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Supplement To Final Environmental Impact Statement

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Final Designation Georgetown Ocean Dredged Material Disposal Site

DRAFT SUPPLEMENT TO FINAL

ENVIRONMENTAL IMPACT STATEMENT

FINAL DESIGNATION GEORGETOWN OCEAN DREDGED MATERIAL DISPOSAL SITE

Prepared by

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SUMMARY

This supplement to the Final EIS for Savannah, Ga., Charleston, S.C., and Wilmington, N.C. Ocean Dredged Material Disposal Site Designation (ODMDS) considers permanent designation of a similar site for the Georgetown Harbor area, which lies within the South Atlantic Bight region described in the Final EIS.

The Port of Georgetown, although considerably smaller than Charleston in terms of shipping commerce, contributes to the overall economy of the State. For over 30 years, the Charleston District, Corps of Engineers, has dredged material from the Georgetown Harbor entrance channel and deposited the material on nearby, predominantly sandy substrate. The impacts of harbor maintenance were discussed in the Corps' March 1976 Final EIS for Georgetown Harbor. Since 1977 the currently used Georgetown ODMDS has been designated by EPA as an interim site, pending study and final designation in accordance with the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA). In October 1983, EPA filed a Final EIS for the permanent designation of Savannah, Ga., Charleston, S.C., and Wilmington, N.C., ODMDS's. Originally, as recorded in the 9 December 1980 Federal Register (Vol. 45, No. 238), the Georgetown ODMDS was to have been part of this multiple-site designation, and the studies that supported the designation EIS covered, both geographically and topically, the portion of the South Atlantic Bight in which the Georgetown ODMDS is located.

The maps, descriptions, and explanations that appear in the Final EIS for Savannah, Charleston, and Wilmington ODMDS's and the site-specific evaluation of the Georgetown ODMDS (summarized in Chapter 3) show that the rationale used to reject mid-shelf and shelf break alternative sites for Savannah, Charleston and Wilmington also apply to Georgetown. Upland disposal of material is not feasible because of the excessive pumping costs and because all of the land near the entrance channel is part of the Thomas Yawkey Foundation or the Belle W. Baruch Foundation holdings which are managed for wildlife preservation, and research.

The designation of a nearshore Georgetown ODMDS other than the existing site is possible but was rejected because of the following reasons:

(1) Previous use of the existing ocean site has failed to cause any problems such as mounding, significant alteration of substrate or benthic communities or water quality degradation.

(2) Arbitrary selection of another nearby site might result in unforseen problems not encountered at the existing site.

(3) There are no plans in the forseeable future to ocean dump materials different than those now being deposited in the Georgetown ODMDS.

(4) Permanent designation of the interim site based on current and planned uses would in no manner imply that all material dredged in the future could be dumped at this location. A separate analysis of each type of dredged material, the quantity proposed for disposal, and the compatibility of the material with the ODMDS would be required. If a newly proposed material does not satisfy the criteria established pursuant to Section 102(a) of the MPRSA, it can not be dumped at the designated site.

(5) The interim (existing) site is relatively close to the entrance channel. Relocation of the site even three of four miles away would greatly increase hauling and operating costs.

The affected environment of the nearshore waters around Winyah Bay includes the existing ODMDS and the shallow (less than 20m) area seaward to the mid-shelf region, 10 nautical miles from shore. Nearshore waters are greatly influenced by the large discharges through Winyah Bay, salt marshes, and the North Santee River; by strong tidal action, which alters longshore currents; and by seasonal weather patterns. Sediments in and around the existing ODMDS are medium to coarse sands with little (<1%) silt and clay. No hard bottom areas have been found in or near the existing ODMDS; however, the nearshore of South Carolina is typically variable and hardbottom sites may exist elsewhere. Several commercially important finfish and shellfish species migrate through nearshore areas to adjacent coastal areas. Two endangered marine species, the short-nosed sturgeon and the loggerhead turtle are known to be present along this section of the coast at certain times of the year. Suspension feeders dominate the benthic infauna. Pelecypods, polychaetes, amphipods, and bryozoans are the most numerous; polychaetes are the most diverse taxonomic group.

Short summaries of the mid-shelf, shelf break, inland waters, and uplands that were briefly considered as alternatives appear in Chapters II and III. Because these sites were rejected early for economic and environmental reasons, the summaries are not repeated here.

Consequences of the proposed action (designation of the existing ODMDS) are limited mainly to smothering of aquatic organisms by burial and temporary increases in turbidity. Detailed examination of the ODMDS after repeated use shows no significant adverse long-term effects due to mounding or changes in water quality, substrate type, or benthic communities.

Hauling dredged material to mid-shelf, shelf break, inshore waters ("of the U.S.") or upland sites would increase costs by about $157,000 per mile (round trip). Environmental impacts of ocean dumping at mid-shelf and shelf break areas could be greater than at the existing ODMDS because the substrate, water quality, and benthic organisms at the offshore sites would be different and less compatible with heavy suspended sediment loads. The impacts of disposal in Winyah Bay, nearby wetlands, or uplands now managed for wildlife preservation and research are not acceptable.

Dumping material at nearshore sites, even a few miles away from the entrance channel, would greatly increase costs. For much of the nearshore area, environmental consequences would probably be similar to those at the existing ODMDS, but they would be greater at certain landward locations and could be greater at some less well studied sites.

EPA knows of no controversies or outstanding issues with this proposal. There is no reason to incur the additional costs of hauling dredged material to more distant sites where the environmental impacts may be greater or are less well understood. If, at some later date, materials not suitable for disposal at the existing ODMDS are proposed for dumping, disposal of this material may be denied, the ODMDS may be moved, or a new ODMDS may be designated.

I. Purpose and Need

This document presents the environmental evaluation of alternatives for permanent designation of an ocean dredged material disposal site for Georgetown, South Carolina. The Marine Protection, Research and Sanctuaries Act (MPRSA) authorizes EPA to designate a permanent disposal site when a need has been established and an environmentally suitable site is available. Section 102(a) of this act requires EPA to establish criteria for the ocean dump sites and for material which can be disposed at these sites. These criteria are presented in EPA's Final 1977 Ocean Dumping Regulations (40 CFR, Part 227, Subpart C).

Pages 1-5 through 1-19 of the Final EIS for Savannah, Charleston, and Wilmington ODMDS designations contain a thorough discussion of the Marine Protection, Research, and Sanctuaries Act, a history of the Act's implementation, including regulations, establishment of dumping and designation criteria, and international considerations. That discussion is incorporated by reference rather than repeated here.

On the average, over 500,000 tons of commerce are shipped in deep draft vessels through the Georgetown Harbor entrance channel each year. The Port of Georgetown is essential to the continued operation of the biggest industries in the Georgetown area, Georgetown Steel and International Paper Companies. Other items, such as hardwood lumber, are shipped through the port and contribute to the economy of the larger S.C.- N.C. region. The significance of the port to the local economy was detailed in a March 1979 "Georgetown Navigation Project Study," prepared by Enviroplan, Inc., for the South Carolina State Ports Authority. The per capita income for Georgetown County is among the lowest and the unemployment rate is the highest in South Carolina, a state that routinely ranks near the lowest and near the median, respectively, in the country for these two statistics.

The Georgetown Harbor entrance channel is maintained at 27 feet, a depth that limits navigation to relatively small ocean-going vessels. In order to maintain the benefits attributed to navigation, dredging in the entrance channel is necessary, on the average, once per year, and an average of 450,000 cubic yards is removed during each dredging effort.

II. Alternatives (including the proposed action)

The proposed action is the designation of the existing ocean dredged material disposal site (ODMDS) for Georgetown Harbor. This rectangular shaped site covers approximately one square mile and lies three miles off the entrance to Winyah Bay on the south side of the channel, in 20 - 36 feet of water (MLW). In order to understand the significance of the proposed action and the range of alternatives to this action, one must be aware that the Marine Protection, Research, and Sanctuaries Act (MPRSA) requires two separate procedures to be followed before material can be dumped at an ocean site. The first is a designation of the site to be used, based upon its environmental suitability as a dump site. The suitability is determined by application of criteria developed pursuant to Section 102(a) of the Act. The designation may include restrictions as to the time and type of material to be dumped, if necessary to protect critical areas. The second procedure following the site designation is the process described in Section 103(b) of MPRSA which is an evaluation of a proposed harbor dredging project. Assessments are then made of the particular types and quantities of materials to be dumped, the compatibility of the materials with the substrate and biota at the ocean disposal site, and the impacts of the proposed disposal on "human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities." The site designation proposed in this Supplement will in no manner permit the disposal of any and all materials at the site without the second assessment procedure.

