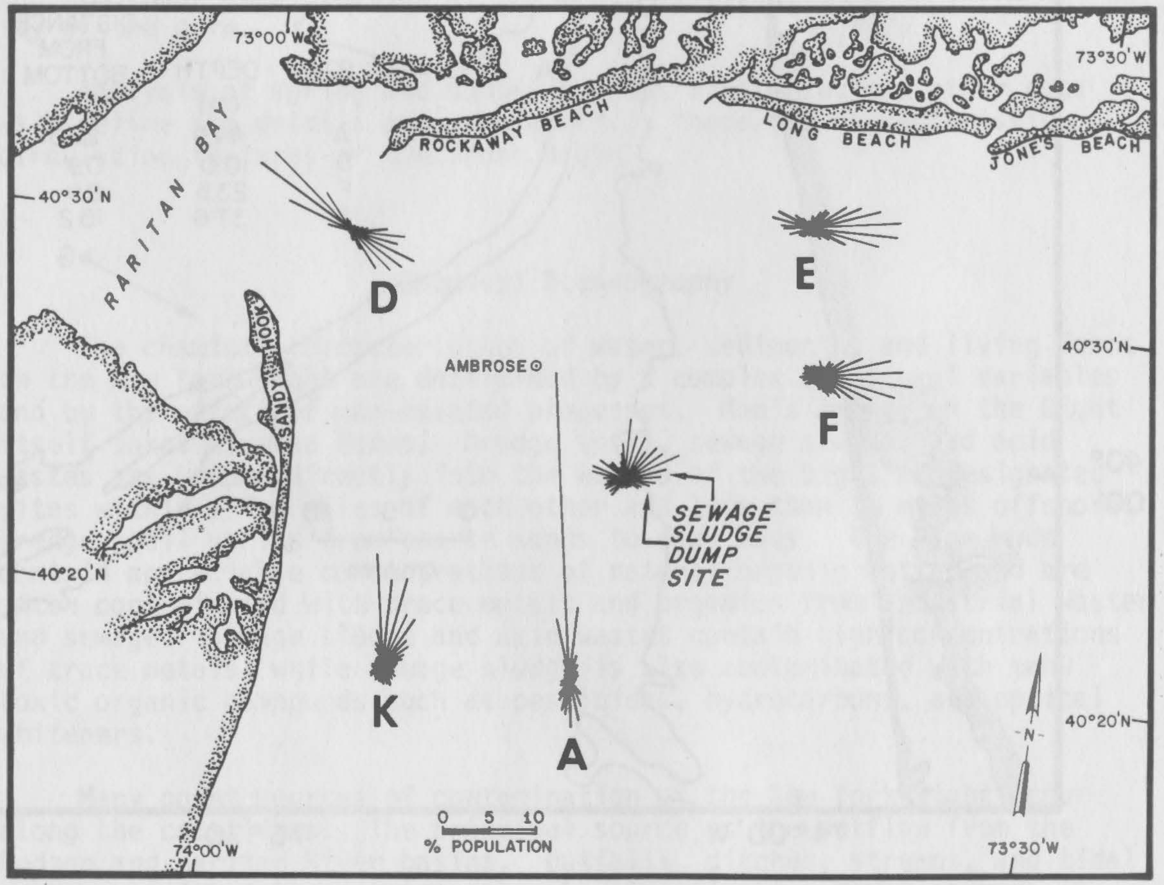

Figure 19. Polar histograms of frequency of current direction during the period Oct-Nov 1973.

Sewage Sludge Chemistry

Sewage sludge is one of the products resulting from the treatment of wastewater, a mixture of human, animal, and industrial wastes, and storm runoff. The material, although it varies with source and treatment plant (Klein et al., 1974; Duedall et al., in preparation), is about five percent solids and 95 percent liquid. In 1973, some 150 million ft^3 (5.3×10^6 m^3) of this material, along with 72 million ft^3 (2.04×10^6 m^3) of industrial wastes, were dumped in Bight waters from 7 to 110 n mi (10-160 km) offshore (EPA, 1974). Organic matter in sludge includes mostly amorphous organic aggregates with some identifiable material such as tomato and melon seeds, human hair, and fragments of rubber and plastic, and cellulose. Some major consitutents of sewage sludge have been identified (Hunter and Heukelekian, 1965; Gross, 1973; Watler, 1961). Raw sludge contains about 80% volatile matter; digested sludge has about 50%, the difference accounted for by methane and carbon dioxide produced during digestion. Total organic carbon usually accounts for 20% to about 50% of the dry weight of raw solids. Polymers and cellulose fibers survive digestion. Proteins and carbohydrates compose around 20% and 10% respectively of dry solids by weight. Other minor organic components include amino sugars, soluble acids, fats, anionic detergents, hydrocarbons, and amides, all together composing less than 10% of the dry weight of solids. Bacteria and fungi, trace metals and refractory hydrocarbons are also present.

Sludge in equilibrium with waste water is no longer in chemical equilibrium when it is discharged into the ocean. Here, the sludge undergoes chemical and biochemical changes and physical fractionation. Microbial species composition changes. Physical fractionation is caused by the wide range of densities, sizes, and shape of particles introduced to the water column so that, for example, eggshell fragments and tomato seeds are deposited at different places. Small particles aggregate to form large ones which sink.

Sediment Chemistry

Sewage sludge in the New York Bight has been called "black mayonnaise". Similar appearing materials are found in coastal locations where they have formed naturally from organic matter which originates at or near the coastline and which accumulates in small basins or other areas of deposition.

Several investigators have examined distributions of trace metal concentrations in New York Bight sediments (Gross, 1969, 1970 a, b, 1972; Carmody et al. 1973). Higher trace metal concentrations in sediments have been observed at and near the sewage sludge and dredge spoil dump sites, decreasing with increasing distance from the sites. Klein et al. (1974) and Duedall et al. (in preparation) have documented high and variable trace metal concentrations of sewage sludge from various treatment plants in the New York area. The Project has extended previous sediment trace metal studies. Of the 3000 sediment samples collected in 1973 and 1974 about 500 have been analyzed for heavy metals.

Sediment samples have been taken on a quarterly basis at 103 stations in the Apex (see Fig. 20) and analyzed for copper, chromium, lead, zinc and nickel. High concentrations and similar concentration patterns for these five metals occur at and near the sewage sludge and dredge dump sites. Sampling on a denser grid pattern shows variation of trace metal concentration with time. High concentrations of these five metals are found north and west of the sewage sludge and dredge spoil dump sites, and south in the Hudson Shelf Valley. Figure 21 illustrates these occurrences for lead. Because dumped dredge spoil remains in the local area of the dredge spoil dump site, it is probable that the rather widespread distribution of high lead concentrations illustrated in Figure 21 are caused primarily by dispersal of sewage sludge material and of Hudson River outflows. Distribution of elevated lead concentrations is evidence for southerly movement of some portion of sewage sludge, and, perhaps some dredge spoil seaward via the Hudson Shelf Valley. Segar and Pellenbarg (1973) have observed anomalously high trace metal concentrations where contaminant inputs do not include sewage.

Figure 22 shows a dense station grid pattern north of the sewage sludge dump site. Sediment samples from these stations were analyzed for chemical, geological, and biological composition. These analyses were made in collaboration with other government agencies to determine whether or not sewage sludge from the dump site was reaching the beach and near-beach areas. Analyses of these sediments from near the Long Island beaches north of the sewage sludge dump site (samples were taken during cruises conducted 10-15 June and 22 July 1974) were made for several chemical parameters, including heavy metals. Bottom samples from these stations were analyzed for eight trace metals: zinc, manganese, chromium, copper, nickel, silver and lead. The legend on Figure 22 shows stations with significant portions of black mud.

A major factor in using trace metal concentration data for characterizing sewage sludge from the dump site is the variability in its trace metal composition. Recent data of Duedall et al. (in preparation) on the concentrations of five heavy metals in settleable portions of sewage sludge from two New York sewage treatment plants, Newtown Creek and Wards Island, are presented in Tables 2 and 3. For the period January 1972 to September 1973, the combined sludge output from these two plants comprised 47.4 percent of the total sludge output of New York City (28.4 percent by Newtown Creek, and 19.0 percent by Wards Island) (Klein et al. 1974).

These data show the variability which can be expected. Further emphasis is given to this point by the large variation in *average* heavy

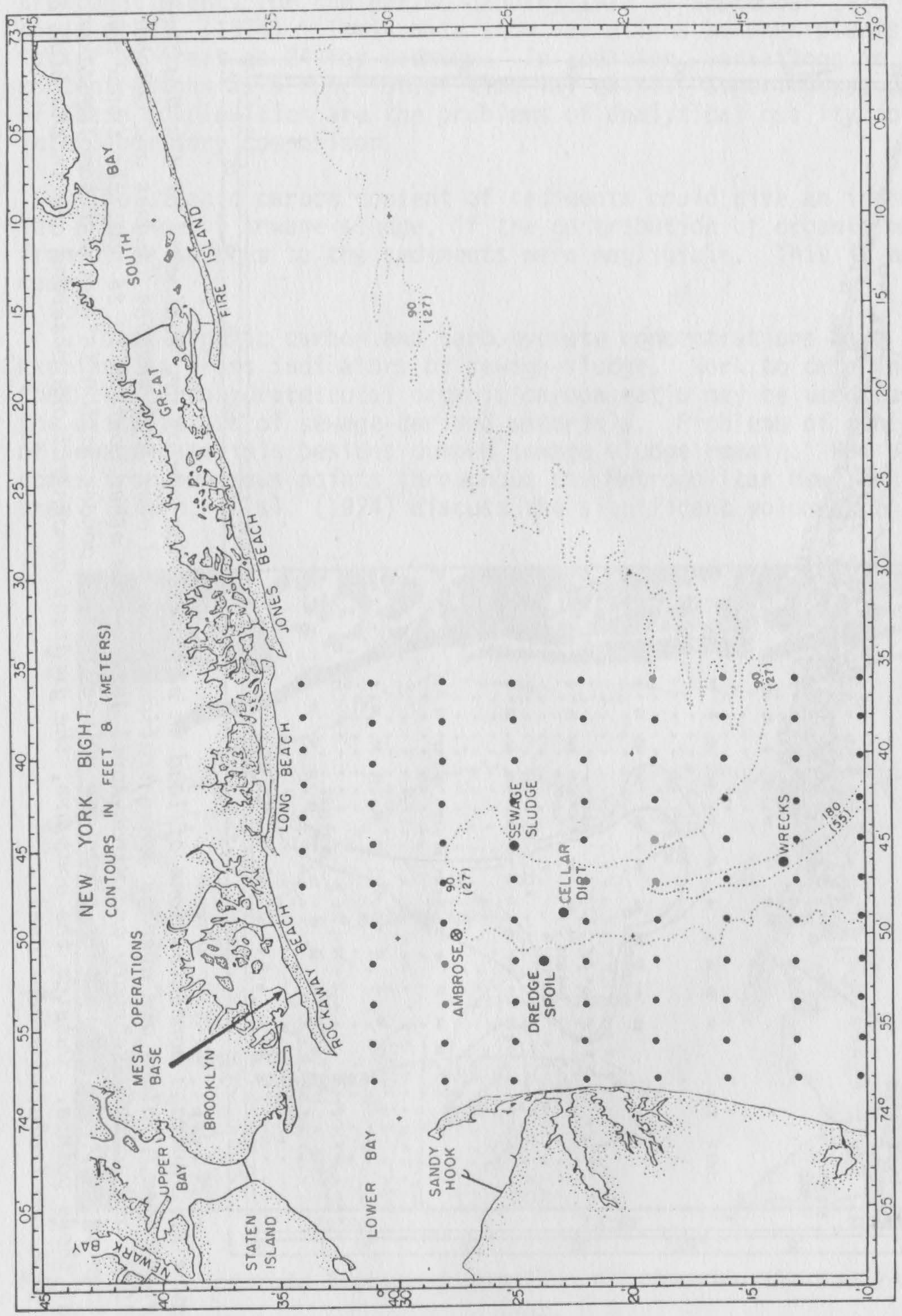

Figure 20. Stations sampled quarterly for benthic invertebrates and sediment attributes, including trace metals.

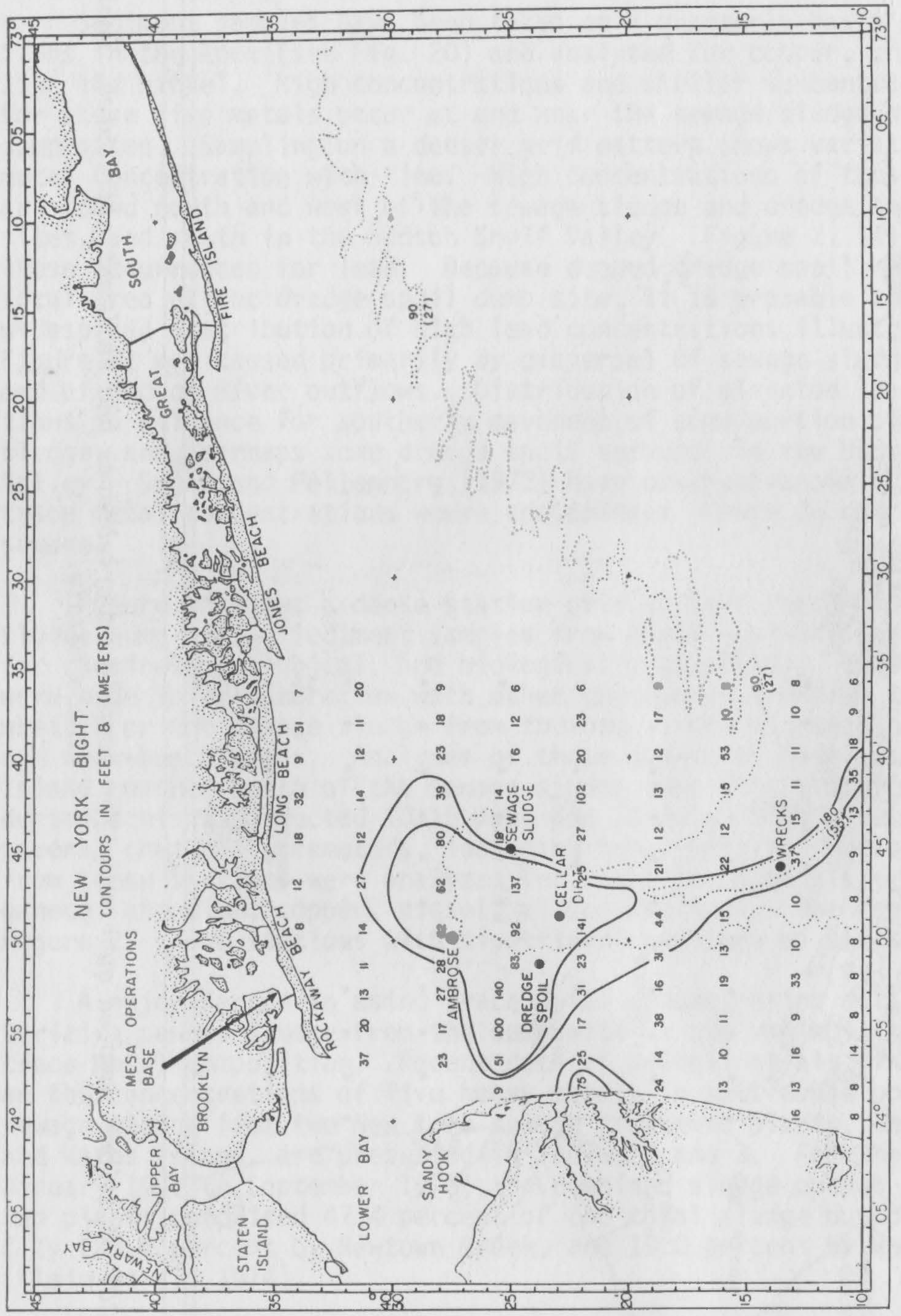

Figure 21. Average concentrations of lead in sediments (as ppm of dry sediment) of the New York Bight Apex. Values are average concentrations measured over four seasons (August and October 1973, and January-February and March-April 1974). The other contour is 25 ppm; the inner contour is 50 ppm. The numbers shown are values of lead concentration in sediment samples taken at those points. Outside the contours, the greatest concentrations observed are in the high 30's (with two isolated exceptions).

metal concentrations in total sewage sludge from ten New York City treatment plants for the period January 1972 to September 1973 found by Klein et al. (1974). Their data show variations between plants by a factor as great as 24 for cadmium. In addition, variations in these concentrations as a function of time may exist. Superimposed upon all of these complexities are the problems of analytical quality control and interlaboratory comparison.

The organic carbon content of sediments could give an indication of the presence of sewage sludge, if the contribution of organic matter from other sources to the sediments were negligible. This is not the case.