Alternatives to the proposed action are:

(1) Designation of an ODMDS considerably farther from shore (mid-shelf or shelf break region) than the existing site.

(2) Designation of another ODMDS in the same general area as the existing ODMDS.

(3) Not designating any ODMDS for Georgetown. Options then available to the Corps of Engineers and any other potential ODMDS user would be:

(a) Dispose of materials at an upland site.

(b) Dispose of materials in "waters of the U.S." (regulated by Section 404 of the Clean Water Act).

(c) Stop dredging (no disposal site required).

(d) An agency or individual proposing ocean disposal might, itself, seek designation of an ODMDS, rather than use an ODMDS recommended by EPA. In this case, the range of ocean dump sites would be the same as that available to EPA, and this option is not further discussed here.

Designation of an ODMDS in the Mid-shelf or Shelf-break Region

Mid-shelf and shelf-break alternatives were considered in pages 2-11 through 2-33 of the Final EIS for Savannah, Charleston, and Wilmington ODMDS designation, which has been incorporated into this Supplement by reference. In the Final EIS, the mid-shelf and shelf-break regions were broadly characterized, and the Georgetown offshore area lies within the portion of the South Atlantic Bight (SAB) so characterized. With the exception of a few parargraphs dealing specifically with Charleston, Savannah, or Wilmington, the broad descriptions apply equally well to Georgetown. Figures 4,5,9-11, and 17-19 in Chapter 3 of this Supplement are reproduced from the Final EIS.

The Final EIS described the mid-shelf and shelf break regions as follows:

> "The mid-shelf extends from approximately 10 to 50 nautical miles from shore. In general, bottom depths on the shelf increase gradually from 20 to 60 m, with an average slope of 36 cm/km. The shelf-break occurs at depths of 50 to 70 m, from approximately 50 to 70 nautical miles from shore."

> "Physical and biological characteristics of the mid-shelf region of the SAB are influenced by seasonal oceanographic and climatic patterns, and episodic Gulf Stream intrusions. The mid-shelf is covered with medium-grained sands with scattered low to moderate relief, hard-bottom terrain. Rocky reefs support diverse and productive invertebrate assemblages, and demersal and pelagic finfish species. Consequently, reefs are important to commercial and recreational fisheries. Primary productivity in mid-shelf waters is limited by nutrient inputs from Gulf stream intrusions and upwelling. Soft-bottom, benthic communities have high biomass relative to nearshore areas, especially in areas contiguous with reefs."

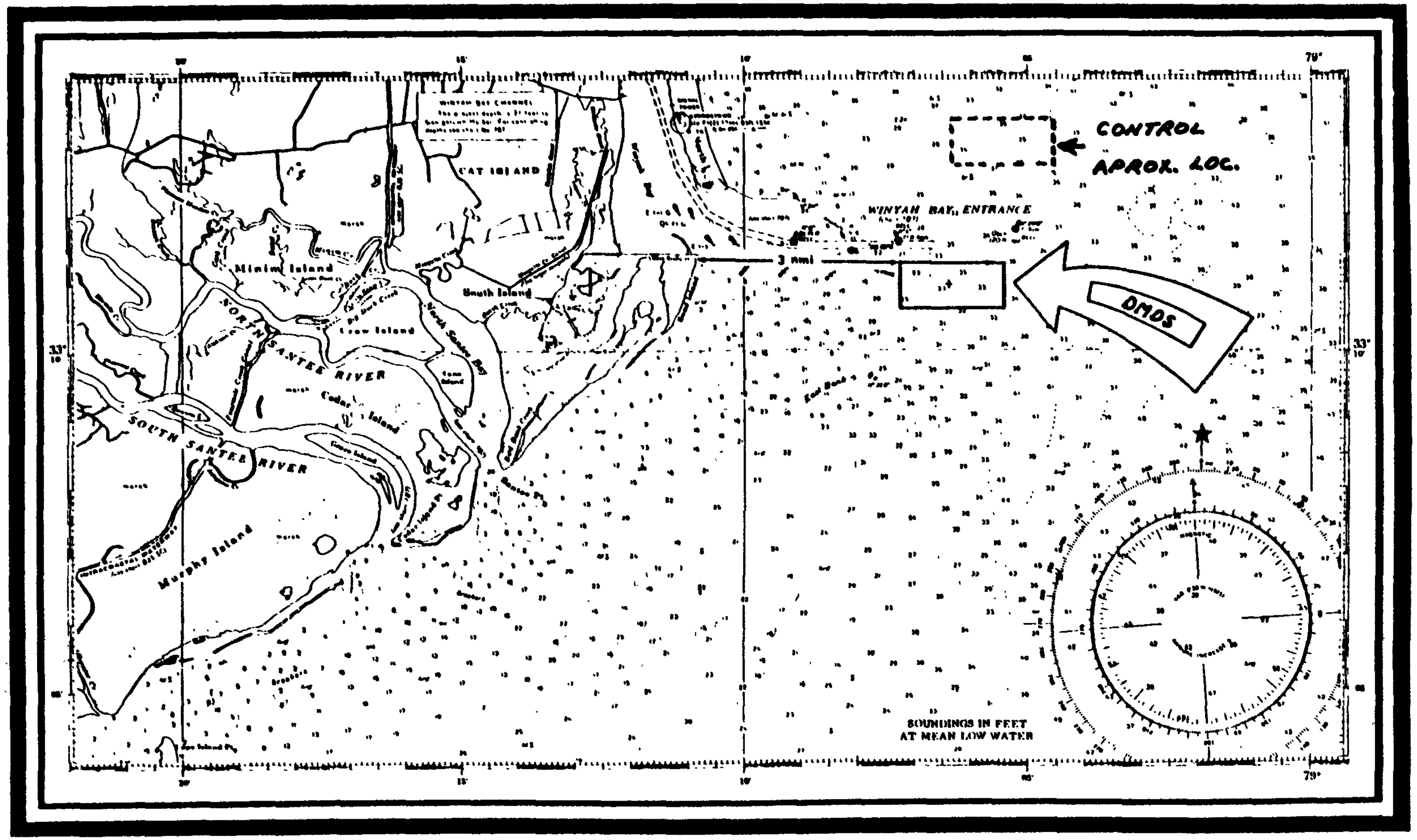
> "The physical and chemical characteristics (seawater temperatures, salinities, nutrients, and trace metal concentrations) of the shelf break region of the SAB are strongly influenced by the Gulf Stream. Extensive but discontinuous Lithothaminon and Black Rock Reefs occur at depths of 100 to 200m, and are productive areas for invertebate and demersal finfish species (Pequegnat, 1978). Sandy-mud bottom regions are characterized by depauperate, but heterogenous infaunal assemblages."

A mid-shelf and shelf break site alternative to the nearshore proposed ODMDS were not specifically investigated. However, sites in these offshore zones would be expected to be quite similar to those considered in the Final EIS for Savannah, Charleston and Wilmington. Available environmental data lead to the findings in the Final EIS which support the rejection of mid-shelf and shelf break ODMDS's in the South Atlantic Bight (SAB) and show that the rationale presented in the Final EIS for their rejection is applicable to Georgetown without change:

> "No dumping has occurred previously in either region (mid-shelf or shelf break) of the SAB.
>
> Baseline studies would be needed to provide data on water quality, ecology, and the presence or absence of sensitive, natural, or cultural resources.
>
> The additional costs of transporting materials further would be significant.
>
> Dredged sediments are not physically similar to either mid-shelf or shelf break sediments, thus the probability of altering sediment texture and adversely affecting benthic organisms is higher.
>
> Monitoring and surveillance would be more difficult due to the greater depths and distances from shore.
>
> The probability of inadvertent dumping of dredged materials on sensitive hard-bottom areas during rough weather is higher."

<u>Designation of Another ODMDS in the Same General Area as the Existing ODMDS</u>

The nearshore environment in the South Atlantic Bight is shallow (less than 20m) and strongly influenced by coastal processes: "runoff from rivers and salt marshes, longshore sediment transport, winter storm effects, and anthropogenic inputs" (Final EIS). In the vicinity of the Georgetown ODMDs, tidal currents strongly affect nearshore current direction and velocity, and wave action extends throughout the water column to the bottom. The Final EIS generally characterized the nearshore bottom sediments as "fine to very fine-grained sands with some river-derived silts." In the Georgetown ODMDS and in the "control" site on the northern side of the entrance channel (Figure 1), the bottom sediments, possibly winnowed by wave and current activities, are moderately to poorly sorted clean coarse sand. Sediments "down current"



Boundary Coordinates .... 33°11'18"N., 79°07'20"W.
33°11'18"N., 79°05'23"W.
33°10'38"N., 79°05'24"W.
33°10'38"N., 79°07'21"W.
Center Coordinates .... 33°10'58"N., 79°06'22"W.

Navigation Chart No. .... NOS 11531
Area .... 1.04 Square Nautical Miles
Local Navigational Aids .... Loran A & C, Omega, RDF, Radar
Material Type .... Dredged Material

Figure 1

Georgetown Harbor, SC

September 1980

(to the southwest) are finer, but the differences are not statistically significant. To the north of Winyah Bay and in other scattered locations, even finer-grained sands mixed with silt are encountered.

As part of a study* under contract to the Charleston District, Corps of Engineers, the South Carolina Wildlife and Marine Resources obtained information on the nearshore coast of Georgetown. Figures 2, 3, 6-8, 12-14 in Chapter III and figures in Appendices A and B to this Supplement are reproduced from this SCWMRD report, also incorporated into the Supplement by reference.

Because of the large freshwater discharge through Winyah Bay and strong tidal action, water quality is highly variable but within the ranges normally encountered along the South Carolina coast (SCWMRD Georgetown ODMDS report). Figure 16 of this Supplement shows a massive turbidity plume caused by this discharge engulfing the existing ODMDS. Some water quality parameters have been graphically summarized in the next chapter.

The Final EIS described the nearhsore biological communities of the SAB as "characterized by benthic infaunal assemblages with low abundances and high diversity, productive penaeid shrimp and anadromous fish species, and hard-bottom assemblages." The SCWMRD site-specific study of the Georgetown ODMDS and surrounding area documented the "large seasonal and spatial variability in species composition and abundance, which is typical for nearshore environments throughout the South Atlantic Bight". However, the SCWMRD study differed from the Final EIS in reporting greater number of species and a dominance by suspension feeders rather than by small-bodied deposit feeders. Shrimp and sturgeon are two of the many commercially and ecologically significant nektonic species in the nearshore area which must be considered in the selection of an ODMDS and, more importantly, in the determination of the types and quantities of material to be dumped at the site.

Although a nearshore ODMDS, other than the existing site, was an alternative that received considerable attention during the field studies and evaluations that were conducted prior to the preparation of the draft EIS supplement, it has since been eliminated from serious consideration.

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* "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site," January, 1984. South Carolina Wildlife and Marine Resources Department. Robert Van Dolah et.al. authors.

Downgrading of this alternative was due mainly to findings of Charleston District surveys and the SCWMRD study of the existing ODMDS, which showed that 30 years deposition of entrance channel materials have not caused significant long-term changes such as mounding, degradation of water quality, or significant alteration of substrate or benthic communities. Based on these findings, there is no reason to relocate the ODMDS to a nearby area where there is no history of previous use, and there are several reasons why such a move might result in adverse impacts:

-Relocation of the ODMDS considerably closer to shore might adversely affect loggerhead turtle nesting, shellfishing areas, or other landward resources.

-A detailed study of an area to the north of the entrance channel (originally chosen for a "control" site; see Figure 2) showed differences in sediments between the "control" and the existing site, but the differences were not significant.

-A survey of existing data shows that although the Georgetown nearshore area is fairly typical of the South Carolina coast, there exists some variability within the area. Less well studied sites might not be as suitable as the existing site.

-The Landsat photograph (Figure 16) and field data show that an area around the entrance channel receives large amounts of freshwater runoff heavily laden with suspended sediments. Dumping of dredged material outside this plume area might result in greater impacts to water quality and marine fauna, since sites outside the plume are not directly and frequently subjected to influxes of these sediment-laden waters.

-Movement of the ODMDS away from the entrance channel would increase costs by about $0.35/c.y. per mile (about $157,500 for a typical contract). The biggest increase would be in operating costs (equipment, salaries, per diem, etc.) due to the non-productive time when the hopper dredge is hauling material rather than dredging.

No changes in current disposal practices are anticipated for Georgetown Harbor. If significantly different materials are proposed for ocean dumping, this alternative can be reconsidered in the required Section 103 evaluation. At present, there is no reason to incur the added costs or to take a chance that unforseen adverse impacts might occur at sites which have not received dredged material in the past and have not been studied in as much detail as the existing ODMDS and the "control site".

The approximate quantities of material dredged from Georgetown Harbor Entrance Channel over the last ten years are as follows:

Date	Gross Cubic Yards
1973 (Sept)	255,000
1974 (Sept)	389,000
1975	441,000
1976 (Jun-Aug)	476,000
1977 (Dec)	200,000
1978	NONE
1979 (Jan-Feb)	170,000
1980 (Jan-Apr)	546,000
1981	NONE
1982 (Jul-Aug)	538,000
1983	NONE
1984 (May)	425,000

Do Not Designate Any ODMDS for Georgetown

If EPA failed to designate an ODMDS for Georgetown, the Corps of Engineers probably would seek permanent designation of the existing ODMDS. The proposed action and the alternatives would not be substantially different than the EPA action; however, failure by EPA at this stage to designate an ODMDS as originally proposed would greatly extend the process, and would probably result in the entrance channel not being maintained at authorized project depth until the designation process is complete.

A permanent halt to dredging in the entrance channel would result in permanent loss of the navigation benefits attributable to the project. Since the Georgetown Harbor project has been authorized by Congress and continues to be vital to the local economy, a halt to dredging is not a practical option.

Disposal of entrance channel materials on upland sites is also not practical. Hauling and/or pumping costs, together with mobilization costs, would be prohibitive. The nearest upland sites are part of the Thomas Yawkey Foundation or the Belle W. Baruch holdings. Since these lands are generally managed for preservation, wildlife and research, disposal of sandy material and salt water on these lands would be incompatible with most of the present land uses. Disposal upland is not being permanently set aside in favor of ocean disposal. Each applicant for an ocean disposal permit must fully evaluate the availability and environmental impact of feasible upland sites. For the Georgetown area, there are designated upland sites which are reserved for poor quality dredged spoil from inner harbor areas.

Disposal of dredged materials into "waters of the United States," including Winyah Bay and nearby streams and wetlands, is generally prohibited when there are reasonable alternatives. Wetlands and open waters regulated under Section 404 of the Clean Water Act are protected because of their roles as spawning, breeding, and nursery areas for many marine and estuarine species; their function in maintaining water quality; the habitat provided to wildlife; recreation and other uses. In the case of Georgetown Harbor, ocean disposal at the existing ODMDS is a proven and superior alternative to disposal in estuarine or wetland areas. Further, the cost of hauling and/or pumping the dredged material to landward waters would be much greater than hauling it the short distance to the existing site.

III. AFFECTED ENVIRONMENT

The affected environment of the South Atlantic Bight was described in Chapter 3 of the Final EIS and is incorporated into this Supplement by reference. Chapter II of the SCWMRD report on the Georgetown ODMDS reviewed existing information on the South Carolina coastal environment and the Georgetown area in particular. Chapter IV of that same report provided detailed evaluations of the bottom sediments, hydrography, and benthic communities in the existing ODMDS, in a similarly sized site to the north of the entrance channel ("control" site), and in three stations to the southwest of the existing ODMDS. These chapters are also incorporated into the Supplement by reference, with the notation that the recommendations and suggestions at the end of Chapter IV are those of the SCWMRD and are not necessarily those of the Corps of Engineers or EPA.

Mid-Shelf and Shelf Break Areas

A brief verbal summary of the mid-shelf and shelf break areas appears in Chapter II , of this Supplement. Graphic summaries of selected environmental data appear in Figures 4, 5, 9-11, and 20-22 which follow. For further information, the reader is directed to the two documents referenced above. Rather than paraphrase the large amount of data in these two reports, they have been made readily available.

Nearshore Environment

A brief verbal summary of the nearshore ocean area appears in the preceeding chapter of this Supplement. The figures and tables that follow summarize further some of the environmental data collected or reviewed in the Final EIS and the SCWMRD study. Sources for the figures and tables and additional information on nearshore waters can be found in these two documents. when any differences appear between the broad descriptions of the Final EIS and the site-specific information in the SCWMRD study, the latter should be considered more precise. (E.g., the SCWMRD study reported a larger mean, grain sediment size, a higher number of benthic faunal species, and a predominance of suspension feeders over small-bodied filter feeders.)

Of the commercially important fisheries, the SCWMRD report emphasized the Atlantic sturgeon (*Acipenser oxyrhynchus*) and shrimp because of their proximity to the ODMDS during certain times of the year. The shortnose sturgeon (*Acipenser brevirostrum*) and loggerhead turtle were mentioned as endangered species sometimes in the vicinity of the ODMDS.