Total organic carbon and carbohydrate concentrations have been examined as gross indicators of sewage-sludge. Work to date indicates that the carbohydrate:total organic carbon ratio may be used to estimate the distribution of sewage-derived materials. Problems of other sources of sewage materials besides dumped sewage sludge remain. Raw sewage comes from numerous points throughout the Metropolitan New York City area. Klein, et al. (1974) discuss the significant volumes of untreated

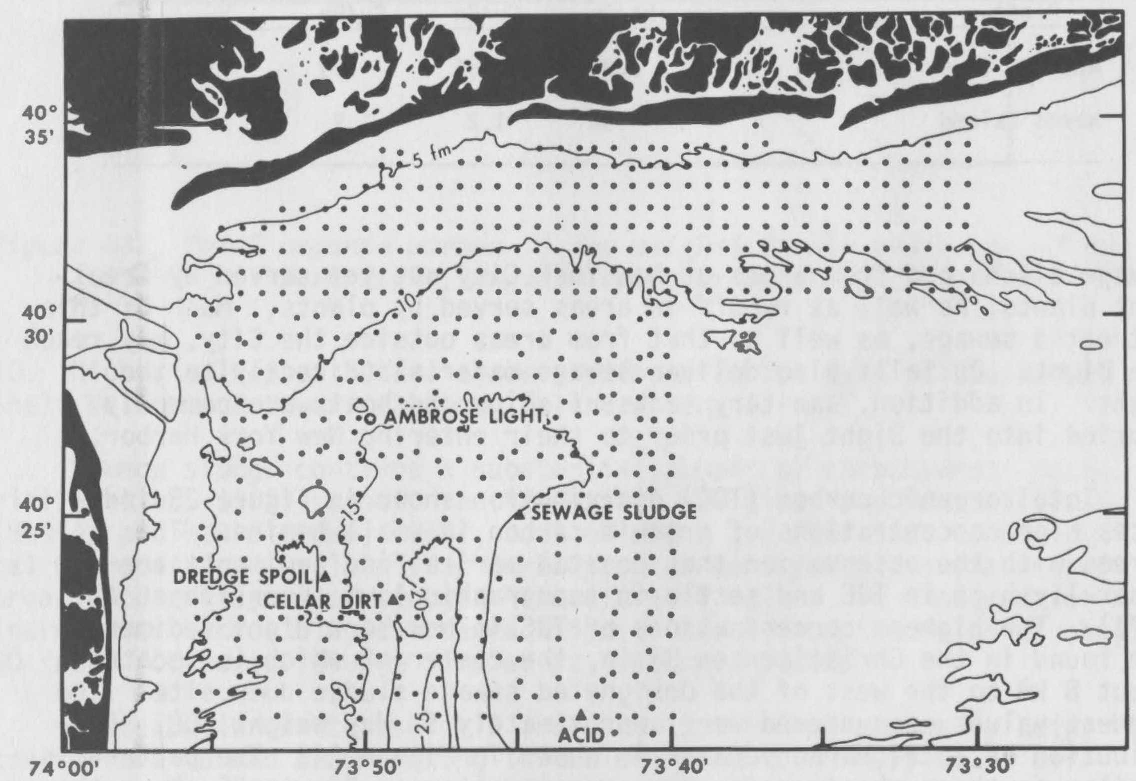

Figure 22. Substrate inventory sampling stations in the New York Bight Apex.

Table 2. Heavy Metal Concentrations (ppm, dry material) in the Settleable Portion of Sewage Sludge from Two New York City Waste Treatment Plants.

Plant	Zn	Pb	Cu	Cd
Newtown Creek	3,070	11,500	2,650	17.1
Wards Island	1,080	686	1,300	not detectable

Data from Duedall et al. (in preparation)

Table 3. Ratios of Concentrations of Heavy Metals in the Settleable Position of Sewage Sludge from Two New York City Waste Treatment Plants.

Plant	Pb/Zn	Cu/Zn	Cu/Pb
Newtown Creek	3.8	.86	.23
Wards Island	.64	1.2	1.9

sewage discharged from areas of New York City not yet served by treatment plants, as well as runoff in areas served by plants. Much of this untreated sewage, as well as that from areas outside the City, may reach the Bight. Outfalls also deliver sewage materials directly to the Bight. In addition, sanitary tanks of ships and boats are commonly emptied into the Bight just prior to their entering New York Harbor.

Total organic carbon (TOC) distribution shown in Figure 23 indicates high concentrations of organic carbon in small basins. This agrees with the observation that coastal marine fine sediments are generally high in TOC and settle in topographic lows (Foerlich et al. 1971). The highest concentrations of TOC in New York Bight sediments are found in the Christiaensen Basin, the center of which is located about 8 km to the west of the designated sewage sludge dump site. The highest values encountered were approximately 5% dry weight TOC. Distribution of total carbohydrates is shown in Figure 24. The pattern is similar to those obtained for TOC concentrations. Figure 25 shows the carbohydrate/TOC ratio, R, in New York Bight sediments. The entire Apex area is enriched in carbohydrates, relative to TOC, with values of R ranging from 20-70. The R value for normal coastal sediment is about

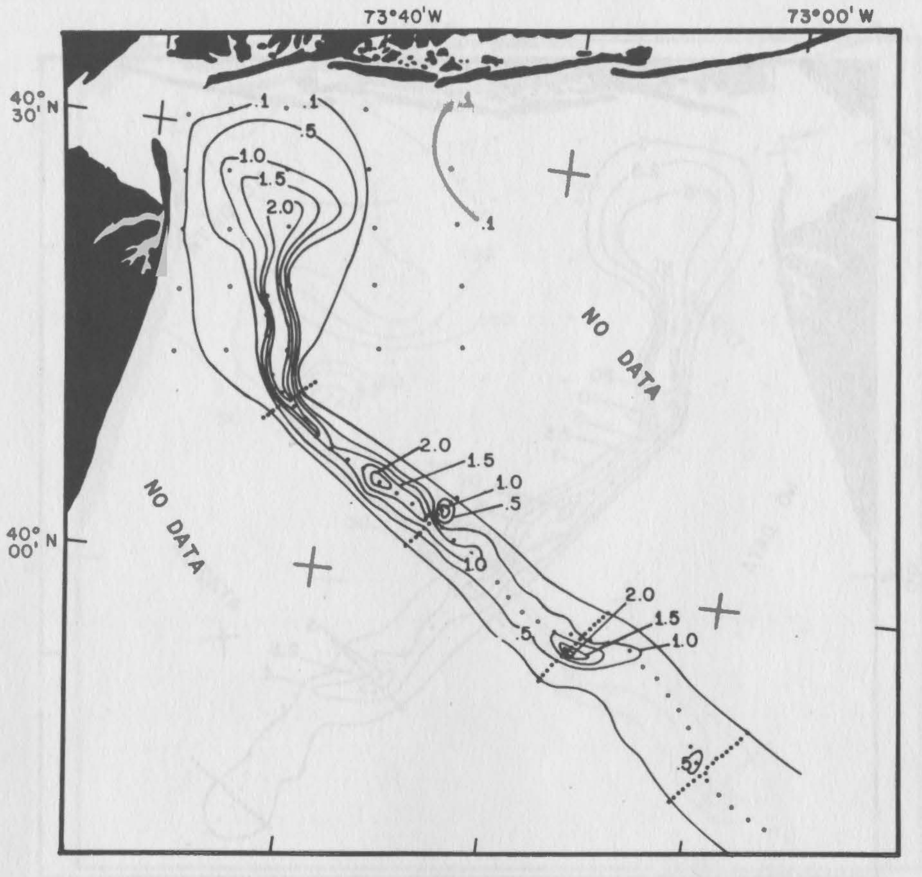

Figure 23. Total organic carbon (% dry weight) in the sediments of New York Bight, August-September 1973.

10. Higher values of 50 and above are found in the axis of the Hudson Shelf Valley and toward the Long Island shore.

Sewage sludge contains a substantial amount of carbohydrate material (Walter, 1961), mostly in the form of cellulose and hemicellulose (Hunter and Heukelekian, 1965), both of which are resistant to biological degradation. Cellulolytic carbohydrates decompose less than other organic constituents of sewage. Therefore, R values are expected to increase as microbiological degradation proceeds from the value of about 30 found for sewage sludge sampled at treatment plants.

Distribution patterns for R indicate that sewage sludge is being transported to and accumulating in the Hudson Canyon, many miles offshore (see Fig. 25). It is not known how this material is transported to the Hudson Canyon for deposition. Regardless of the mechanism involved, a significant portion of ocean dumped sewage sludge is being transported away from the coastline into deeper water.

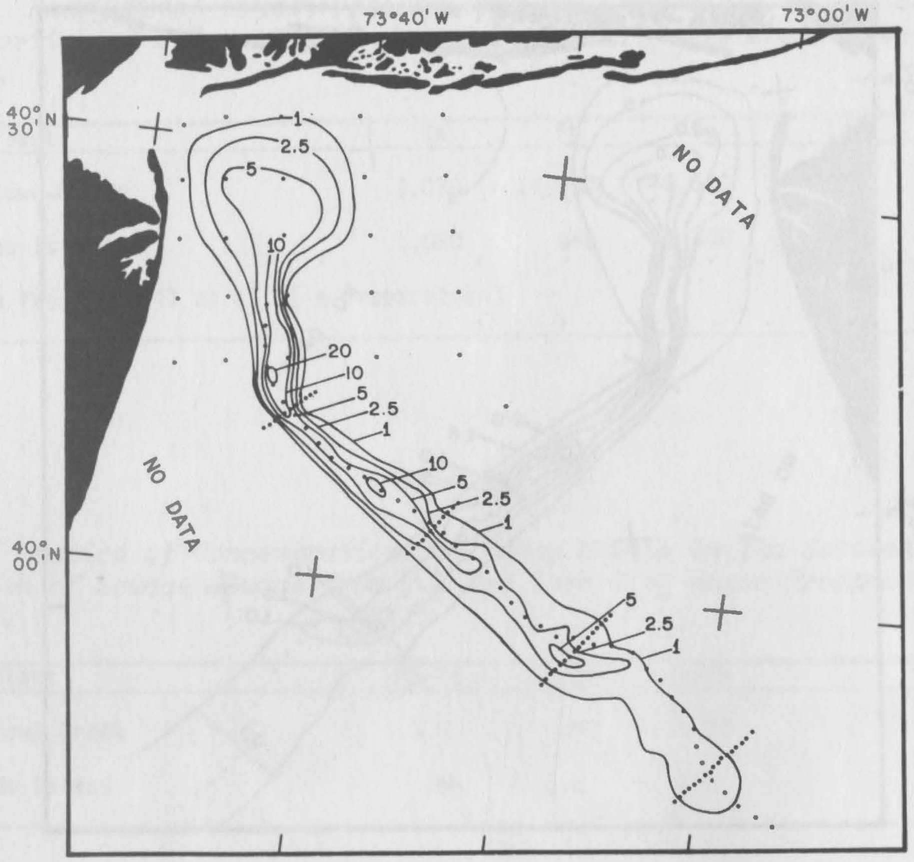

Figure 24. Total carboydrates (% dry weight × 1000) in sediments of the New York Bight (the dots represent sampling stations).

Thin-layered black muds, rich in TOC (~5%), exist within 1½ n mi (2.8 km) of Long Island beaches. This TOC concentration is similar to that found close to the actual dump site. Within ½ mi (0.9 km) of this beach, other pockets of mud were found to have a TOC concentration of approximately 2%. Sandy sediments in the vicinity had TOC contents of 0.04% to 0.3%.

The value of $\underline{R}$ is high for all of these samples; values range from 40 to 60. The same range was observed for samples from the Christiaensen Basin. Thus, sediments close to the south shore of Long Island contain organic matter enriched in carbohydrates, indicating a probable sewage source. Whether the source is a nearby outfall or channel or the more distant sludge dumping site cannot be determined from existing data.

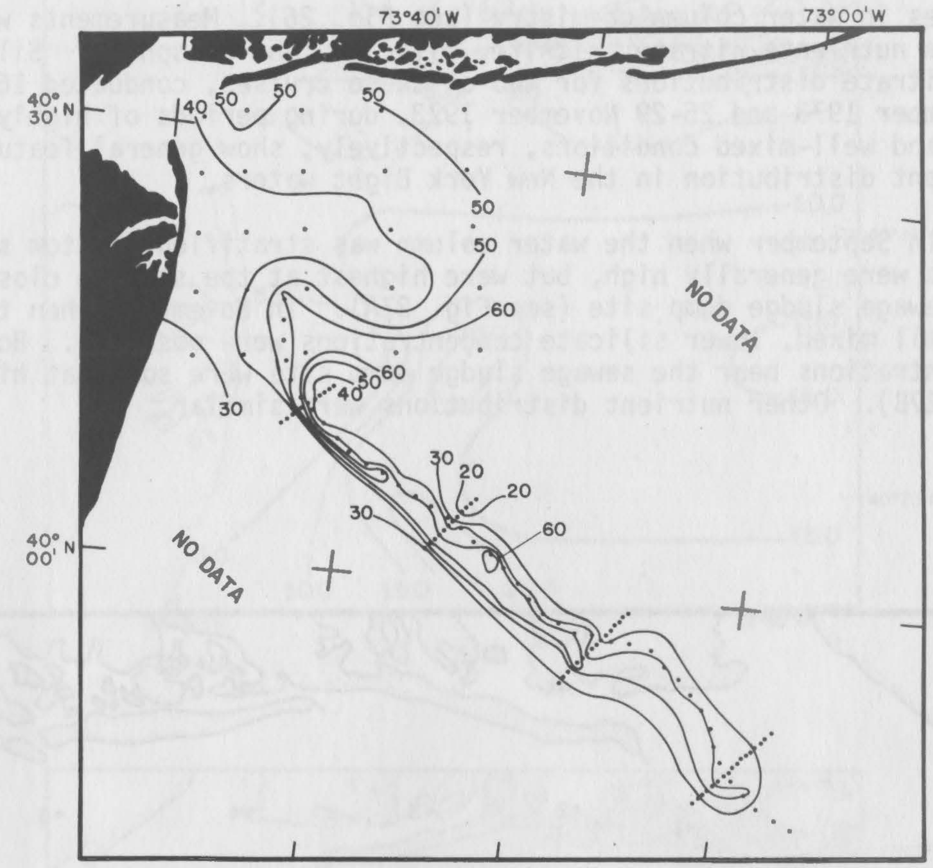

Figure 25. Parameter $\underline{R}$ (carboydrate/TOC × 100) for sediments of the New York Bight (the dots represent sampling stations).

Water Chemistry

Dumped dredge spoil and sewage sludge materials place an increased oxygen demand on the near-bottom waters in areas around the dump sites and other sites of material deposition. Mixing with water having higher values of oxygen content, augmented seasonally by reaeration of surface waters when the water column is not stratified, restores these oxygen-deficient waters to near-saturation values. Low oxygen content of water near the beaches is no indication that the water has been in contact at one time or another with sewage-derived or any other organic materials. Water near the beach in summer contains less than 5 ml/L oxygen of sea water (Green, 1965) when temperatures of 25°C and salinities of 30°/oo are common; this is at saturation or at equilibrium with the atmosphere.

Between the end of August 1973, and the end of September 1974, a total of 11 cruises were conducted in the Apex to characterize seasonal changes in water column chemistry (see Fig. 26). Measurements were made of the nutrients nitrate, nitrite, silicate, and phosphate. Silicate and nitrate distributions for two of these cruises, conducted 16-20 September 1973 and 25-29 November 1973, during periods of highly stratified and well-mixed conditions, respectively, show general features of nutrient distribution in the New York Bight waters.

In September when the water column was stratified, bottom silicate values were generally high, but were highest at the station closest to the sewage sludge dump site (see Fig. 27A). In November, when the water was well mixed, lower silicate concentrations were observed. Bottom concentrations near the sewage sludge dump site were somewhat high (see Fig. 27B). Other nutrient distributions were similar.

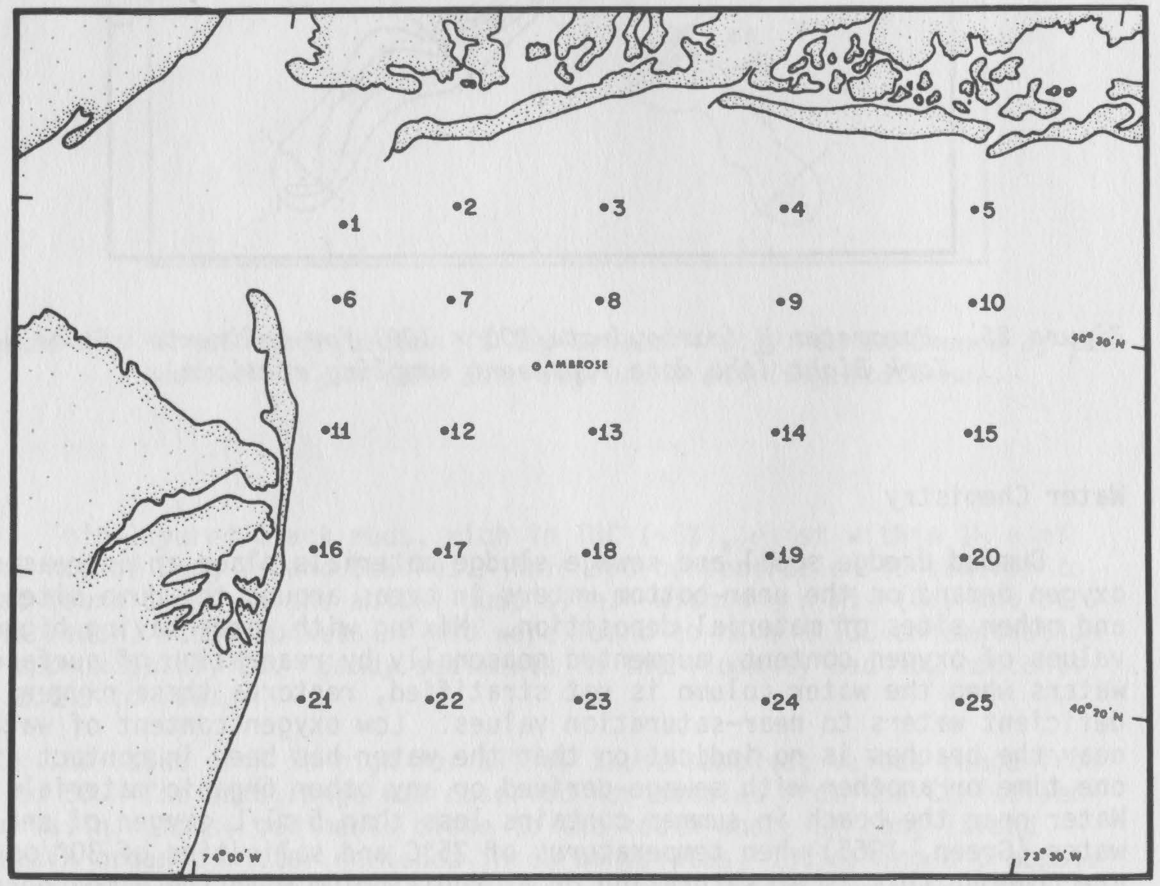

Figure 26. Water column chemistry cruise station grid.