The Existing ODMDS and "Control" Site

Prior to the SCWMRD study of the Georgetown ODMDS, it was thought that if significant changes to the bottom substrate and benthic community had taken place as a result of 30 years' ocean disposal, the effects would be most easily detected at the ODMDS and "downcurrent" (based upon the generally southerly direction of nearshore currents) stations. Analysis of SCWMRD study data indicated that there were no significant long-term changes in the benthos due to dumping and that the differences observed between the existing ODMDS and "control" site were probably due to substrate differences not related to dumping. The use of the site to the north of the channel as a "control" site was, therefore, greatly diminished, but the detailed data permits an accurate evaluation of this site as an alternate nearshore ODMDS. The following is from the SCWMRD report.

> "Standard hydrographic factors, which included temperature, salinity, dissolved oxygen, and turbidity were within the limits normally encountered along the South Carolina coast. Some seasonal and spatial differences were discerned for each factor. High runoff via Winyah Bay resulted in reduced salinities and increased turbidities at some sites. Moderately high turbidities in summer may have been the result of frequent shrimp trawling in the area. Currents in the DMDS appear to be largely tidal, although some evidence of a southerly nearshore current was noted. Trace contaminants in water samples were within or below ranges noted in other areas of the South Atlantic Bight. Many trace metals were below detection limits, as were PCBs and all pesticides tested."

> "Sediment analyses indicated that bottom sediments at most of the sampling sites consisted of medium to coarse sands with very little (<1%) silt and clay. Stations to the south of the DMDS had consistently finer-grained sediments than those in the DMDS and control areas, but no statistically significant differences were noted among sites. Sediments were low in trace metal and organic contaminant concentrations. Comparisons with other studies indicated that sediments in and near the Georgetown DMDS cannot be considered polluted. No hard bottom areas were found in the entire study area."

> "Benthic epifauna and fishes captured in beam trawl collections were typical of those from sand bottom habitat of South Carolina coastal waters. Community structure was influenced by season, and the number of

species was significantly higher in summer. Species assemblages were noticeably different in winter than in summer, with several species occurring during only one season. Although the total number of species was lowest in the disposal area, comparison of species composition among the sites indicated that lower diversity resulted from fewer sessile species, mainly bryozoans and cnidarians. This suggests that less substrate was available for colonization by sessile organisms in portions of the disposal area, although, lesser amounts of hard substrate (i.e., wood, shell) in the DMDS were probably not related to past disposal activities. Tissue analysis of whelks (Busycon carica) collected in and near the DMDS did not reveal any high concentrations of contaminants."

"The infauna collected in grab samples at the 13 offshore stations were numerically dominated by pelecypods, polychaetes, amphipods and bryozoans. Polychaetes were the most diverse taxon. Of the 357 species collected, many were limited in abundance of frequency of occurrence. The dominant species, however were generally ubiquitous throughout the study area and exhibited considerable temporal and spatial variation. No significant differences could be attributed to past disposal activities with respect to species composition or faunal density among the control, disposal and "down current" sites. Unlike the deposit-feeding communities previously described for the SCW-DMDS, the Georgetown DMDS and vicinity were characterized by a seasonally variable, diverse community of suspension-feeding organisms. Numerical classificatin of the data illustrated some differences in similarity between stations in the control site versus those in the disposal and "down current" areas, particularly during winter. These difference probably were not related to previous disposal practices. Rather, they were most likely due to natural variability in sediment composition. Cluster analysis also indicated that most of the abundant and frequently occurring species were widely distributed throughout the study area."

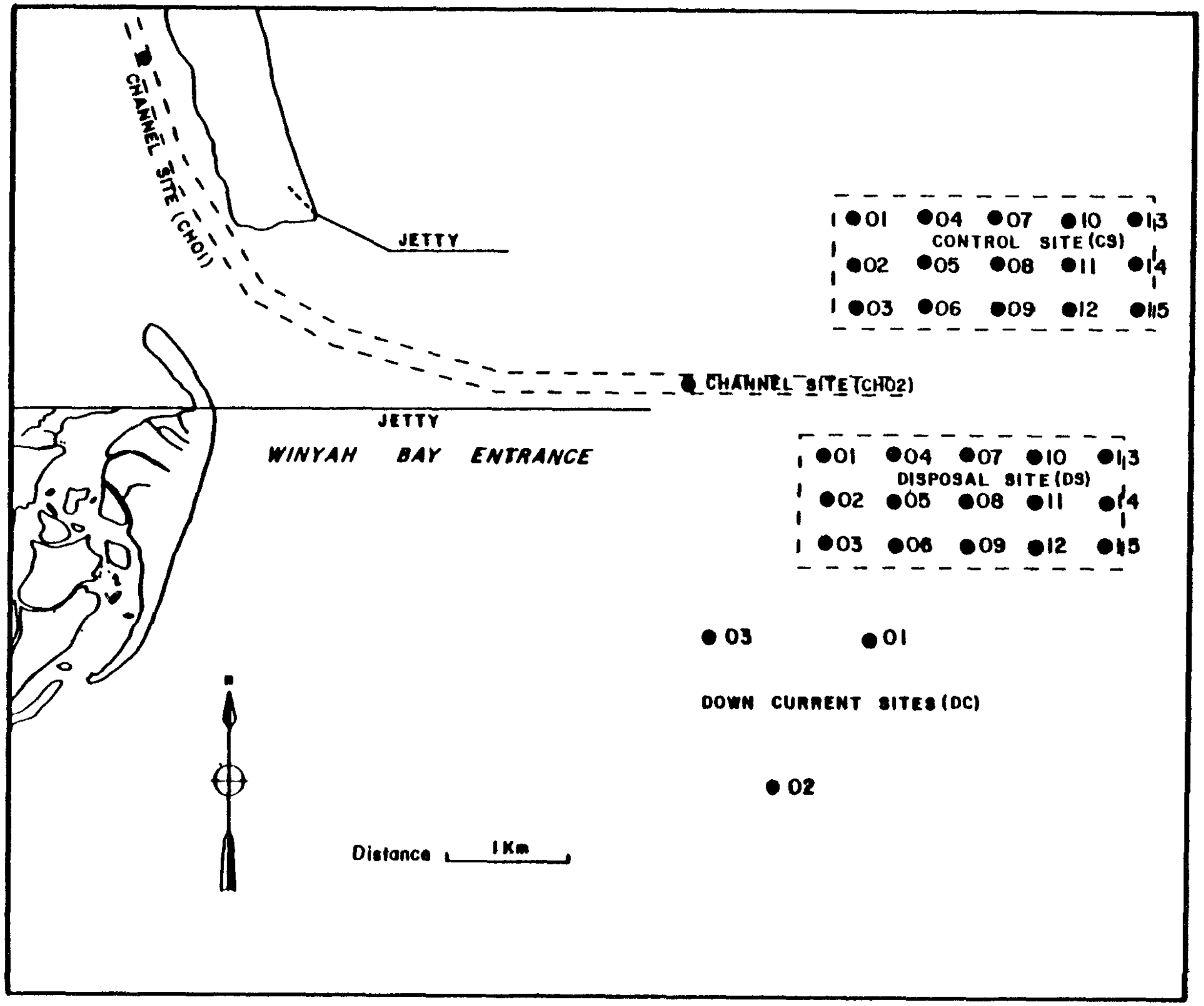

Figure 2 Map showing location of the 15 possible sampling locations in the control and DMDS sites, as well as the location of "down current" and channel sampling locations.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

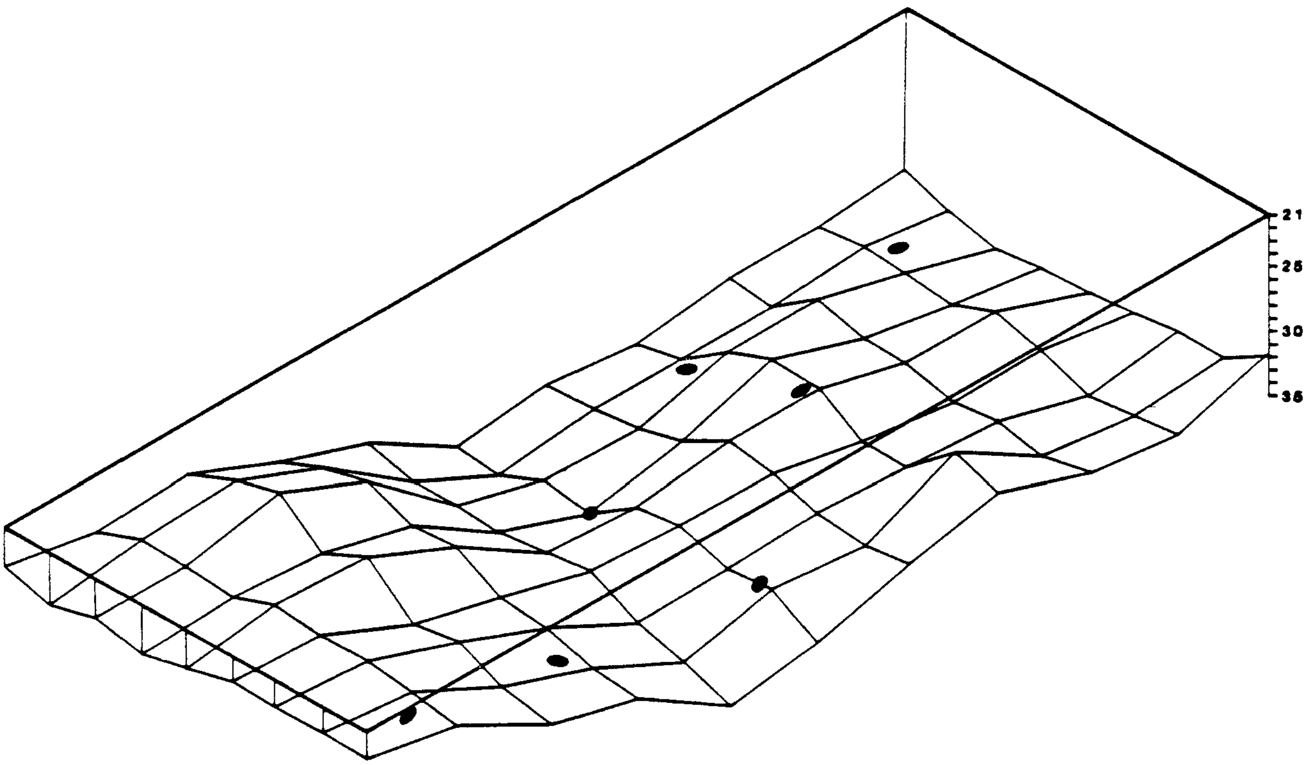

Figure 3 Three-dimensional plot of bottom survey data collected in the Georgetown DMDS by the U.S. Army Corps of Engineers, April 1983. Rectangular boundaries represent the DMDS boundaries and dots represent the stations sampled during winter and summer in the present study. The vertical scale is greatly exaggerated relative to the horizontal scale.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