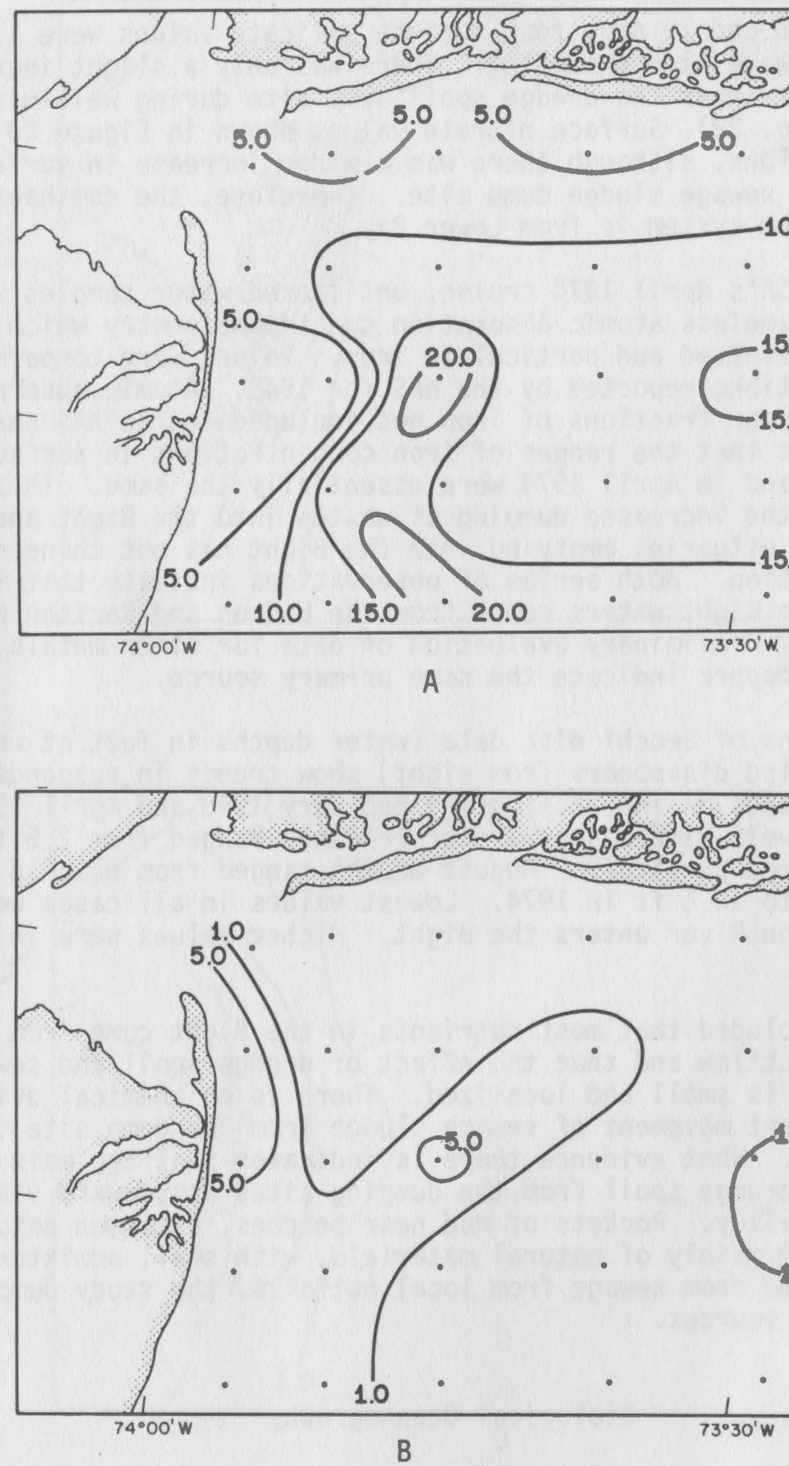

Figure 27. A - bottom silicate, 16-20 September 1973. B - bottom silicate, 25-29 November 1973 (µg - atoms per liter).

Figures 28 and 29 show that surface silicate values were little affected by sewage sludge dumping. There was only a slight increase of surface silicate near the dredge spoil dump site during well-mixed conditions (Fig. 28). Surface nitrate values shown in Figure 29 show similar variations, although there was a minor increase in surface nitrate near the sewage sludge dump site. Therefore, the dominant nutrient input to the system is from Lower Bay.

During MESA's April 1974 cruise, unfiltered water samples were analyzed by flameless atomic absorption spectrophotometry which determines total dissolved and particulate iron. Values were compared with iron concentrations reported by the NAS for 1948. Atomic absorption data include minor fractions of iron not included in the NAS analyses. Figure 30 shows that the ranges of iron concentrations in surface waters in April 1948 and in April 1974 were essentially the same. These data indicate that the increased dumping of wastes into the Bight and into the rivers and estuaries emptying into the Bight has not changed the iron concentration. Both series of observations indicate that most of the iron in the Bight waters comes from the Hudson and Raritan Rivers and estuaries. Preliminary evaluation of data for other metals such as manganese and copper indicate the same primary source.

Comparisons of Secchi disc data (water depths in feet at which a 1-ft (30 cm) disc disappears from sight) show trends in suspended solids as seen in Figures 31 and 32. During February 1948 and April 1974, when the water was well-mixed, Secchi disc readings ranged from 2.5 to 10, and 2 to 7 ft, respectively. August depths ranged from 5 to 15 ft in 1949, and 1.5 to 16.5 ft in 1974. Lowest values in all cases were found where the Hudson River enters the Bight. Higher values were in deeper waters.

It is concluded that most nutrients in the Bight come from the Hudson River outflow and that the effect of dredge spoil and sewage sludge dumping is small and localized. There is no chemical evidence for a significant movement of sewage sludge from the dump site to Long Island beaches. What evidence there is indicates that the main movement of sludge and dredge spoil from the dumping sites is seaward via the Hudson Shelf Valley. Pockets of mud near beaches, a common natural occurrence, are mainly of natural materials, with small admixtures of material derived from sewage from local outfalls, the study dumping site, or other sources.

Biological Oceanography

Identification of man's influences on the ocean is difficult because large-scale natural changes are typical of most marine populations (Longhurst et al., 1972). Most studies of the plankton, benthos, and fish in the New York Bight have been directed to the efforts of massive

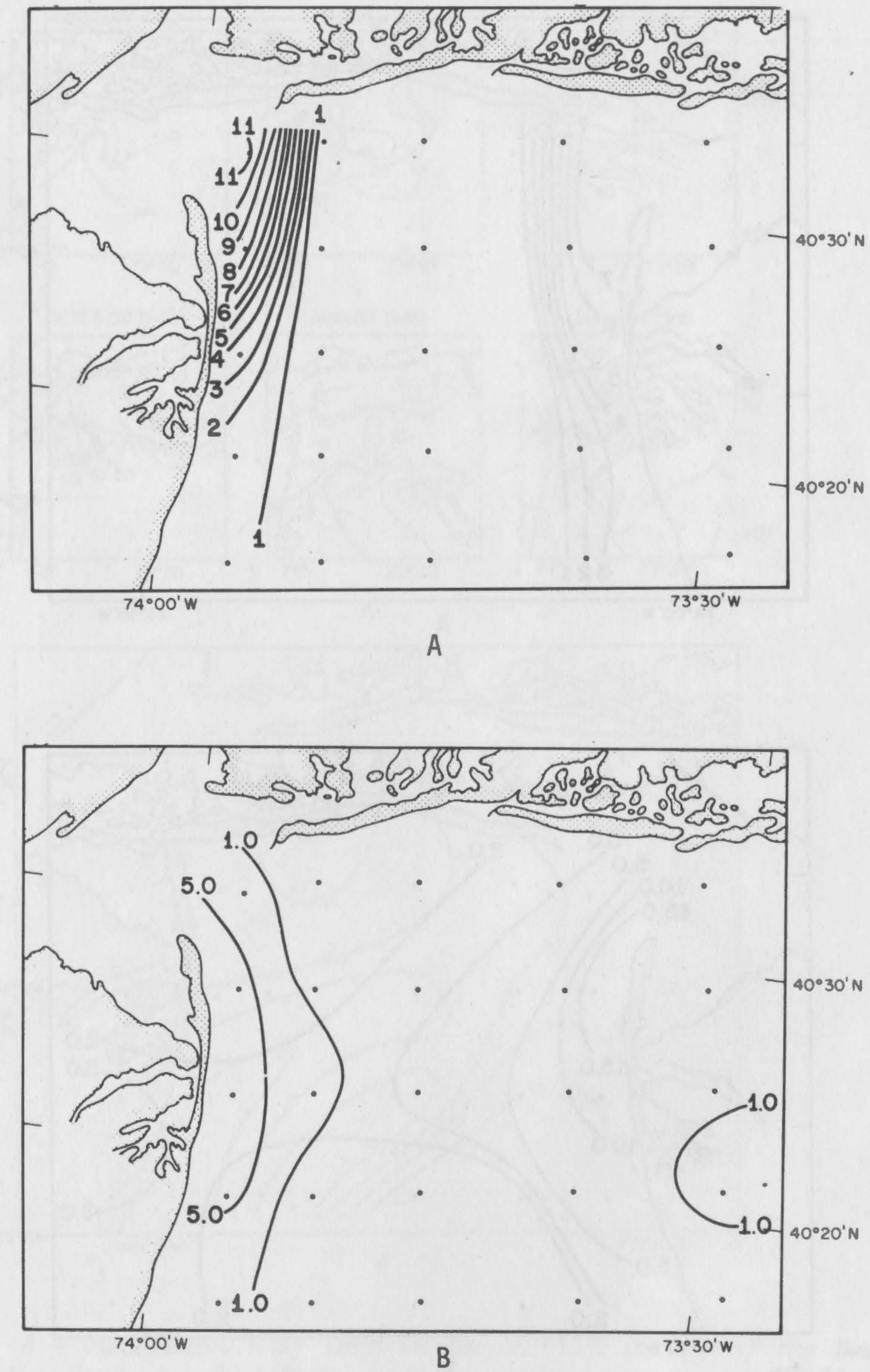

Figure 28. A - surface silicate, 16-20 September 1973. B - surface silicate, 25-29 November 1973 (µg - atoms per liter).

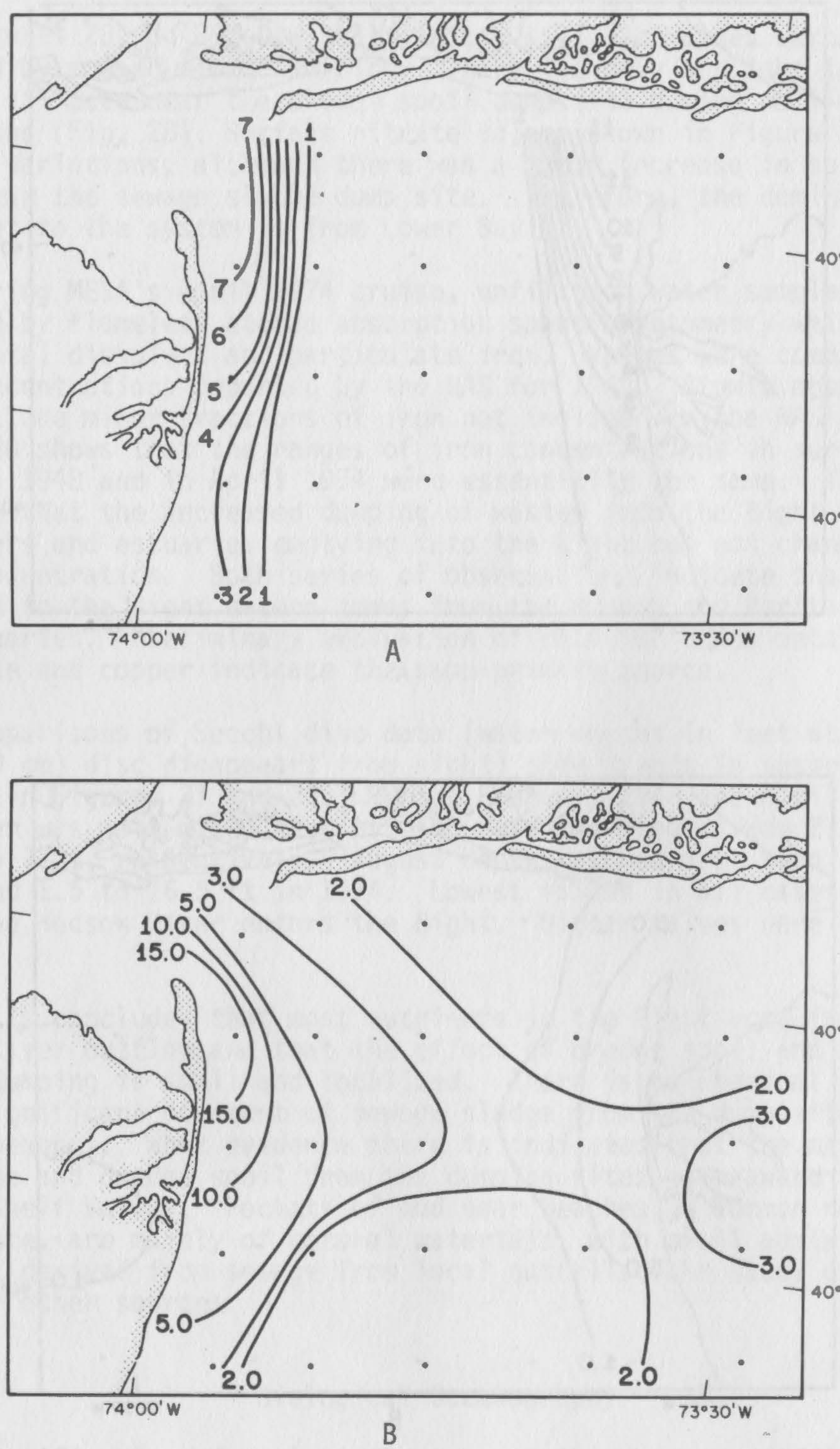

Figure 29. A - surface nitrate, 16-20 September 1973. B - surface nitrate 25-29 November 1973 (μg - atoms per liter).

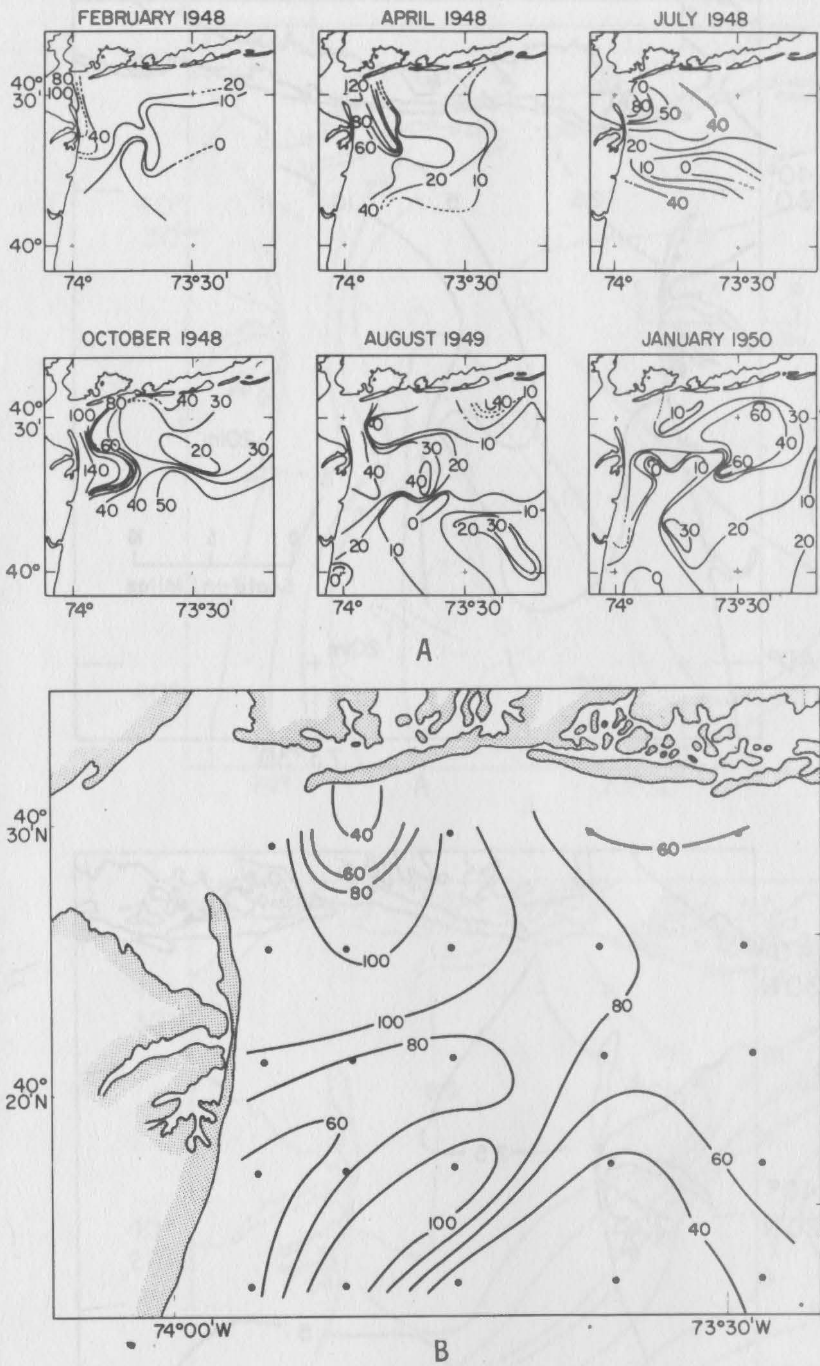

Figure 30. A - Distribution of iron in the surface waters of the New York Bight. Contours show iron concentrations in parts per billion (micrograms per liter)(NAS, 1955). B - Distribution of total dis solved iron concentrations in surface water of the New York Bight Apex obtained during MESA cruise WCC-6, April 1974. Contours show iron concentrations in parts per billion (micrograms per liter).

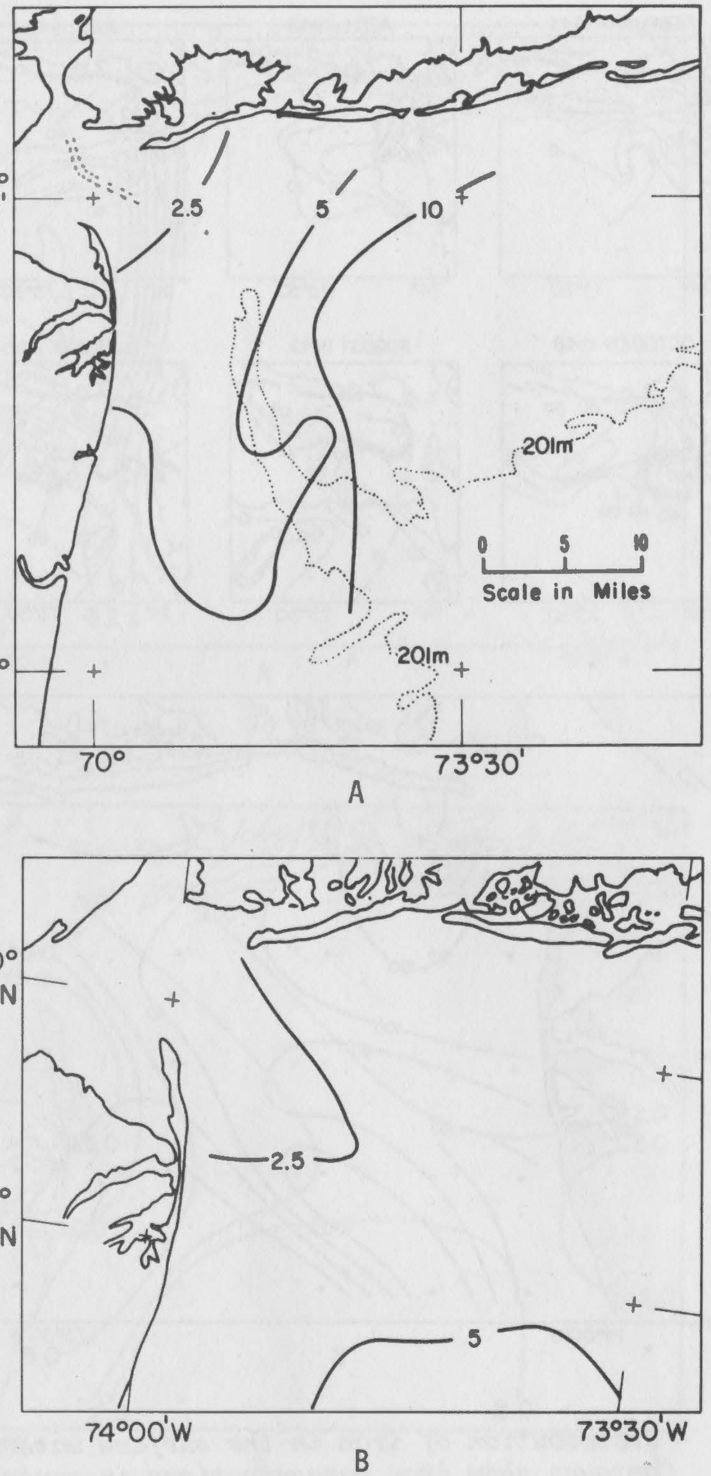

Figure 31. Transparency in feet of the waters of the New York Bight. A - February 1948 prior to disposal of titanium wastes offshore. B - April 1974 Secchi disc depths in the New York Bight Apex observed during MESA cruise.

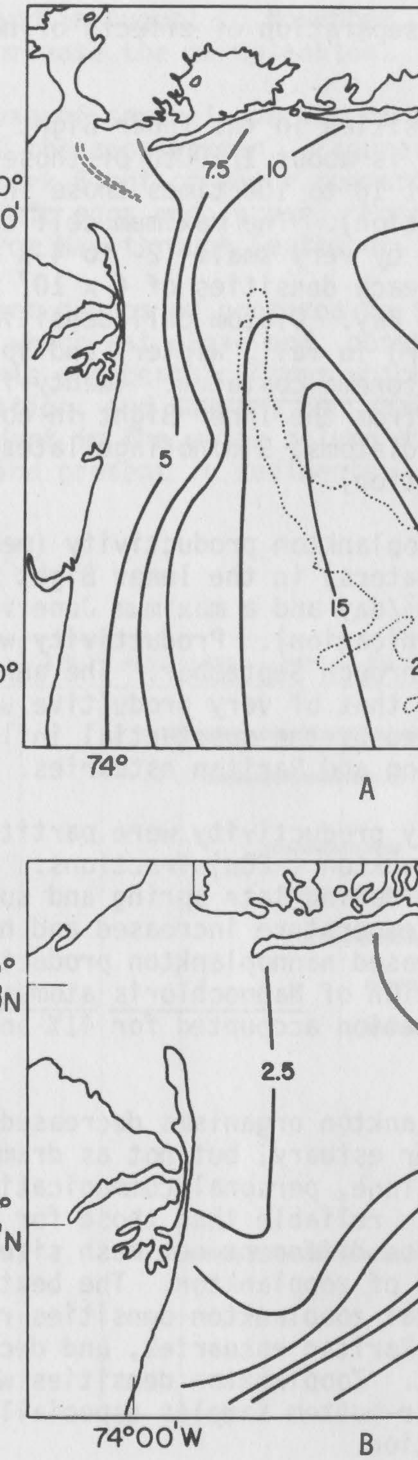

Figure 32. Transparency of waters of the New York Bight. A - August 1949 (NAS, 1955). B - Secchi disc depths in the New York Bight Apex obtained during MESA cruise WCC-10, August 1974. Contours show depths in feet.

ocean dumping. Even here, separation of effects of natural and man-made events is difficult.

Phytoplankton cell densities in the Inner Bight range from about 10^4 to 10^7 per liter. This is about 1/100th of those in the Hudson and Raritan estuaries, and about 10 to 100 times those in the Outer Bight (Malone, personal communication). The maximum cell densities of summer are almost always dominated by very small (2- to 4-μ diameter) cells of Nannochloris atomus which reach densities of 4 x 10^7 per liter at the Bight's boundary with Lower Bay. Diatom cell densities are highest (from 2 to 9 x 10^6 per liter) in fall, winter, and spring, due primarily to periodic blooms of Skeletonema costatum. Twenty-five phytoplankton species have been reported from the Inner Bight in concentrations exceeding 10^3 per liter: 13 diatoms, 9 dinoflagellates, and 3 other taxa (Malone, personal communication).

A 1-year study of phytoplankton productivity (measured using carbon-14 uptake in deck incubators) in the Inner Bight showed a minimum December value of 0.3 g C/m^2/day and a maximum June value of 1.7 g C/m^2/day (Malone, personal communication). Productivity was generally high (>1 g C/m^2/day) from June through September. The annual production of 370 g C/m^2 is comparable to that of very productive upwelling systems (Ryther, 1969), and is caused by the substantial influx of nutrient-rich surface water from the Hudson and Raritan estuaries.

Measurements of primary productivity were partitioned into netplankton (>20μ) and nannoplankton (<20μ) fractions. Nannoplankton productivity increased rapidly during late spring and summer as the water column became stratified, temperature increased and nutrient concentration decreased. This increased nannoplankton productivity coincided with an increase in population of Nannochloris atomus. Netplankton and nannoplankton primary production accounted for 41% and 59% of annual production, respectively.

The abundance of zooplankton organisms decreased with distance from the Hudson and Raritan River estuary, but not as dramatically as the decrease in phytoplankton (Malone, personal communication). Estimates of zooplankton density are less reliable than those for phytoplankton density because investigators use different net mesh sizes and have made relatively few observations of zooplankton. The best available estimates indicate the that total zooplankton densities range from 1 to 400 x 10^3/m^3 in the Hudson and Raritan estuaries, and decline to 0.4 to 3.3 x 10^3/m^3 in the Outer Bight. Zooplankton densities were generally higher in mid-depth and near-bottom samples especially during periods of water column stratification.

Seasonal changes in zooplankton composition are dominated by variations in abundance of copepods which reach peak concentrations during summer and fall months. There are maximum values in abundance of meroplankton (forms which are planktonic during part of their lives) during

January to March and in August to November. Larvae of bivalve molluscs and polychaetes dominate the meroplankton.

Eggs and larvae of several species of fishes also comprise important components of the zooplankton. Figure 33 illustrates peak spawning times in the New York Bight of major commercial and recreational species which have planktonic eggs and larvae. Most of this reproductive activity takes place from May through September.

The predominant groups of protozoa in the Bight are tintinnids (planktonic forms which eat algae and, possibly, bacteria) and scutico ciliates (planktonic and benthic forms which eat bacteria) (Small, personal communication; and Sawyer, personal communication). Scutico ciliates are abundant in the water column during summer, absent from the water in winter, and present in sediments.

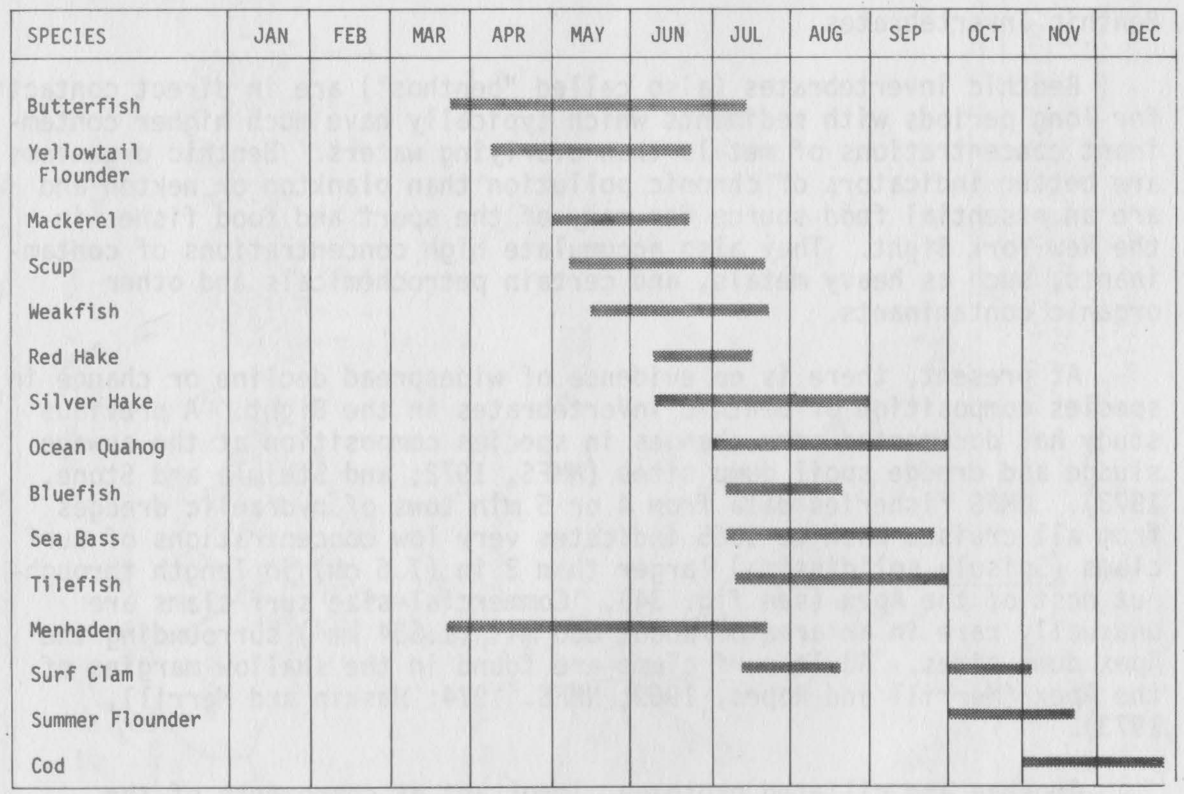

Figure 33. Peak spawning times of major commerical and recreational species with plankton egg and larval stages in the New York Bight. (Livingston, personal communication).

Several species of scutico ciliates have been found in close association with the sewage sludge dump site, in the water column and/or as cysts in the sediment: Uronema nigrocans, Cyclidium dimacronucleatum, and Cyclidium polyschizonucleatum. In contrast, Uronema marina has been found only at clean sites. There appears to be a predominance of ciliates which feed upon bacteria in waters above the sewage sludge and dredge spoil dump sites during higher summer and fall temperatures.

Two studies of phytoplankton nutrients and productivity (Malone, personal communication; and Duedall, personal communication), three studies of net zooplankton (NMFS, 1972; Vaccaro et al., 1972; and Wiebe et al., 1973), and two studies of planktonic protozoa (Small, personal communication; and Sawyer, personal communication) were designed to detect effects of ocean dumping on plankton of the Bight. Impacts of dumping on plankton were localized and had imperceptible influences on the planktonic composition and productivity of the Inner Bight as a whole.

Benthic Invertebrates

Benthic invertebrates (also called "benthos") are in direct contact for long periods with sediments which typically have much higher contaminant concentrations of metals than overlying waters. Benthic organisms are better indicators of chronic pollution than plankton or nekton and are an essential food source for many of the sport and food fishes in the New York Bight. They also accumulate high concentrations of contaminants, such as heavy metals, and certain petrochemicals and other organic contaminants.

At present, there is no evidence of widespread decline or change in species composition of benthic invertebrates in the Bight. A previous study has documented some changes in species composition at the sewage sludge and dredge spoil dump sites (NMFS, 1972; and Steimle and Stone, 1973). NMFS fisheries data from 4 or 5 min tows of hydraulic dredges from all cruises back to 1965 indicates very low concentrations of surf clams (Spisula solidissima) larger than 3 in (7.6 cm) in length throughout most of the Apex (see fig. 34). Commercial-size surf clams are unusually rare in an area of about 600 mi^2 (1.554 km^2) surrounding the Apex dump sites. Adult surf clams are found in the shallow margins of the Apex (Merrill and Ropes, 1969; NMFS, 1974; Haskin and Merrill, 1973).

Amoebae and ciliated protozoa, important as components of the plankton, are also significant as benthic organisms. Over 150 samples of these small organisms in sediments are being analyzed to learn how their distribution is influenced by the dumping. Active amoebae and

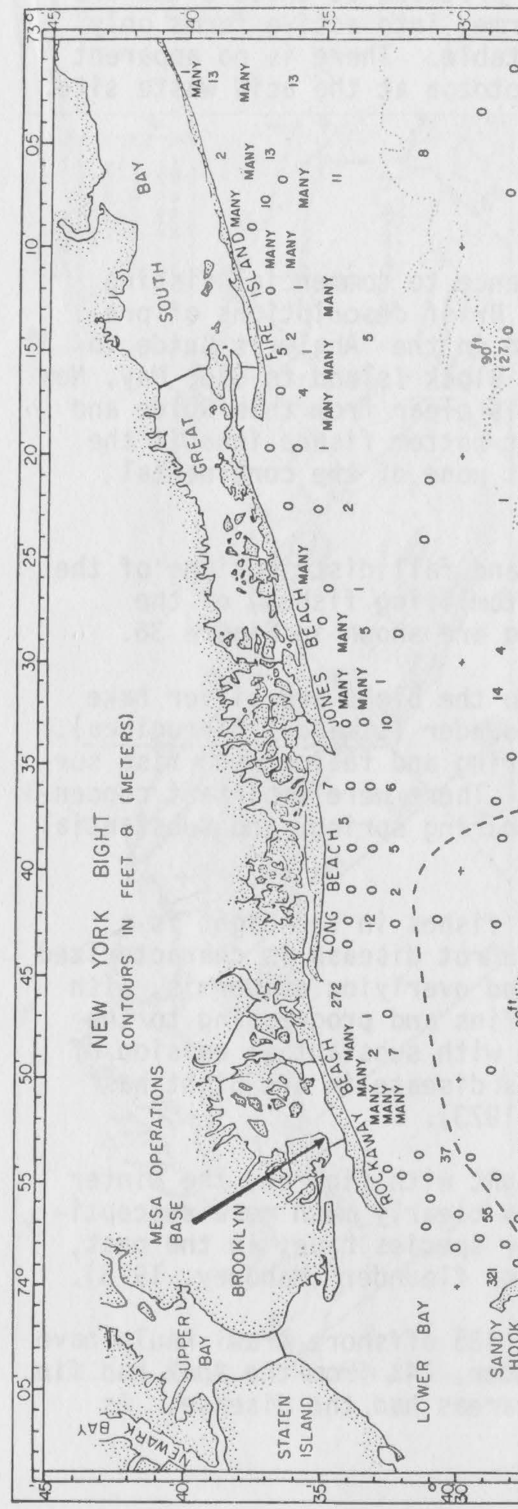

Figure 34. Numbers of large surf clams (Spisula solidissima) caught in 4-to-6 min tows of hydraulic clam dredges. Data from cruises of 1965 to the present (NMFS, 1974); Ropes and Merrill, 1971; Haskin and Merrill, 1973; and Franz, personal communication. "Many" indicates more than 0.5 bushels per haul. The dashed line delineates the area inside the 90-ft depth contour having absence of large surface clams.

ciliates of any kind are rare in sediments near the dredge spoil and sewage sludge dump sites. Essentially all protozoa at these sites are present only extremes, and become transformed into active forms only when environmental conditions become acceptable. There is no apparent influence on the composition of benthic protozoa at the acid waste site.