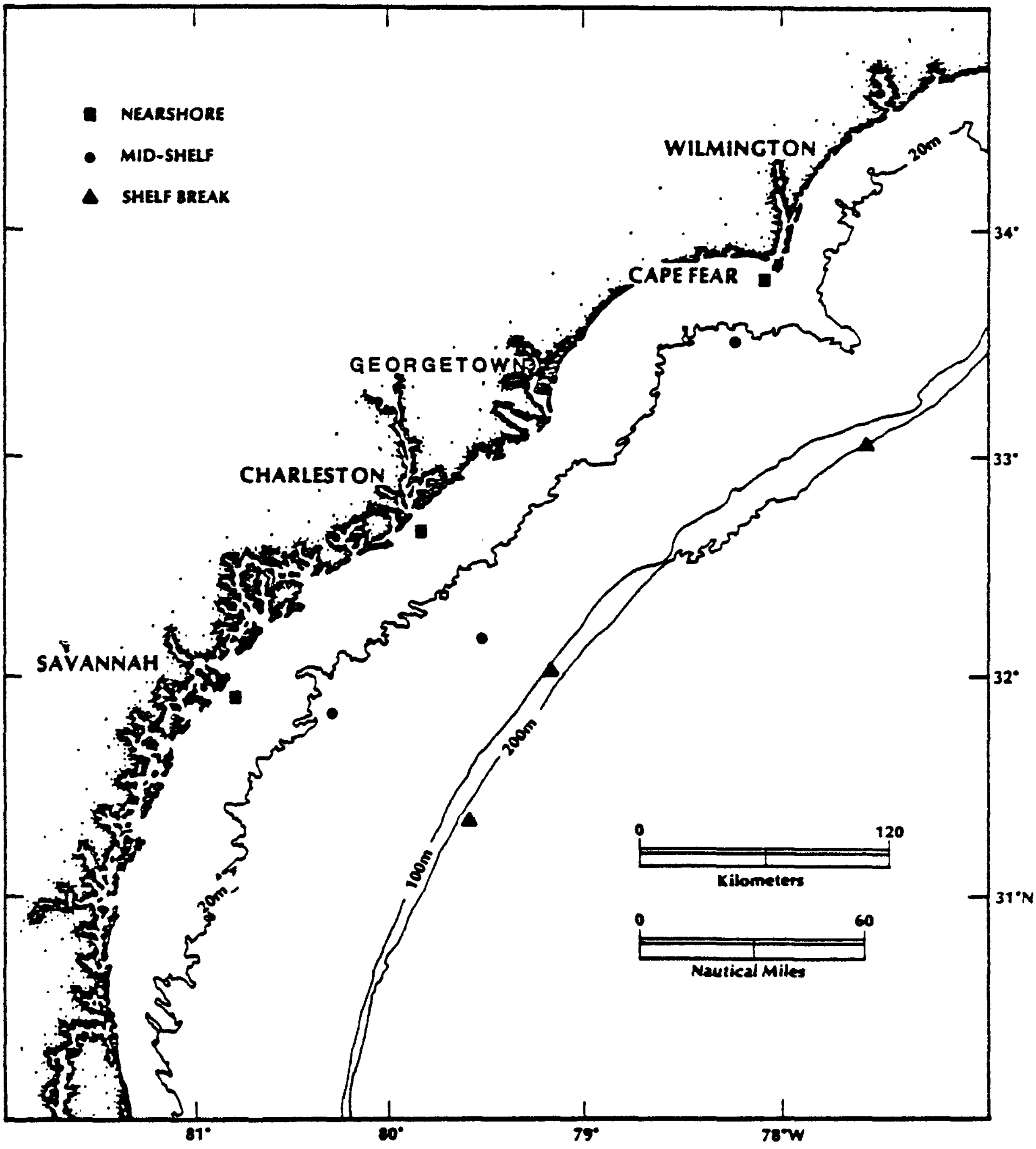

Figure 4 Nearshore, Mid-Shelf, and Shelf-Break Alternative Areas

Source: Final EIS on Savannah, Charleston, and Wilmington ODMDS designation

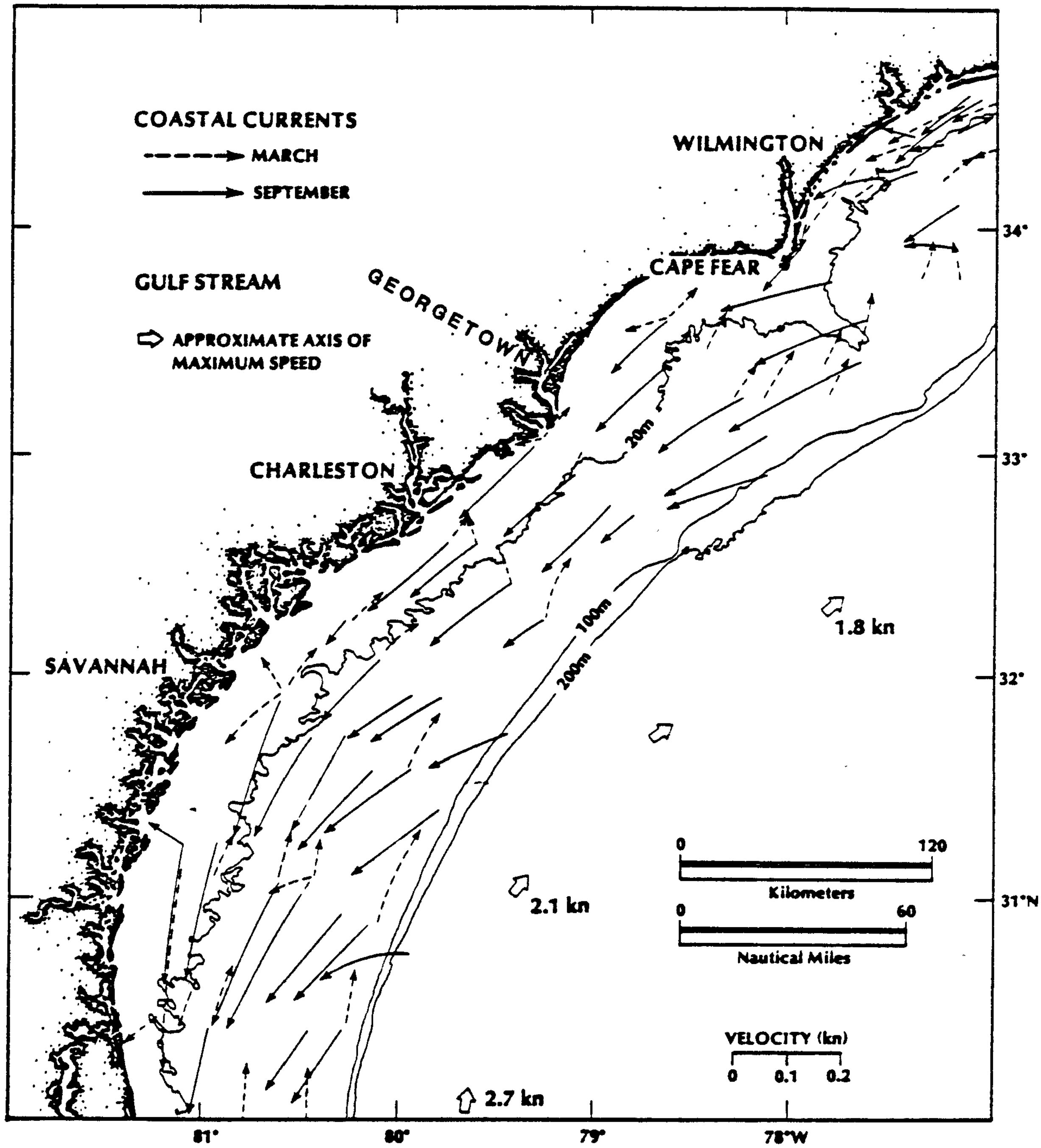

Figure 5 Surface Currents Over the South Atlantic Bight Shelf
Source: BLM, 1978

Source: Final EIS on Savannah, Charleston, and Wilmington ODMDS designation

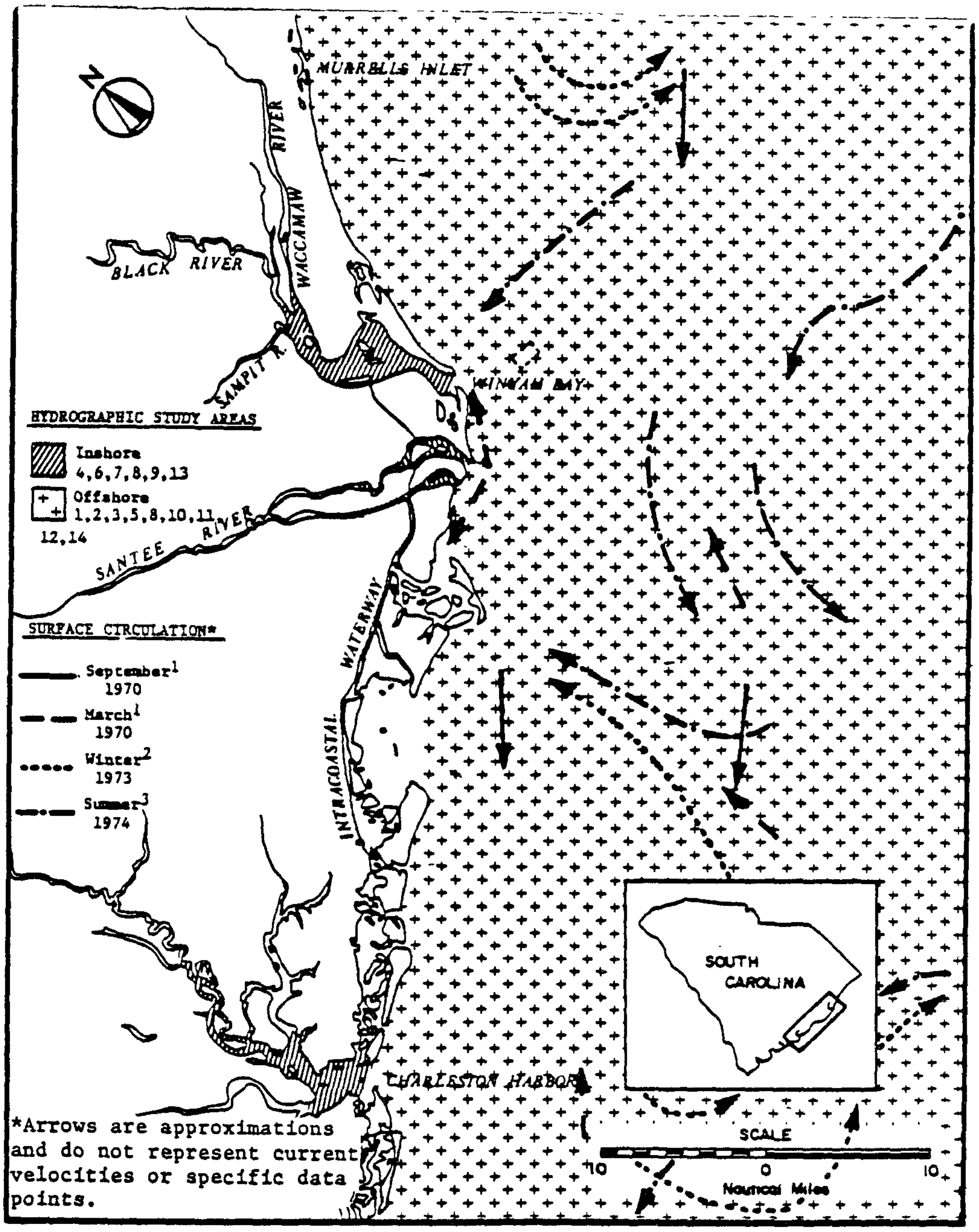

Figure 6 Location of hydrographic study areas and surface circulation patterns: [1]Bureau of Land Management (BLM), 1981; [2]Mathews and Pashuk, 1977; [3]Mathews and Pashuk, 1982; [4]Allen, et al., 1982; [5]Churgin and Halminski, 1974; [6]Hinde, et al., 1981; [7]Johnson, 1970; [8]Jones, Edmunds and Assoc., 1979a, 1979b, 1979c; [9]Mathews et al., 1981; [10]Minerals Management Service (MMS), 1982; [11]Science Applications Inc. (SAI), 1981a, 1981b; [12]SAI, 1983a, 1983b; [13]Shealy, 1974; [14]South Carolina Wildlife and Marine Resources Dept., 1979.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

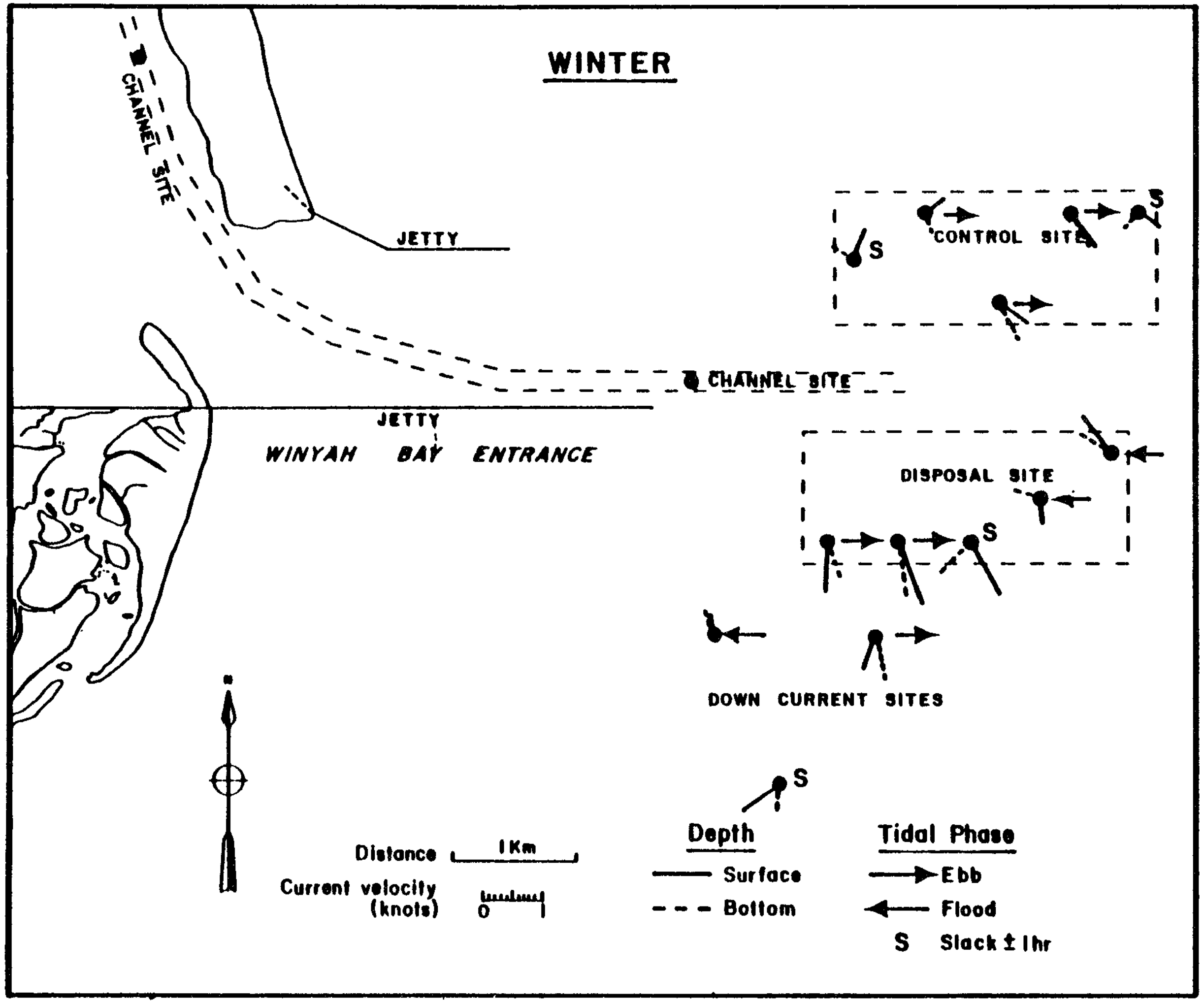

Figure 7 Current velocities and directions for the 13 stations sampled during the winter in and near the Georgetown Harbor DMDS.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