Fish

Several species of fish are of importance to commercial fishing and/or recreational fishing in the Bight. Brief descriptions of preferred habitats for these species are given in the "Angler's Guide to the United States East Coast, Section III, Block Island to Cape May, New Jersey", (Freeman and Walford, 1974). It is clear from this Guide and from regular sampling of bottom fishes that bottom fishes inhabit the entire area of the New York Bight, and that none of the continental shelf is devoid of fish life.

Figure 35 illustrates typical spring and fall distributions of the most important commercial ground fish (bottomliving fishes) of the northeast. Locations trawled during spring are shown in Figure 36.

Two fishes of commercial importance in the Bight are silver hake (Merluccius bilinearis) and yellowtail flounder (Limanda ferruginea). The average catches of these species in spring and fall ground fish surveys are illustrated in Figures 37 and 38. There were important concentrations of yellowtail in the Inner Bight during spring, and substantial seasonal movements of silver hake.

Fin rot disease in several species of fishes in the Bight is a manifestation of environmental stress. Fin rot disease is characterized by a progressive erosion of the fin rays and overlying epidermis, with erosion originating at the outer edges of fins and progressing to the base. Figures 39 and 40 illustrate a fish with substantial erosion of dorsal and anal fins. The presence of this disease in the Bight has been known for some time (Mahoney et al., 1973).

Of the 22 species of fishes in the Bight with fin rot, the winter flounder (Pseudopleuronectes americanus) is clearly much more susceptible than any other species. However, other species have, in the past, had higher incidences of fin rot than winter flounder (Mahoney, 1973).

A total of 4,489 winter flounder from 435 offshore trawl hauls have been examined for fin rot. Of these flounder, 14% from the Apex had fin rot, whereas only 1.9% of them from other areas had the disease. As

Figure 35. Generalized picture of the seasonal distribution of fishes vulnerable to bottom trawling -- based on plots of individual catches of ground fish surveys. The areas outlined as statistical areas of the International Commission for the Northeast Atlantic Fisheries (ICNAF) (from Grosslein and Bowman, 1973).

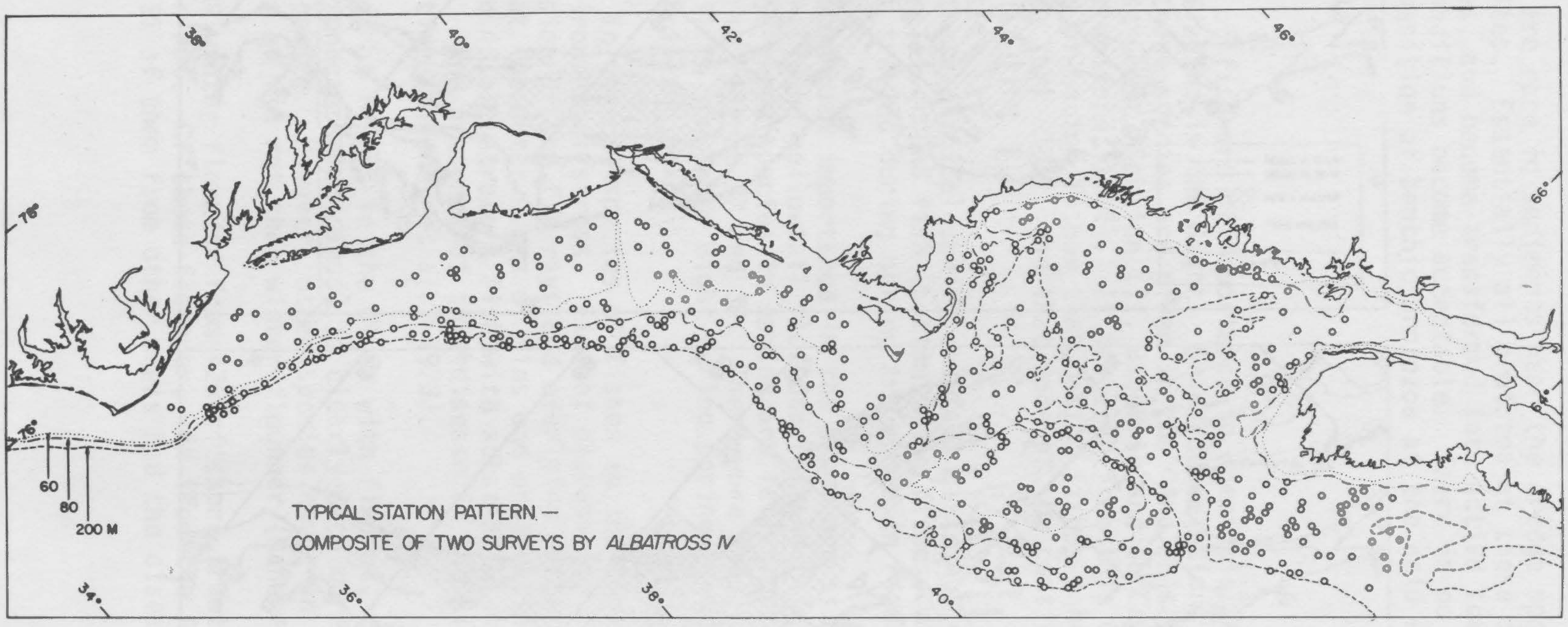

Figure 36. Location of stations where groundfish were sampled during two surveys (from Grosslein and Bowman, 1973).

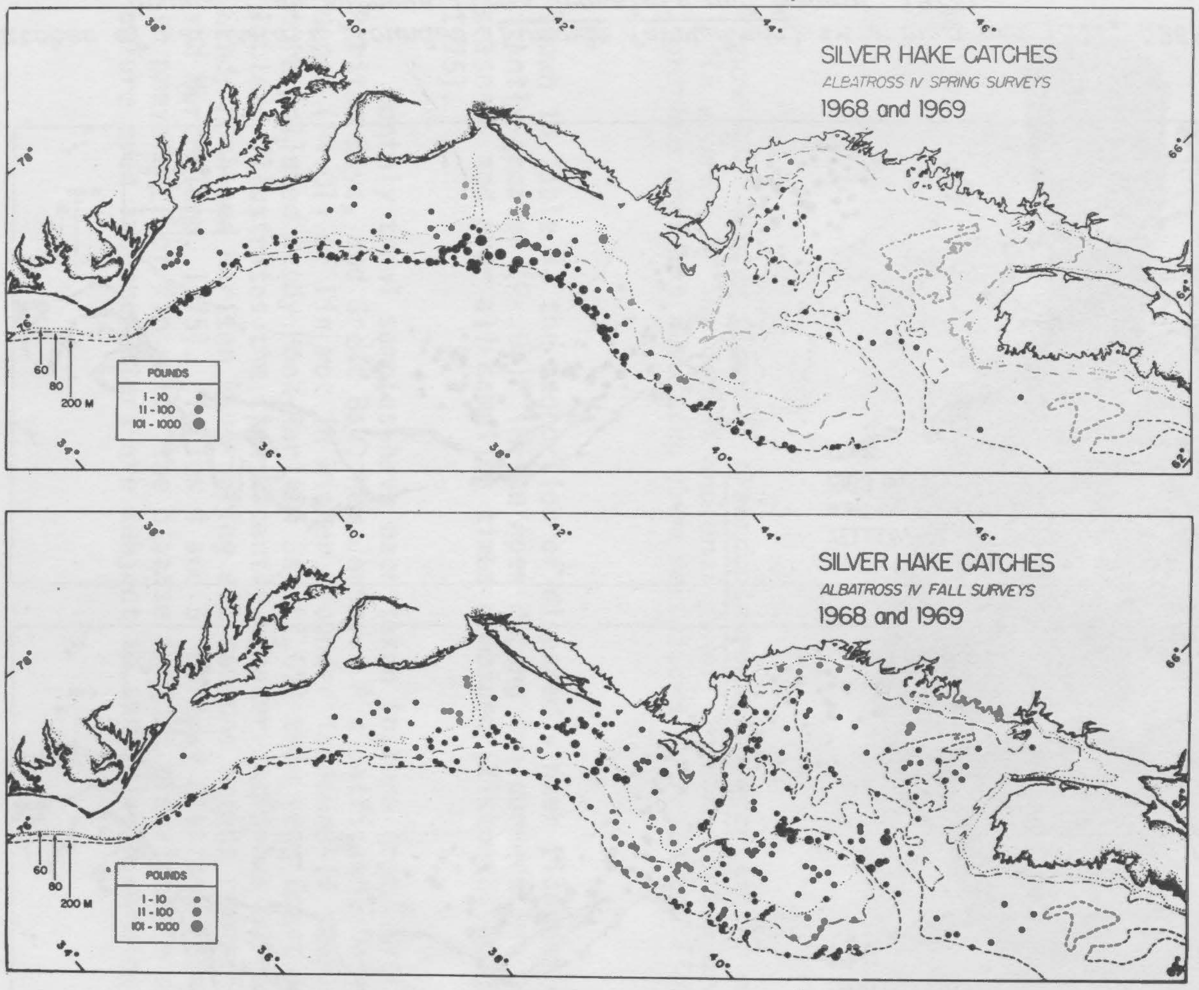

Figure 37. Catches of silver hake (<u>Merluccius</u> <u>bilinearis</u>) in spring and fall, 1968 and 1969 groundfish surveys (from Grosslein and Bowman, 1973).

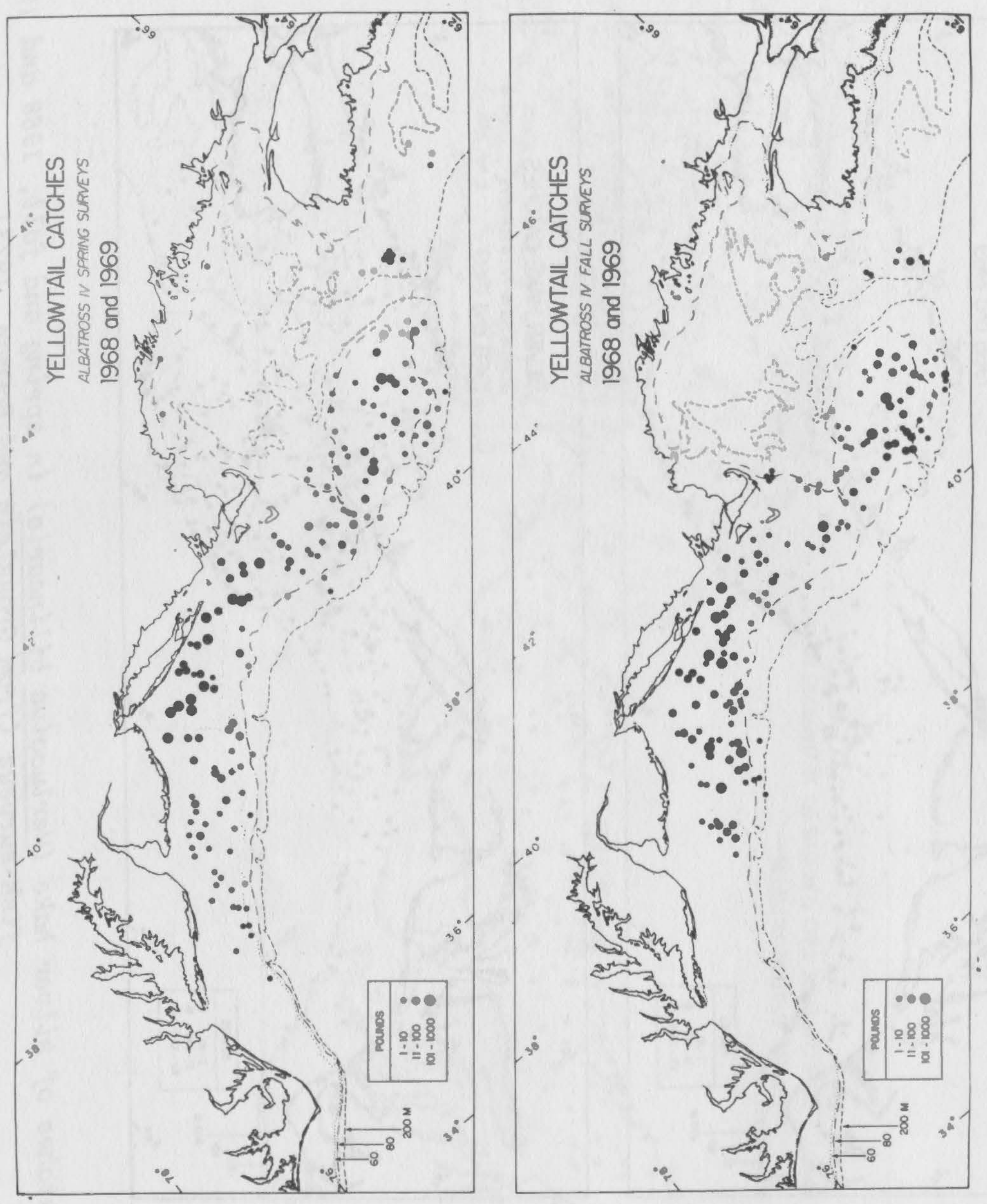

Figure 38. Catches of yellowtail flounder (Limanda ferruginea) in spring and fall, 1968 and 1969 ground fish surveys (from Grosslein and Bowman. 1973).

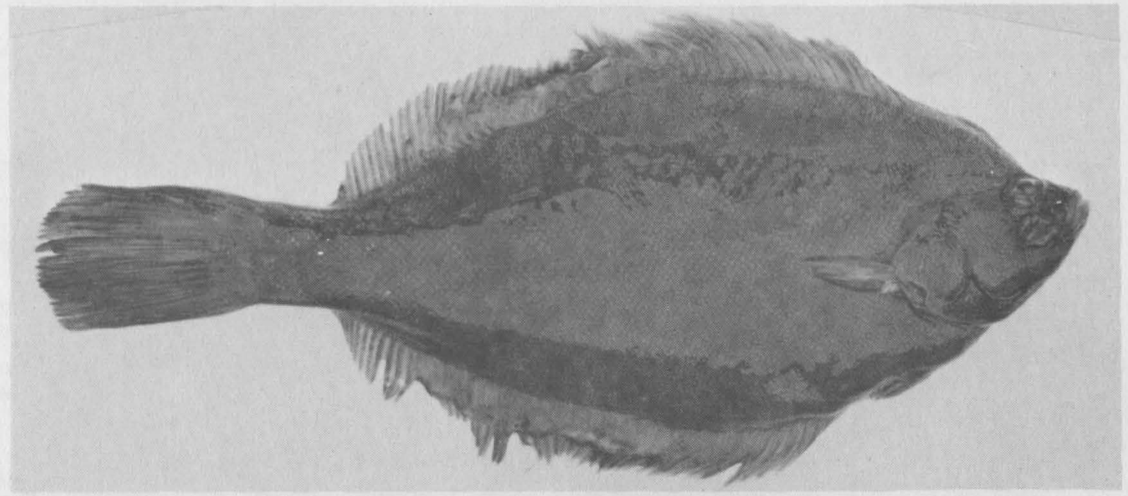

Figure 39. Winter flounder (Pseudopleuronectes americanus) exhibiting fin erosion of the dorsal and anal fins. Darkened areas are photographic artifact resulting from variations in reflected lights.

shown in Table 4, the proportion of diseased winter flounder was significantly greater (P<.01)* in the Apex during two consecutive spring seasons, and over all sampling times combined (Ziskowski and Murchelano, 1975).

Monthly trawl samples have been taken inshore from Sandy Hook and Raritan Bays, and Great Bay, New Jersey. A significantly higher incidence (P<.01) of fin rot in winter flounder is found in samples from the more polluted Sandy Hook-Raritan Bay (7.6%) than from Great Bay (1.9%). Table 5 illustrates the significantly greater incidence of fin rot in Sandy Hook and Raritan Bays during all seasons except summer (Ziskowski and Murchelano, 1975). Tables 4 and 5 portray a strong seasonal cycle in prevalence of fin rot. The disease is most prevalent in spring, before even inshore waters are subject to appreciable warming.

* The probability is less than one in 100 that the difference could be due to chance.