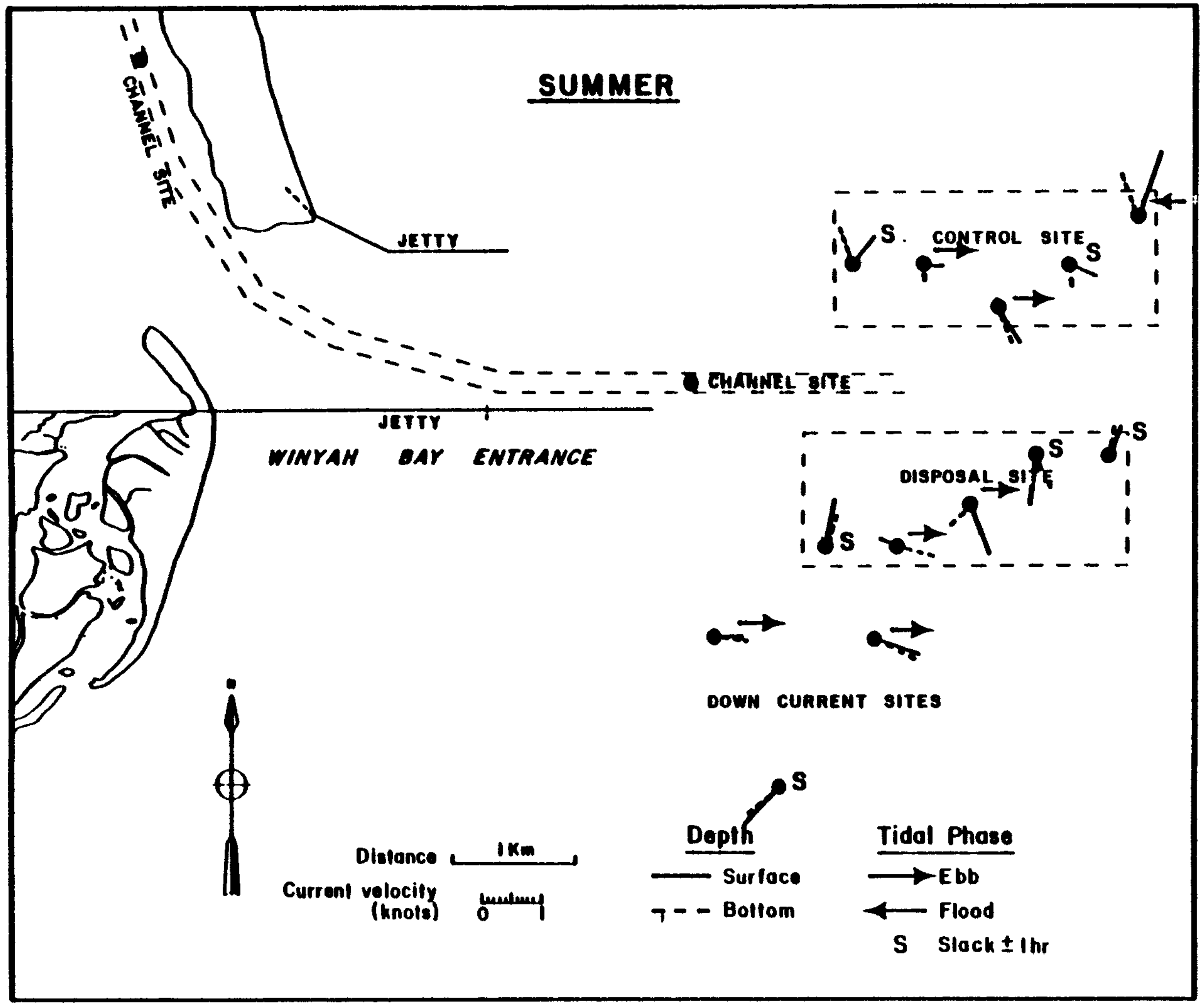

Figure 8 Current velocities and directions for the 13 stations sampled during the summer in and near the Georgetown Harbor DMDS.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

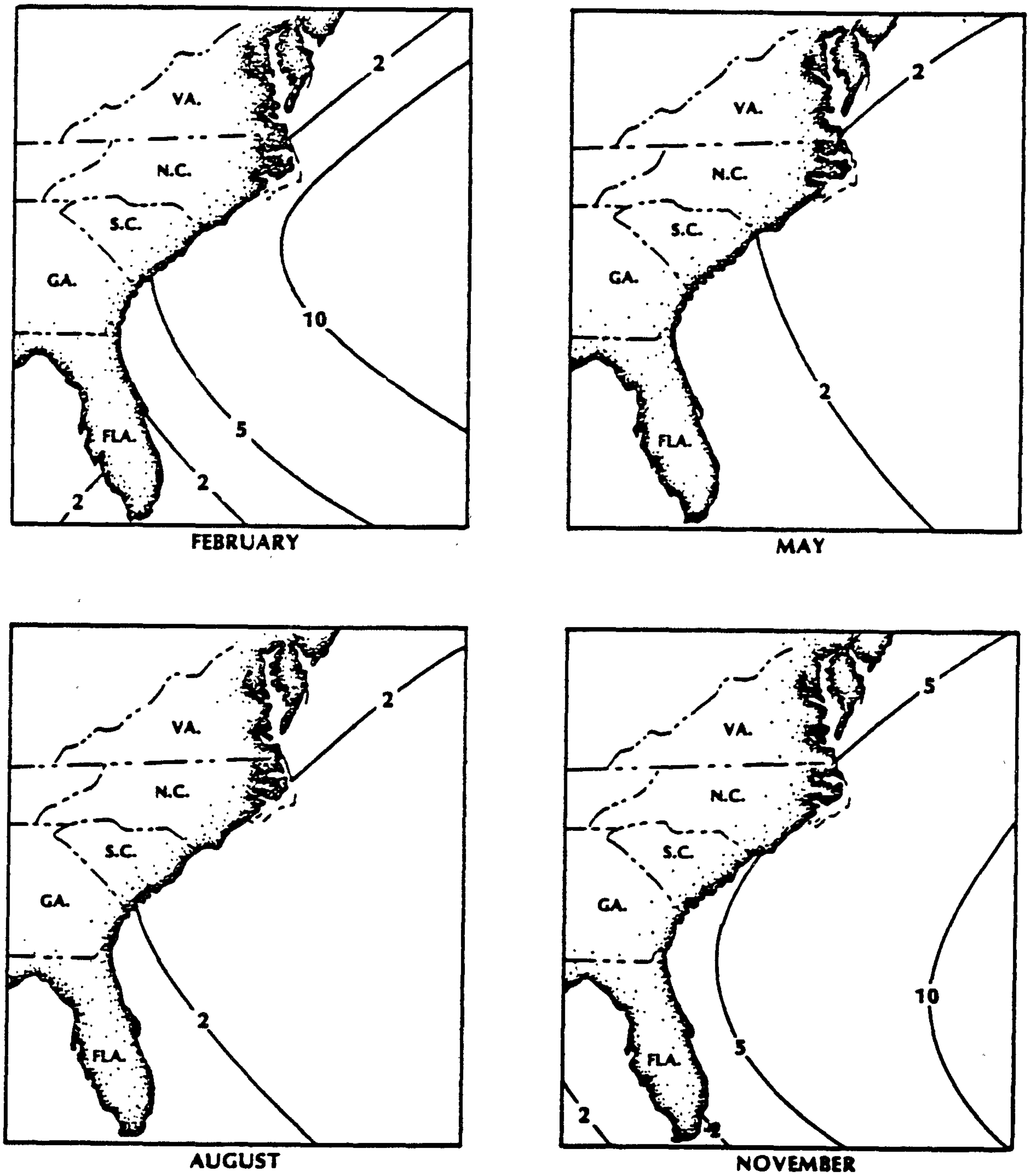

Figure 9 **Frequency of Waves Greater Than 12 ft (3.6m) in Height in the South Atlantic Bight**
Source: BLM, 1978