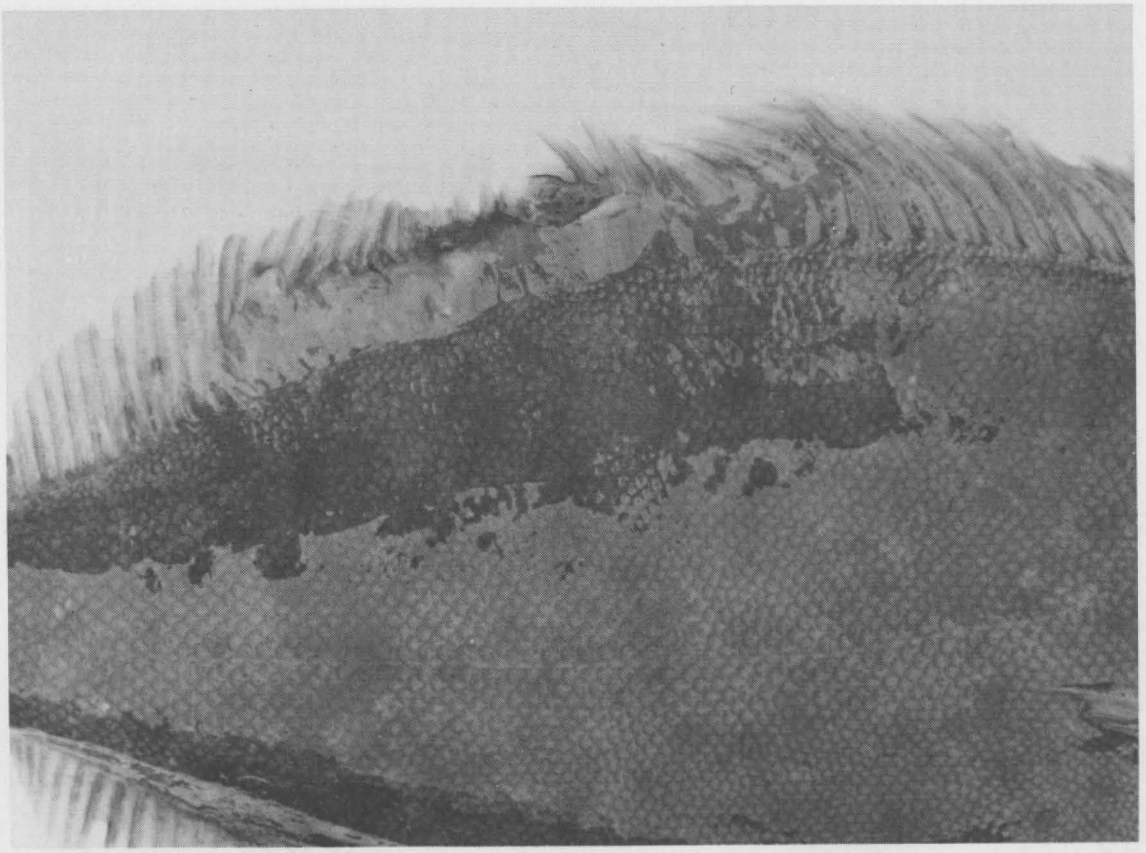

Figure 40. Enlargement of dorsal fin of fish in Figure 39 showing a distal erosion of fin tissue and disorganized arrangement of fin rays. Darkened area are photographic artifact resulting from variations in reflected light.

While the prevalence of fin rot in winter flounder is clearly greater in the inner areas of the New York Bight, its precise causes are still unknown. Recent work concluded that fin rot of winter flounder from Narragansett Bay, Rhode Island was caused by the bacterium Vibrio anguillarum (Levin, Wolke and Cabelli, 1972). Studies of several Pacific coast fishes having fin rot disease indicate that some species have evidence of microbial infection whereas others do not (Sherwood and Bendele, 1974). Extensive histological examinations of winter flounder from the Bight with fin rot failed to show any *in situ* bacteria.

Bacteria

It is well known that shellfish near the sewage sludge and dredge spoil dump sites contain unacceptably high concentrations of coliform bacteria (Buelow et al., 1968).

Table 4. Fin Rot in New York Bight Waters.

	1973			1974		
	Spring (May)	Summer (August)	Fall (October)	Winter (February)	Spring (April)	All
NEW YORK BIGHT APEX						
Number of Trawl Stations	43	23	44	26	26	163
Total Number of fish	1944	200	177	103	103	2632
Number of Diseased Fish	317(16.3%)*	14(7.0%)	15(8.4%)	4(3.9%)	2(10.1%)	371(14.1%)
OUTSIDE APEX						
Number of trawl stations	112	24	56	23	57	272
Total Number of Fish	1209	49	5	112	482	1857
Number of Diseased Fish	28(2.3%)	1(2.0%)	0	1(0.9%)	6(1.2%)	36(1.9%)

*Indicates that the percentage of diseased fish in the Apex is significantly greater ($P<0.01$) than that outside the Apex, as determined by the test for equality of percentages described by Sokal and Rohlf (1969, pp. 607-610).

A study of possible movements of bacteria from the sewage sludge dump site to Long Island beaches shows that all the beaches monitored had acceptable bacteriological water quality (U.S. EPA, 1974, a,b,c; and Graikoski et al., 1974). Analyses of beach waters from Long Island for pathogenic bacteria did not reveal contamination (Cabelli, personal communication).

A circular area with a 6 n mi (11 km) radius around the sewage sludge dump site was closed to shellfishing in 1970 by the Food and Drug Administration (FDA). In May 1974, FDA expanded this closure area west of a line from the circle to East Rockaway Inlet, New York, and north of a line from the circle to Belmar, New Jersey, because of bacterial contamination from ocean sewage outfalls and seaward flow from Lower Bay and other bays (Meyer, personal communication).

Table 5. Fin Rot in Coastal Waters

	1973 M,A,M	J,J,A	S,O,N	D,J,F	1974 M,A,M	All
SANDY HOOK and RARITAN BAYS						
Total Number of Fish	451	918	325	40	493	2227
Number of Diseased Fish	68(15.0%)*	24(2.6%)	19(5.8%)	4(10.0%)	55(11.1%)	370(7.6%)
GREAT BAY						
Total Number of Fish	480	14	65	210	195	964
Number of Diseased Fish	11(2.2%)	0	0	2(0.9%)	6(3.0%)	19(1.9%)

*Indicates that the percentage of diseased fish in Sandy Hook-Raritan Bay is significantly greater (P<0.01) than that in Great Bay, as determined by the test for equality of percentages described by Sokel and Rohlf (1969, pp. 607-610).

Increasing use of antibiotics has contributed to improvement of human health throughout the world during the past 30 years. Some of the pathogenic bacteria have developed strains which are becoming increasingly resistant to the antibiotics so that larger doses have to be used for treatment of disease. Resistance to toxic heavy metals also has developed in some bacteria. It has been found that this resistance, called the "R" factor, can be transmitted to different genera and species of bacteria. Coliform bacteria, ordinarily a harmless indicator of pollution (people are full of them), have been found not only to transmit the R factor, but to serve as a reservoir through which other bacteria, for example, *Salmonella*, will be resistant to antibiotics (Anderson, 1968; and Grabow et al., (1974). Coliform bacteria having resistance to heavy metals and a broad spectrum of antibiotics have been found in the New York Bight (Koditschek and Guyre, 1974). Their health hazard is unknown.

CHAPTER 6. ALTERNATIVE DUMP SITES

The Environmental Protection Agency, Region II, requested advice, comments and information on an alternative continental shelf sewage sludge dump site. The response, on 8 March 1974, proposed two areas for consideration. Amplification of comments and information relative to these two areas was provided at a public hearing on sewage sludge disposal called by New York State Assemblyman Peter A. Berle on 22 March 1974 (see Fig. 1).

Area 1-A lies northeast of the Hudson Shelf Valley. Its northern boundary is a line roughly parallel to and 25 n mi from the Long Island coast (this boundary is seaward of the 20-fm curve). Its southern boundary is a line roughly parallel to and 10 n mi north of the axis of the Hudson Shelf Valley; and its eastern boundary is described as an arc of a circle with a radius of 65 n mi, centered at the midpoint of the Sandy Hook, New Jersey-Rockaway Point, New York transect.

Area 2-A lies southwest of the Hudson Shelf Valley. Its northern boundary is a line roughly parallel to and 10 n mi south of the axis of the Hudson Shelf Valley. It western boundary is an approximation of the 20-fm curve; and its southern boundary is an arc of a circle with a radius of 65 n mi, centered at the midpoint of the Sandy Hook-Rockaway Point transect.

Selection of the two areas proposed was based upon three general criteria:

- The location should minimize the chance of contamination reaching shorelines and beaches,
- The location should minimize, to the extent possible, adverse effects upon living marine resources, and
- The location should be within 65 n mi of the harbor entrance.

Water circulation patterns, and interaction of the waters with bottom topography, along with biological considerations, were examined for these two areas.

The location of the Hudson Shelf Valley itself imposes some restrictions on locating an alternative dump site. The clockwise circulation gyre in the Inner Bight appears to have its western edge aligned with the Hudson Shelf Valley. There are indications of deposition and erosion, and transport both up and down the Shelf Valley. Additionally, the Shelf Valley area:

- Serves as a migration route for certain fishes and shellfish,
- Supports active fisheries, and
- Serves as a winter aggregation zone for some fishes.

No consideration was given to the area's winter no-fishing zone, and the over-wintering zone for several fishes defined by international bilateral agreements.* The areas most intensively fished for surf clams were also avoided in proposing the two areas. These areas are generally shoreward of the 20-fm contour along New Jersey and Long Island, with the greatest concentrations between the 10- and 20-fm contours.

Available evidence does not indicate any environmental advantages which might result from moving the sludge site. Temporary utilization of a new site is likely to result in more harm than good.

However, the increased quantity of sewage sludge to be dumped in the Bight over the next few years, requires that studies be made now to evaluate the potential environmental impact of a change in the dump site location should future conditions warrant.

The problem of what to do with the dredge spoil dump site remains. There is a potential hazard to navigation at the dredge spoil site because of the build-up of dredge spoils. In moving the dredge spoil dump site, consideration should be given to combining the sewage sludge and dredge spoil dump sites. Due to the toxic nature of many dredge spoils, there may be little benefit from moving only one of these two substantial sources of contamination in the Bight Apex. One or more new dredge spoil sites might be chosen from the already contaminated areas of the Bight.

* This area (see Fig. 1) is bounded by 37°50'N, 74°25'W at the SW corner, NE to 38°24'N, 73°44'W, thence NE to 39°40'N, 72°32'W, thence ENE to 40°05'N, 71°40'W, thence S to 39°50'N, 71°40'W, thence SW to the SE corner 37°50'N, 74°00'W.

CHAPTER 7. FINDINGS AND RECOMMENDATIONS

Findings

Some marine scientists (Bascom, 1974) suggest that the waste assimilation and oxidation capacities of the ocean should be used for waste disposal. Anaerobic basins provide a reducing environment into which many wastes may be satisfactorily discharged. Meanwhile, interim results from the present study include:

(1) Geological, chemical, and physical oceanographic studies indicate that water and sediments discharged to the existing sewage sludge dump site move northerly in a clockwise gyre. Much of the sludge is mixed with natural sediments in Christiaensen Basin and in the Hudson Shelf Valley. The amount of sludge that moves farther north to the vicinity of Long Island beaches is unknown; there is no evidence of massive shoreward movement.

(2) Available data show no net advantage to moving the sewage sludge dumping site to one of the two presently identified alternative sites 65 miles offshore for an interim period of uncertain duration. Further study is needed to determine whether one of these sites or a more distant one on or beyond the continental slope would be more acceptable for longer-term use.

(3) A 30-ft (10-m) mound of dredge spoil has accumulated over the 33-year period of operation at that disposal site. If this site is to be moved in order to avoid further shoaling, the Christiaensen Basin offers topographic advantages.

(4) The hazards of dumping sewage sludge and dredge spoils containing trace metals and other toxic wastes into the New York Bight are not known, although the higher than normal incidence of fin-rot disease of fish in the area indicates that something is wrong.

(5) Bacteriological effects of ocean dumping have resulted in closing the area around the sludge dumping site to shellfishing. There is concern that Long Island beaches are threatened by bacteriological contamination from sludge dumping. Additional study is needed to determine the probable level of contamination from dumping the larger future quantities of sludge at either present or alternative sites. These studies are underway, including assessment of resistance factors in coliform and pathogenic bacteria from the sludge. Meanwhile, there is no evidence of an imminent hazard to the beaches.

Recommendations

It is recommended that:

(1) Interim use of alternative dump sites be avoided,

(2) Expanded studies be made of alternatives to existing ocean dumping practices. Alternatives include:

(a) land disposal of materials presently dumped at sea,

(b) source control of toxic wastes necessary for safe ocean disposal at different locations or distances from shore, and

(c) processing necessary for pathogenically-safe sewage sludge disposal at different locations or distances from shore.

(3) Research on environmental impacts of ocean dumping and other activities of man in the New York Bight be continued with emphasis on the fates and effects of toxic materials, including trace metals, hydrocarbons, and pathogenic contaminants.

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Say It Isn't Sludge

aterials; others have come up clean.
ly suggests that these things are pop-
dom," Richard T. Dewling, head of the
nd analysis division of the regional
d. "There's no steady creep of sludge"
lled Dead Sea area, the main municipal
ing ground 10 miles off Long Island's
Dewling said.
re, Dewling said, the sludgelike par-
found could be "organic matter" from

Although the Nassau County Health Departmen
agreed there is no immediate health danger, the
county yesterday asked the EPA to relocate the exist
ing sewage dumping site 20 miles offshore "as a pre
cautionary measure" against any possible spread fror
the sludge area, according to Stan Juczak, director c
water pollution control for the county department.
However, the EPA, which regulates

Nowhere was the ho
acutely felt than at the
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much left the testing
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The head of the EP
M. Hansler, whose own
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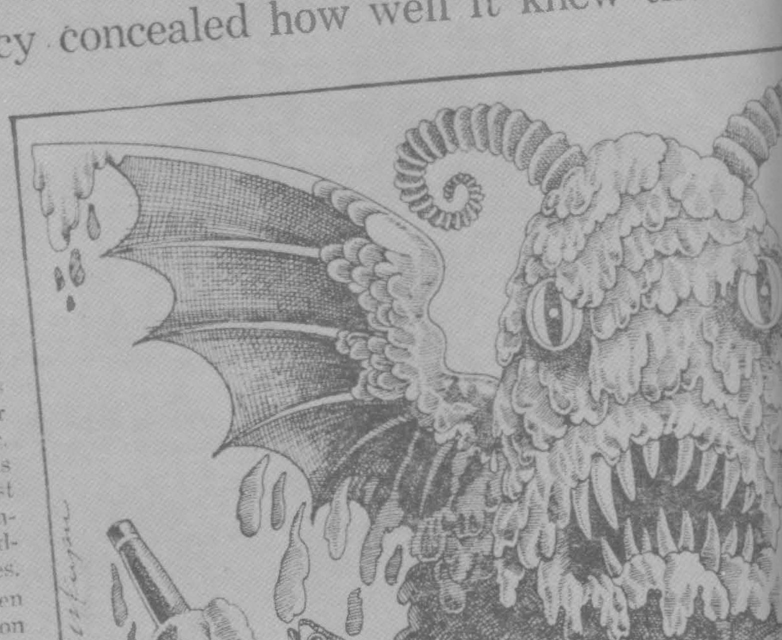
The Truth, Beneath a Pile O

In deciding to permit more sewage dumping in the ocean off Lon ronmental Protection Agency concealed how well it knew the dan

hardly knows how to assess the show put on at
al office of the federal Environmental Protection
on Feb. 11 in New York City.
e occasion should have been one of the utmost sig-
ce. The agency was holding a public hearing os-
ly to decide whether or not to renew, for another
nths, the permits necessary for a host of metropoli-
area municipalities to continue their practice of
ing sewage sludge into the ocean. Normally, this
of hearing would draw out about the same number
lks as an upper Westchester bubonic-plague clinic.
ever, late last year, the debate on the sludge beds
ered 12 miles southwest of the Long Island coast
denly mushroomed from under the mantle of govern-
t scientists, who had not been advertising their find-
, and onto the front page of the New York Times.
The debate among federal scientists had been
evidence that the 1.176 billion



[June 1976]

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OFFICE OF THE VICE PRESIDENT

WASHINGTON, D.C.

VICE PRESIDENT

Congressman Jack Wydler

(Courtesy of Roger Whyte)

[June 1976]

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FOR PALM A. F. FUGARO

[June 1976]

DURING LATE AFTERNOON OF 10 MAY 1976 A LARGE QUANTITY OF BLACK OIL BALLS RANGING IN SIZE FROM A PEA TO A GRAPEFRUIT, BEGAN WASHING UP ON ROCKAWAY BEACH, NEW YORK. THE COAST GUARD CAPTAIN OF THE PORT OF NEW YORK IMMEDIATELY COMMENCED A FEDERALLY FUNDED CLEAN UP OF THE AREA AND SIMULTANEOUSLY DIRECTED HELO OVERFLIGHT TO GET AN AERIAL SURVEY OF THE AREA.

TAR BALLS (BLACK OIL BALLS) CONTINUED TO BE WASHED UP ON THE BEACHES FROM RIIS PARK, ROCKAWAY BEACH TO BELLPORT BEACH, FIRE ISLAND. DUE TO EXTENSIVE AREA OF COVERAGE OF THESE TAR BALLS ESTIMATED IN CONCENTRATION OF ONE (1) GALLON PER 75 FT. TO ONE (1) GALLON PER 750 FT. THIS MYSTERY SPILL WAS CLASSIFIED AS A MEDIUM SPILL.

HELO OVERFLIGHTS PROVED INEFFECTIVE FROM AIR BECAUSE THE OUTER SKIN OF THE TAR BALLS WERE COVERED WITH SAND. APPROPRIATE FEDERAL, STATE AND LOCAL AGENCIES WERE NOTIFIED. THE COAST GUARD THEN COMMENCED WALKING THE ENTIRE BEACH AREA OF FIRE ISLAND AND ROCKAWAY.

MEANWHILE ALL SHIPS THAT HAD TRANSITED THE LONG ISLAND SHORE WERE BOARDED AND SAMPLES OF THEIR #6 OIL WERE SENT TO COAST GUARD R&D CENTER FOR ANALYSIS. DURING THIS ANALYSIS, THE COAST GUARD R&D CENTER IN GROTON, CONNECTICUT FOUND A MATCH OF THE TAR BALL SAMPLES TO A RECENT SPILL AND COMMENCED A SPILL FORECAST STUDY UTILIZING THE SPILL FORECAST MODEL DEVELOPED FOR NEW YORK HARBOR. THIS SHOWED AN EXTREMELY HIGH PROBABILITY THAT OIL ON THE WATER'S SURFACE IN NEW YORK HARBOR DEFINITELY CAN COME ASHORE ON THESE BEACH AREAS UNDER THE WINDS AND CURRENTS WHICH EXISTED AT THE TIME OF THIS INCIDENT.

CLEAN UP COMPLETED ON 28 MAY 1976 AT A COST OF APPROXIMATELY $150,000.

THE FEDERAL GOVERNMENT ~~IS PROCEEDING~~ INTENDS TO PROCEED TO RECOVER FEDERAL FUNDS AND TAKE CIVIL ACTION AGAINST THE ALLEGED SPILLER.

ON THE EVENING (2005Q) OF 2 JUNE 1976, COAST GUARD GROUP ROCKAWAY RECEIVED A REPORT OF AN EXPLOSION IN THE VICINITY OF EAST MEADOW ISLAND, LONG ISLAND, NEW YORK. WITHIN THIRTY MINUTES, TWO COAST GUARD PATROL BOATS WERE ON SCENE SEARCHING FOR PERSONS KNOWN TO BE ON BOARD A SMALL BOAT NEAR THE EXPLOSION. IT WAS LEARNED THAT A SEWAGE TREATMENT PLANT HAD EXPLODED. APPROXIMATELY ONE AND ONE HALF MILLION GALLONS OF TREATED SEWAGE FROM TWO HUGE HOLDING TANKS AT THE PLANT FLOWED INTO HOG ISLAND CHANNEL AS A RESULT OF THE EFFECTS OF THE EXPLOSION. THE CAPTAIN OF THE PORT OF NEW YORK HAD NOTIFIED THE NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION, THE NASSAU COUNTY DEPARTMENT OF PUBLIC HEALTH AND THE U. S. ENVIRONMENTAL PROTECTION AGENCY ALMOST IMMEDIATELY. AT 0034Q, MEMBERS OF THIRD COAST GUARD DISTRICT (MEP) BRANCH CONTACTED MR. PAUL ELLIOT OF THE U. S. E. P. A., REGION II, ENVIRONMENTAL EMERGENCY RESPONSE BRANCH TO DETERMINE THE IMPACT OF THE INCIDENT ON BOTH THE PUBLIC HEALTH AND THE ENVIRONMENT. MR. ELLIOT STATED THAT SINCE THE LOCAL PUBLIC HEALTH COMMISSIONER WAS REPORTEDLY ON SCENE, HE WOULD BE BEST ABLE TO ASSESS THE

THREAT TO THE PUBLIC HEALTH AND WELFARE. THE IMPACT ON THE ENVIRONMENT WAS NOT CONSIDERED TO BE ADVERSE BECAUSE THE MATERIAL IN THE RUPTURED TANKS HAD BEEN TREATED. IT WAS FELT THAT CONTAINMENT AND CLEANUP OF THE MATERIAL WAS NOT FEASIBLE BECAUSE MR. ELLIOT INDICATED THAT IT WOULD DISSOLVE IN THE WATER AND NOT FLOAT ON THE WATER. AT PRESENT, ALL PHYSICAL CONTAINMENT BARRIERS IN USE ARE DESIGNED TO BLOCK THE PASSAGE OF MATERIAL ON THE SURFACE LAYERS OF THE WATER.

THE QUESTION OF FEDERAL INVOLVEMENT WAS DISCUSSED AT THIS TIME. THE NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN INDICATES FEDERAL POLICY [40 CFR § 1510.21(A)] : "THE CONGRESS HAS DECLARED THAT IT IS THE POLICY OF THE UNITED STATES THAT THERE SHOULD BE NO DISCHARGE OF OIL OR HAZARDOUS SUBSTANCE INTO OR UPON THE NAVIGABLE WATERS OF THE UNITED STATES, ADJOINING SHORELINES, OR INTO OR UPON THE WATERS OF THE CONTIGUOUS ZONE (SECTION 311(B)(1) OF THE ACT)," AND FURTHER THAT THE: "PLAN IS TO PROVIDE A COORDINATED FEDERAL RESPONSE CAPABILITY AT THE SCENE OF AN UN-

PLANNED OR SUDDEN, AND USUALLY ACCIDENTAL, DISCHARGE OF OIL OR HAZARDOUS SUBSTANCE THAT POSE A THREAT TO THE PUBLIC HEALTH OR WELFARE".

HOWEVER, TREATED SEWAGE IS NOT INCLUDED ON THE EPA'S PROPOSED LIST OF HAZARDOUS SUBSTANCES AND IS NOT "OIL".

DURING THE DAYS WHICH FOLLOWED, A VARIETY OF FLOATABLE OBJECTS WERE OBSERVED IN THE WATERS ADJACENT TO THE SOUTH SHORE OF LONG ISLAND AND WERE WASHING ASHORE ON THE BEACHES IN SUCH UNUSUAL NUMBERS AS TO DRAW CONSIDERABLE ATTENTION AND CONTROVERSY. INITIALLY, IT WAS NOT THE TYPES OF ITEMS WHICH WERE SIGHTED THAT WAS NOTEWORTHY. IT WAS THE UNPRECEDENTED AMOUNTS PUZZLED LOCAL, STATE AND FEDERAL THINKING ON THIS PHENOMENON.

THE FOLLOWING IS A CHRONOLOGICAL BREAKDOWN OF THE COAST GUARD'S INVOLVEMENT IN THE DAYS WHICH ENSUED.

SEQUENCE OF COAST GUARD ACTIONS RELATIVE TO MATERIAL WASHING ASHORE ON LONG ISLAND BEACHES.

1. FROM 2130 ON 3 JUNE UNTIL 6 JUNE 1976, COAST GUARD UNITS FOUGHT AN EXTENSIVE PIER FIRE AT WEEHAWKEN, NEW JERSEY ON THE WEST BANK OF THE HUDSON RIVER.

2. FROM 1400 TO 2000 ON 11 JUNE, COAST GUARD UNITS FOUGHT A PIER FIRE AT 66TH STREET IN MANHATTAN, NEW YORK ON THE EAST BANK OF THE HUDSON RIVER.

3. ON 11 JUNE 1976, A COAST GUARD HELO FLIGHT OVER THE SEWAGE DUMP SITE REPORTED NO UNUSUAL OCCURRENCES.

4. ON THE AFTERNOON OF 14 JUNE, A COAST GUARD HELO FLIGHT PASSED OVER THE SEWAGE DUMP SITE TWICE AND ALSO REPORTED NO UNUSUAL OCCURRENCES.

5. AT 1200 ON MONDAY, 14 JUNE, COAST GUARD STATION FIRE ISLAND RECEIVED A CALL FROM MR. PAUL COMMESSO (MAINTENANCE FOREMAN FOR

TOWN OF BROOKHAVEN), REPORTING A TAR-LIKE SUBSTANCE ON THE BEACH OF DAVIS PARK, (SOUTHERN SHORE OF FIRE ISLAND, NEW YORK). AT 1245 OUR INVESTIGATORS DEPARTED FIRE ISLAND STATION (JUST EAST OF THE ROBERT MOSES CAUSEWAY) AND WERE ON SCENE AT 1330. THEY OBSERVED WHAT APPEARED TO BE INTERMITTENT TAR BALLS VARYING IN SIZE UP TO 4 INCHES IN DIAMETER MIXED WITH A VARIETY OF DEBRIS AT THE HIGH WATER LINE ON THE BEACHES FROM SUNKEN FOREST TO WATCH HILL. CLUMPS OF UNKNOWN MATERIAL HAVING THE APPEARANCE OF FECES WAS OBSERVED TO VARY FROM 1 TO 12 INCHES IN DIAMETER. WHILE THE INTERMITTENT TAR-LIKE BALLS ENDED AT WATCH HILL, THE FECAL-LIKE MATTER AND DEBRIS EXTENDED TO THE SMITH POINT BRIDGE. FIRE ISLAND STATION REQUESTED THAT A POLLUTION INVESTIGATOR FROM THE CAPTAIN OF THE PORT, NEW YORK BE DISPATCHED TO EVALUATE THE SITUATION.

6. ON TUESDAY, 15 JUNE AT 1410, A COAST GUARD POLLUTION INVESTIGATION TEAM JOINED THE NATIONAL PARK SERVICE POLICE TO OBSERVE THE BEACHES. NO TAR-LIKE BALLS WERE OBSERVED BETWEEN FIRE

ISLAND STATION AND BARRETT BEACH, ALTHOUGH MUCH DEBRIS, ESPECIALLY CHARRED WOOD, SEAWEED AND WHAT APPEARED TO BE UN-TREATED SEWAGE OCCURRED AT THE HIGH WATER LINE.

AT BARRETT BEACH MINOR CONCENTRATIONS OF TAR-LIKE BALLS UP TO 1 INCH IN DIAMETER WERE PRESENT. A SAMPLE TAKEN FROM THIS BEACH WAS ANALYZED AND WAS DETERMINED AS HAVING A MINIMAL PETROLEUM CONTENT.

AT DAVIS PARK (TO THE EAST OF BARRETT BEACH) A SLIGHTLY GREATER CONCENTRATION OF TAR-LIKE BALLS UP TO 2 INCHES IN DIAMETER WAS FOUND SCATTERED AMONGST THE DEBRIS. TWO SAMPLES OF THE TAR-LIKE BALLS WERE TAKEN. ONE CONTAINED NO PETROLEUM COMPONENT, WHILE THE SECOND ONE DID. THE TEAM CONTINUED EAST ALONG THE BEACH TO LONG COVE AND JUST BEYOND, WHERE NO OIL OR TAR-LIKE BALLS WERE FOUND. LARGE AMOUNTS OF DEBRIS WERE EVIDENT. IN VIEW OF THE EXTREMELY INTERMITTENT OCCURRENCE OF THE TAR-LIKE BALLS, IT WAS CONCLUDED THAT THERE WAS NOT SUFFICIENT OIL TO WARRANT A CLEAN UP UTILIZING THE OIL POLLUTION CONTINGENCY FUND FOR ACTIVITIES

UNDER SECTION 311 OF PL-92-500.

7. AT 0800 ON WEDNESDAY, 16 JUNE, A COAST GUARD VESSEL DEPARTED FOR ROUTINE SURVEILLANCE OF THE SEWAGE SLUDGE AND NEARBY DUMP SITES AND REPORTED NO UNUSUAL OCCURRENCES.

AN INVESTIGATION OF BEACH AREAS FROM JONES BEACH TO ROBERT MOSES BRIDGE AND DEMOCRAT POINT TO KISMET WAS UNDERTAKEN SEPARATELY BY TWO COAST GUARD STATIONS IN RESPONSE TO REPORTS OF ADDITIONAL DEBRIS WASHING ASHORE. RESULTS WERE THAT NO OIL OR DEBRIS WAS FOUND IN THE JONES BEACH AREA. NO OIL OR TAR-LIKE BALLS WERE FOUND FROM GILGO BEACH TO DEMOCRAT POINT, ALTHOUGH SLIGHT DEBRIS OCCURRED IN THE WEST AND PROGRESSIVELY INCREASED TO THE EAST.

8. ON THURSDAY MORNING (0900), 17 JUNE, A HELO OVERFLIGHT OF GILGO BEACH EAST TO AN AREA 3 MILES WEST OF MORICHES INLET WAS ACCOMPLISHED. WEATHER RESTRICTED FURTHER PATROL. NO OIL OR TAR BALLS WERE DISTINGUISHABLE FROM THE AIR AT THE SURF LINE TO 1/2 MILE OFFSHORE. DEBRIS WAS NOTED. THE PROBABILITY OF

SITING OIL OR TAR BALLS IN THE WATER WAS RATED AS EXCELLENT. SPOT CHECKS OF THE NORTH SHORE OF FIRE ISLAND REVEALED NEGATIVE POLLUTION. AT 1030 THE COMMANDING OFFICER OF GROUP ROCKAWAY JOINED OFFICIALS FROM THE TOWN OF BABYLON, ON SCENE, UPON THE CLOSING OF BEACHES FROM GILGO BEACH TO FIRE ISLAND INLET.

A MEETING WAS CALLED FOR THURSDAY, 17 JUNE BY THE MESA, NEW YORK BIGHT PROJECT GROUP OF THE NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION AT STONEY BROOK, LONG ISLAND, TO DISCUSS THE VARIOUS ASPECTS OF THIS PHENOMENON WITH THE ASSEMBLED AGENCIES AND TO COMPILE DATA, FINDINGS AND CONCLUSIONS INTO EXPLANATION OF WHAT HAD OCCURRED AND HOW IT HAD COME ABOUT. THE THIRD COAST GUARD DISTRICT MARINE ENVIRONMENTAL PROTECTION BRANCH ATTENDED AND PRESENTED SUCH INFORMATION AS HAD BEEN GATHERED BY THE COAST GUARD UNITS WHICH HAD BEEN INVOLVED WITH THIS MATTER. WHILE THE AMOUNT OF OIL INVOLVED DID NOT WARRANT COAST GUARD INVOLVEMENT, OUR EXPERTISE IN OTHER AREAS OF MARINE POLLUTION WAS OFFERED; SPECIFICALLY IN THE AREAS OF OCEAN DUMPING SURVEILLANCE,

VESSEL POLLUTION, AND THE MOVEMENT OF FLOATABLES FROM NEW YORK HARBOR AS INDICATED BY A MATHEMATICAL MODEL DEVELOPED FOR THE MOVEMENT OF OIL SPILLS (DEVELOPED BY OUR R&D CENTER IN GROTON, CONNECTICUT).

9. ON SUNDAY, 20 JUNE AT 1050, MR. EUGENE MORREALE, ASSISTANT SUPERINTENDENT, DEPARTMENT OF PUBLIC WORKS, DIVISION OF BEACHES, OF OYSTER BAY, REPORTED TO US THAT TOBAY BEACH WAS BEING CLOSED DUE TO "SEWAGE" ON THE BEACH. AT 1115, WE SENT A MAN FROM GROUP ROCKAWAY TO TOBAY BEACH, TRAVELLING ALONG THE SHORE LINE. DEBRIS FROM TOBAY BEACH WAS TAKEN TO FIRE ISLAND STATION FOR COMPARISON. THE RETURN TRIP ALONG THE SHORE INDICATED THAT THE BEACH WAS CLEAR TO THE WEST END OF JONES BEACH. SMALL AMOUNTS OF DEBRIS OCCURRED AT THE WEST END OF JONES BEACH. THE WATER HAD PATCHES OF BROWN FOAM AT THE SURF. A SAMPLE WAS TAKEN IN ANTICIPATION OF ANALYSIS BY THE TOWN OF HEMPSTEAD. NO OIL OR OILY SUBSTANCE WAS LOCATED.

10. ON TUESDAY, 22 JUNE, SEVERAL PIECES OF CHARRED WOOD WERE

OBTAINED FROM SEVERAL OF THE AFFECTED BEACHES IN THE EVENT THAT ANALYSIS COULD BE PERFORMED TO CONFIRM OR RULE OUT THEIR HAVING ORIGINATED FROM THE PIERS THAT BURNED EARLIER IN JUNE.

BEACHES FROM CEDAR BEACH TO OCEAN BEACH WERE OBSERVED BY COAST GUARD INVESTIGATORS IN A VEHICLE. NO WASTE MATERIAL WAS SIGHTED, ALTHOUGH SOME LITTER WAS PRESENT. SMALL SHRIMP-LIKE ANIMALS HAD BEEN WASHED UP ON ROBERT MOSES PARK AND EAST TO OCEAN BEACH.

AN OVERFLIGHT THAT AFTERNOON DISCLOSED CONCENTRATIONS OF DEBRIS NEAR EAST ROCKAWAY INLET AND MORICHES INLET.

11. ON WEDNESDAY, 23 JUNE, WE RECEIVED NUMEROUS CALLS REPORTING "SLUDGE" AND GARBAGE IN THE WATER AND ALONG THE BEACH IN BRIDGEHAMPTON AND SOUTHAMPTON. AT ABOUT 1300 AN OIL RESPONSE TEAM WAS DISPATCHED. THEY REPORTED THE WATER AS NOT HAVING DEBRIS, BUT THAT THE BEACH WAS LITTERED WITH SEWAGE RELATED DEBRIS, MATERIAL RESEMBLING HUMAN EXCREMENT AND GARBAGE OF ALL SORTS.

ON THE EVENING OF 23 JUNE, COAST GUARD AIR STATION BROOKLYN PROVIDED AN OVERFLIGHT OVER THE DUMP SITES AND THE BEACHES OF LONG ISLAND WITH EPA REPORTING NEGATIVE SIGHTINGS OF DEBRIS AND DISCOLORATION OF THE WATER.

SUBSEQUENT TO THE AFOREMENTIONED MEETING OF 17 JUNE ALL THE INFORMATION MENTIONED ABOVE HAS BEEN PASSED TO EPA, REGION II WHICH HAS ASSUMED LEAD ROLE FOR U. S. GOVERNMENT AGENCIES IN COORDINATING AND CORRELATION of THIS INFORMATION.

5. STORM-WATER RUNOFF AND OVERFLOWS

7) need Humphrey up to get it done

Too

1 day - - 50

500
12
10
5
6

$10,000

1) sewage out Hudson — raritan estuary

2) Oil spill in N. J. Waters

3) sludge dumping area floatables from N.J. and municipalities

4) illegal discharges from ships offshore

5) overplaying — scared

monthly long period of sea winds and currents

6. need water quality
A) [illegible]
B) [illegible]
C) Humphrey

[June 1976]

President Ford today directed Secretary of Labor to make available Federal job corp personnel from the immediate area to assist in the cleanup of Long Island beaches.

These beaches have been closed because of a ~~serious~~ series of circumstances still being investigated which include an oil spill, illeguale discharges from ships from offshore, storm water runoff and some unusual wind and ocean current condistions which have moved sewage and sludge ~~and storm water runoff~~ from normal patterns on to some 70 miles of long island southern coast.

The President also directed the Evironmental Pdotection Agency, the Coast Guard and other appropriate Federal agencies to intensify their efforts to monitor the problem, ascertain its source, and make recommendations to prevent reoccurences.

The President asked the Domestic Council to oversee these efforts and to assure that they are carried out in full coordination with the efforts of New York Sate and the effected local communities.

Shut-line -
736-4700

1½ each

5:15
6:15
7:15

516
223-1616

Stephen
~~850-8363~~ Wzmmm
654-46
427-8780

Rhodes -
614
466-8282

Henry Mund
519 -
472-8505

De
354-7327
Mar
879-9666
489-

[June 1976]

President Ford today directed Secretary of Labor to make available Federal job corp personnell from the immediate area to assist in the cleanup of Long Island beaches.

These beaches have been closed because of a ~~serious~~ series of circumstances still being investigated which include an oil spill, illeguale discharges from ships offshore, and from some unusual wind and ocean current condistions which have moved sewage, storm water runoff, and sludge ~~and storm water runoff~~ from normal patterns on to some 70 miles of long island southern coast.

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The President asked the Domestic Council to oversee these efforts and to assure that they are carried out in full coordination with the efforts of New York Sate and the effected local communities.

(516)
223-1616

Environment [June 1976]

Rosenbaum

(518) 439-0398

President Ford today directed James M. Cannon, Assistant to the President for Domestic Affairs, to review personally the damage to the Long Island, New York, beaches and to determine what appropriate Federal action can be taken to assist the State and local governments to remedy the problem.

The President, noting the potentially adverse economic and health impact, is directing the appropriate Federal agencies to assist State and local officials under existing statutory authority. Mr. Cannon, along with other White House staff members and Federal officials, will tour the affected area on Friday, June 25.

SAL SCOTTO

Problems regarding:

Gowanus Canal

Brooklyn Waterfront Navy Yard

The VP promised him you would call him from Nassau upon your arrival and that you would arrange to meet with him.

j

THE WHITE HOUSE

WASHINGTON

June 24, 1976

MEMORANDUM TO THE VICE PRESIDENT

FROM: GEORGE W. HUMPHREYS

SUBJECT: Long Island Beaches

Raw sewage, garbage, sludge and other debris has washed along a 70 mile stretch of beaches -- from Atlantic Beach at the Queens-Nassau border to just east of Southhampton.

The source of the material is not known. The most plausible theory suggests that several factors have combined to create this unique condition. There was a blow-up at a sewage treatment plant two weeks ago on the South Shore and raw sewage was pumped into the bay. Heavy rains on the island have added to the normal run-off problem, in addition to creating over-flow conditions at the treatment plants. Passing ships discharge oil, sewage and garbage into the ocean. A major oil spill was sighted about ten days ago that could contribute to the problem. New York City is still discharging raw sewage into the Hudson and the New York Harbor.

Most importantly, the winds and currents off the island have been flowing contrary to the normal patterns, thus washing the floatables to shore rather than out to sea as in normal conditions. It would appear that the real solution to the problem would be a shift in the winds and currents to take the garbage out to sea. So long as the climatic conditions remain the same, the problem could presist.

It has been suggested that New York City's sludge dumping area -- a site 12 miles out in the ocean -- could be a source of some of the material but there is no evidence as yet to substantiate this..

The beaches were closed on the advice of the County health authorities based more on the concern for potential health problems than on sample data. In fact, the coliform count of the off-shore water indicate the waters are now swimmable. Obviously, the waste materials and fecal matter in the water and on the beaches makes swimming an unattractive option.

Governor Carey has announced his intention to seek Federal aid on the basis of declaring the island a disaster area. I am told that the circumstances do not meet the normal criteria for such relief, and such designation is not likely. The State Department of Environmental Conservation has been assigned the lead responsibility for coordinating state and local activities.

The Federal involvement to date has been:

1. National Park Service has cleared up its own beach area -- 16 miles in length -- on two separate occasions.

2. EPA has stepped up its monitoring efforts to keep track of any water quality changes and is mounting a major effort to determine the actual source or sources of the material.

3. The Regional Director of EPA has called a meeting with the Federal, State and local agencies and the two County Executives to discuss a coordinated effort to clean up the area.

The stance of the Federal agencies to date has been that the State, and County, and local governments have the responsibility to clean up.

The Coast Guard is limited by law to clean up only oil spills and hazardous materials (such as toxic chemicals). The Coast Guard contends that it does not have the authority to clean the area. The Corps of Engineers is limited to cleaning up navigable waters (piers, shipwrecks). EPA has no resources in personnel, material or money to clean up.

POSSIBLE FEDERAL HELP

In addition to determining the sources of the waste, and then taking corrective action, we could aid in the clean up if it appears appropriate that we do so.

There is a Federal Job Corps Camp in the area that has 100 young people currently learning some job skills. The Labor Department could make these people available with a day and a half notice. Supervisory personnel, along with some tools, could be obtained from the Park Service and the Coast Guard. This would be a strong, visible presence and could serve well to demonstrate our concern.

We have not discussed this possibility with any of the people on the scene. I would recommend we find out the results of today's meeting, particularly as it pertains to the technical problems of cleaning the area, before we offer any <u>specific</u> help other than what we are doing so far.

Bkrg Pech City -
Rohatyn .. Fed guarantee

Brooklyn -

Committee on D.C.
to work with depts &
agencies — as
re: matters:
Political input to continue
Budget import.

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES
DIVISION OF PUBLIC HEALTH
HAUPPAUGE, NEW YORK

TO: Mary C. McLaughlin, M.D.
Commissioner of Health Services

David Harris, M.D.
Deputy Commissioner of Health Services

FROM: Mahfouz H. Zaki, M.D.
Director of Public Health

DATE: June 24, 1976

SUBJECT: POLLUTION ON FIRE ISLAND AND OTHER BEACHES

A BACKGROUND AND UPDATE

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* On Monday, June 14, 1976, late in the afternoon the Water Quality Unit received a call from the National Seashore stating that sludge-like and other material had been deposited on shore around Davis Park and other areas. Samples of water collected by the Town of Brookhaven from Davis Park were sent to the Public Health Laboratory.

* On Tuesday, June 15, 1976, the Water Quality Unit staff inspected the Fire Island seashore. Inspection revealed that the following items were deposited on shore in several areas of Fire Island:

  1. Thousands of sludge or tarry grease-like balls varying in size from a golf ball to a tennis ball.

  2. Thousands of personal hygiene items (tampons and condoms).

  3. Pieces of burnt wood.

  4. Plastic ends of cigars.

  5. Egg cartons and other miscellaneous garbage items.

* The Director of Public Health accompanied by staff of the Water Quality Unit made another inspection of a 12-mile strip on the Fire Island seashore during the evening of the same day which confirmed the previous findings.

* The operators of the various beaches were informed of these findings and asked to prohibit swimming at these beaches. All were cooperative and complied with our recommendations. As a matter fact, some of them closed the beaches on their own.

* Samples of water and deposited material were collected and sent to the Public Health Laboratory for examination.

* The Director of Public Health has been in contact with the following agencies and personnel:

Town of Islip	Mr. Frank R. Jones Deputy Supervisor
Town of Brookhaven	Mr. John F. Randolph Supervisor
Town of Babylon	Mr. Thomas F. Fallon Supervisor
U.S. Coast Guard	Lt. Commander Joseph Marotta
U.S. National Seashore	Mr. Richard Marks Superintendent
	Mr. William Schenk Chief Ranger
Suffolk County Department of Parks	Mr. John D. Chester Commissioner
L.I. State Parks Commission	Mr. John Sheridan General Manager
The Environmental Protection Agency Laboratory, Edison, New Jersey	Mr. Francis Brezenski Chief, Technical Support Branch
	Mr. Robert Cibuliski Laboratory

* Examination of the water samples collected from the various beaches indicated that:

1. In most beaches the total coliforms, although relatively higher than what would normally be expected of ocean beaches, were within the recommended standards included in Part 6 of the State Sanitary Code.

2. The total and fecal coliforms were high in the Captree area (430 and 430 per 100 ml. respectively).

3. Several samples from the Davis Park area indicated fecal streptococci in excess of 2,000 per 100 ml.

* Based on these findings, the Department indicated to the beach operators that the water was bacteriologically safe for swimming and that all beaches could be opened with the exception of the Captree area (which is actually a fishing area and not a beach) and Davis Park. It was also indicated that the use of the beaches is contingent on the thorough cleaning of the beach areas. In this respect, I would like to advise that all operators agreed to clean their individual beaches. There is a small problem here. Who is going to clean the parts of the seashore which are not considered beaches?

* On Thursday, June 17, 1976, a meeting was held at the request of the National Oceanic and Atmospheric Administration in Stony Brook and was attended by several agencies including the Health Departments of Nassau and Suffolk Counties and the City of New York, the N.Y.S. Department of Environmental Conservation, the Environmental Protection Agency, the U.S. Coast Guard, the Suffolk County Department of Parks and the Fire Island National Seashore.

  The participants spent two hours describing what they had actually seen, instead of trying to identify the nature of the deposited material and its source. The staff of NOAA and EPA took a defensive position, trying to dissociate this incident with the dumping site and stated that the deposited material had no fecal component. Unfortunately, at that time the results of microbiological examinations of the sludge-like material were not available.

* On Friday, June 18, 1976, in the afternoon the Director of Public Health received a call from the EPA Laboratory in Edison, New Jersey to report on the results of examination of two of the sludge or tar-like balls.

  Sample I - from Ocean Beach

Total Coliforms	>22,000,000/gm.
Fecal Coliforms	7,900,000/gm.

  Sample II - from Davis Park

Total Coliforms	>24,000,000/gm.
Fecal Coliforms	3,480,000/gm.

  Other samples showed coliform counts in the hundred thousand figures.

* The samples of the sludge-like material examined by our laboratory showed:

Total Coliforms	>240,000,000/gm.
Fecal Coliforms	24,000,000/gm.

  Laboratory examination of the sludge-like balls by the State Department of Environmental Conservation in Stony Brook indicated:

Total Coliforms	>2,400,000/gm.
Fecal Coliforms	240,000/gm.

* The Water Quality Unit was on duty all weekend. Beaches were inspected and samples collected and delivered to the Public Health Laboratory.

* The Director was informed Saturday, late in the afternoon and in the evening, of the deposition of new material on some beaches. The new material consisted mostly of smaller balls and numerous seeds and pits. The operators of many of these beaches called the Director informing him of their voluntary closings.

* On Sunday, June 20, 1976, the Director of Public Health held a meeting with the engineering staff and the Water Quality Unit to discuss Saturday's findings and further action to be taken. The Director has been in contact with the town supervisors and all other involved agencies.

* Samples collected by the Water Quality Unit staff were sent to the following laboratories for examination:

    1. The Public Health Laboratory of Suffolk County.
    2. The Nassau County Laboratory.
    3. The New York State Department of Health Laboratory.
    4. The Water Hygiene Laboratory, EPA, Narragansett, Rhode Island.

* On Monday, June 21, 1976, the Department of Health Services held a meeting in Hauppauge to discuss the situation in light of recent developments. The meeting was attended by:

Office of the County Executive	Honorable John V.N. Klein County Executive
Legislator	Mr. Richard G. Lambert District 11
Town of Babylon	Mr. Patrick Halpin Assist. to Supervisor
	Mr. Vincent Manna Director, Dept. of Recreation
Town of Brookhaven	Mr. William Katz
Town of Islip	Mr. Frank Jones Deputy Supervisor

Town of Islip	Dr. Barry Andres Mr. Alan Pompanio Mr. James Crowley
Fire Island National Seashore	Mr. Richard Marks Superintendent
N.Y.S. Department of Environmental Conservation	Mr. James Redman
MESA NY Bight Project	Mr. Hal Stanford
L.I. State Parks Commission	Mr. Francis A. Hyland
Nassau County Department of Health	Mr. Francis V. Padan
S.C. Dept. of Parks	Mr. John D. Chester Commissioner
S.C. Dept. of Environmental Control	Dr. Robert Nuzzi
S.C. Dept. of Health Services	Dr. Mary C. McLaughlin Commissioner
	Dr. David Harris Deputy Commissioner
	Dr. Mahfouz H. Zaki Director of Public Health
	Mr. Herbert Davids Mr. Paul Ponturo Mr. Dave Wirenius Mr. Keith R. Jensen Mr. Dennis Moran Mr. Alan Reiman

Most of the participants, including the representative from MESA Bight Project, admitted - contrary to previous statements - that the deposited balls may have a sludge component. The point emphasized by the Department was that irrespective of the nature of the deposited material it had extremely high total and fecal coliform counts which are indicative of fecal contamination.

The participants agreed that the problem was so extensive and could not be handled at the local level and that federal assistance from the Environmental Protection Agency should be sought. County Executive Klein stated that he would contact the Regional Office of EPA in New York for this purpose.

June 24, 1976

Representatives of the U.S. Coast Guard, U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration/ MESA, and the National Park Service, Fire Island National Seashore met this morning at the offices of the National Oceanic and Atmospheric Administration at the State University of New York to discuss the Long Island beach problem.

The group assessed available data and information, and compiled a listing of probable and possible sources of the debris that has fouled regional beaches. Also discussed were efforts and plans aimed at solving the current problem, and preventing similar incidents in the future.

Res': immediate -

Long Term -

Sources: Wayne Sonn · Raw Sewage

North Am. 79-80 — 4 years —

funds 75% Feds 1/2 to city
1/2 to state

Dead Hook - 5-6 years finished

c/r B fo for sludge disposal

6/24/76

PRELIMINARY WORK SHEET ON WASTE MATERIALS ON THE BEACH

	Grease*	Raw Fecal Material	Fecal Coliform*	Charred Wood	Oil and Tar-Like Material*	Plastic, Rubber and General Trash	Garbage and Related Materials
Probable/ Major Sources	Bay Park Sewage Sludge Storage Tanks - - - - - - - Effluent Outflow pipes - - - - - - - - Outflow from Hudson/Raritan Estuarine System	Not documented	Bay Park Sewage Sludge Storage Tanks - - - - - - - - Outflow from Hudson/Raritan Estuarine System - - - - - - - - Effluent Outflow Pipes	Weehawken Pier Fires 3-6 June - - - - - - - Manhattan Pier Fires 11 June	Spills offshore and nearshore - - - - - - - - Offshore Bilge Pumping	Bay Park Sewage Sludge Storage Tanks Outflow from Hudson/Raritan Estuarine Systems	New York City Solid Waste Barging Operations - - - - - - - Ships Offshore
Possible/ Minor Sources	Sewage Sludge Dumpsite - - - - - - - Combined Storm Sewer Overflows - - - - - - - Outflow from Bays and Estuaries - - - - - - - Ships and Boats	Animal Deposition	Combined Storm Sewer Overflows - - - - - - - - Sewage Sludge Dumpsite - - - - - - - - Outflow from Bays and Estuaries - - - - - - - - Ships and Boats	Beach Fires	Outflow from Hudson/Raritan Estuarine System - - - - - - - - Effluent Outflow Pipes - - - - - - - - Bay Park Sewage Sludge Storage Tanks - - - - - - - - Sewage Sludge Dumpsite	Solid Waste Disposal - - - - - - - Beach Litter - - - - - - - Ships Offshore - - - - - - - Sewage Sludge Dumpsite	Beach Litter - - - - - - - Outflow from Hudson/Raritan Estuarine System - - - - - - - - Near-water Sanitary Landfill/Transport Operations - - - - - - - - Food Processing Plants - - - - - - - - Other

*Waste Ball Components

Chart Compiled by:
U. S. Environmental Protection Agency
U. S. Coast Guard
National Park Service,
Fire Island National Seashore
National Oceanic and Atmospheric Administration/MESA

June 24, 1976

Federal, State and Local Agencies Participating

U. S. Coast Guard
U. S. Environmental Protection Agency
National Oceanic and Atmospheric Administration/MESA
U. S. Army Corps of Engineers
National Park Service, Fire Island National Seashore

New York State Department of Environmental Conservation
New York State Department of Parks and Recreation

Nassau County Department of Health
Nassau County Department of Public Works
Suffolk County Department of Environmental Control
Suffolk County Department of Health Services
Suffolk County Department of Parks, Recreation and Conservation
New York City Department of Water Resources
Town of Hempstead
Town of Islip
Town of Babylon
Town of Brookhaven

William Harris
Anthony Cok
Brookhaven National Laboratories
State University of New York/Marine Sciences Research Center

[6/24/76]

Newsday

THE LONG ISLAND NEWSPAPER • NASSAU EDITION

15 CENTS
THURSDAY
JUNE 24, 1976

Carey Declares LI Shore Disaster Area, Asks Aid

Newsday Photo by Walter del Toro

Math Locates Suspect: City

Beach Closing Spreads East

'Sea' of Sludge May Be Source

Hempstead Supervisor Alfonse D'Amato tells reporters yesterday that he believes 85 per cent of debris and garbage on Long Island beaches comes from Manhattan and New Jersey. The New York Harbor and the "Dead Sea" Atlantic Ocean sludge dump were identified by a number of agencies as sources of the filth.

Stories on Pages 4-5

Nadjari's Days Dwindle Down

Page 3

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