Source: Final EIS on Savannah, Charleston, and Wilmington ODMDS designation

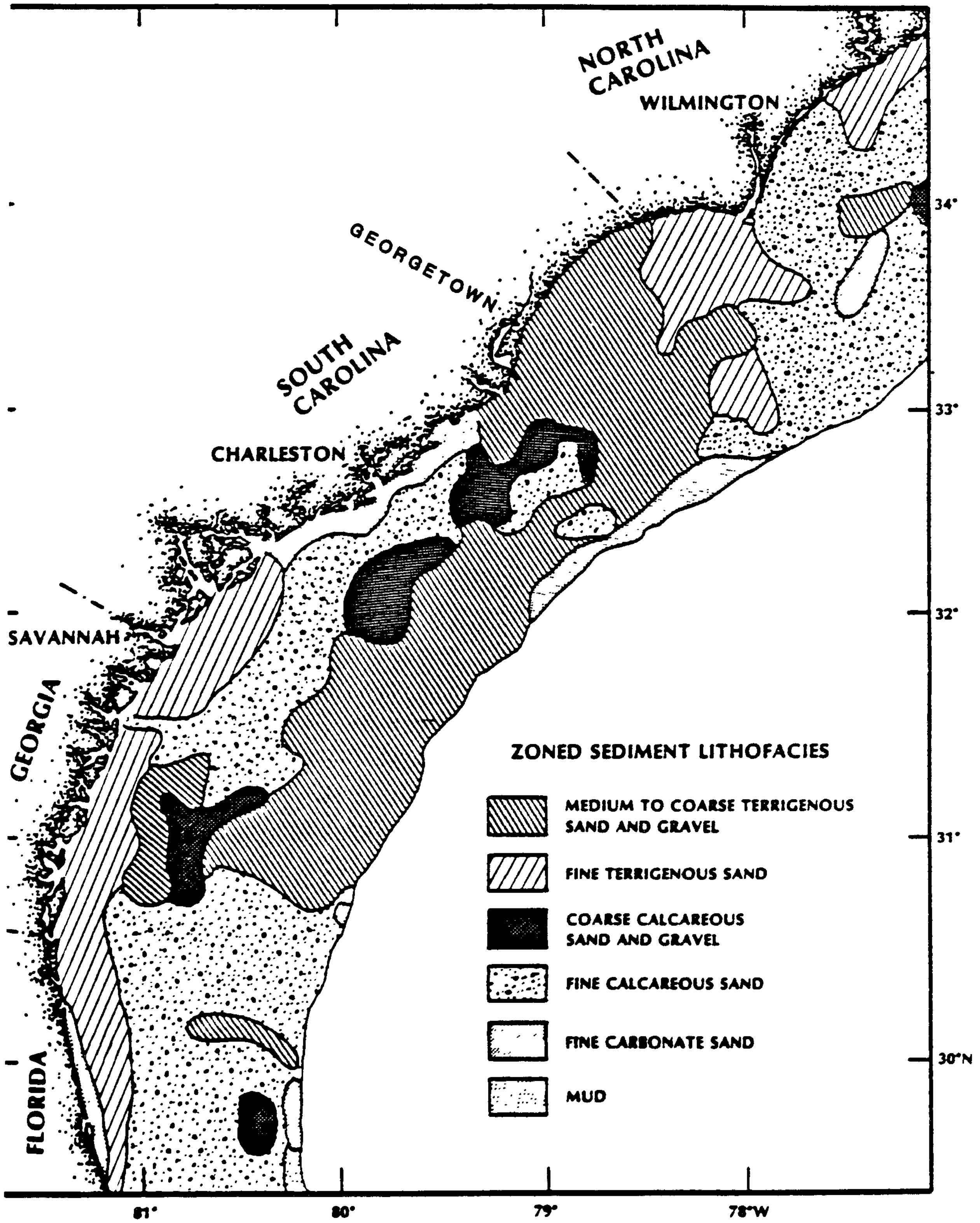

Figure 10 **Areal Distribution of Sediment Lithofacies; Cape Romain to Cape Canaveral**
Source; Pilkey et al., 1979

Source: Final EIS on Savannah, Charleston, and Wilmington ODMDS designation

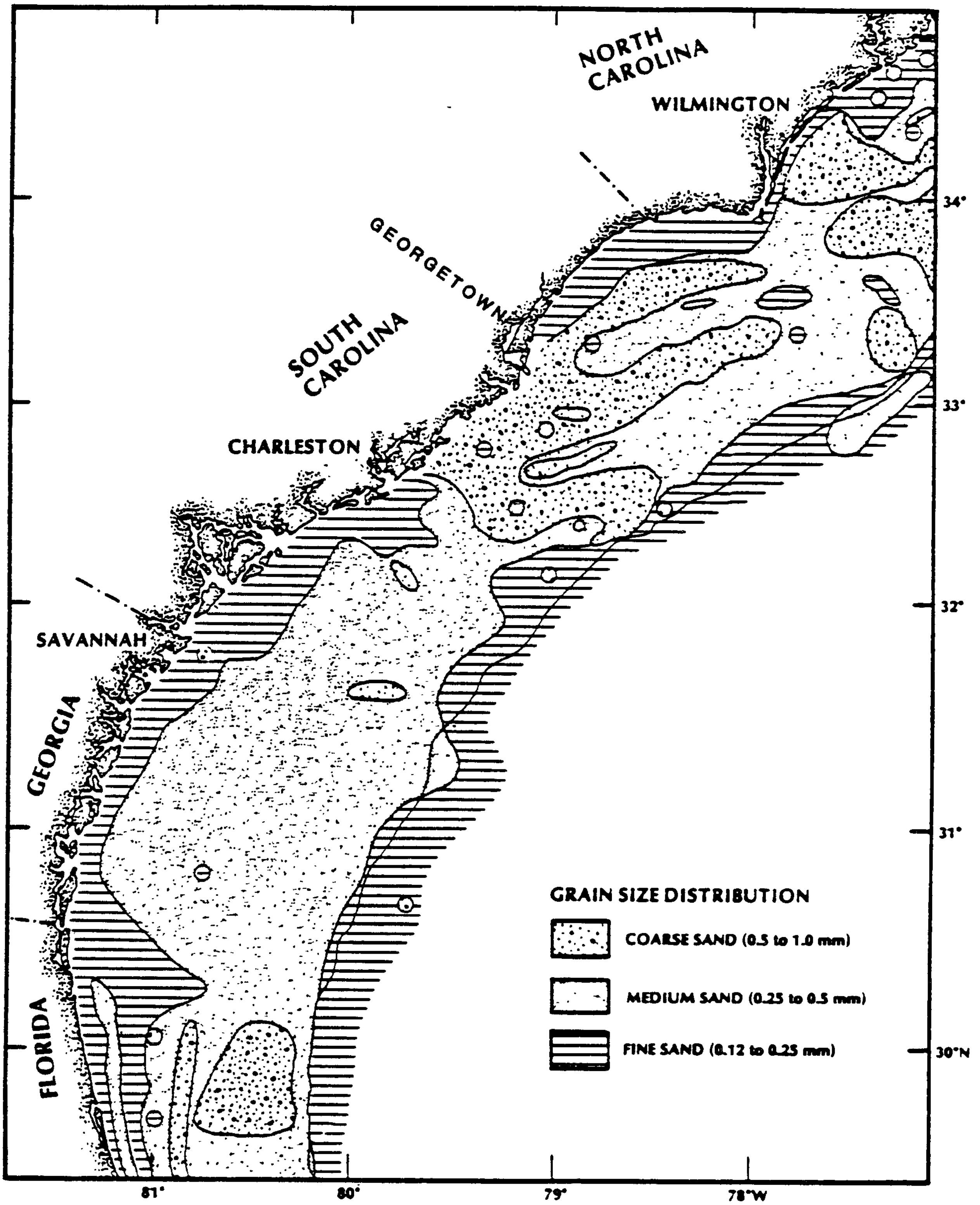

Figure 11 Areal Distribution of Mean Grain Size;
Cape Romain to Cape Canaveral
Source: Pilkey et al., 1979

Source: Final EIS on Savannah, Charleston, and Wilmington ODMDS designation

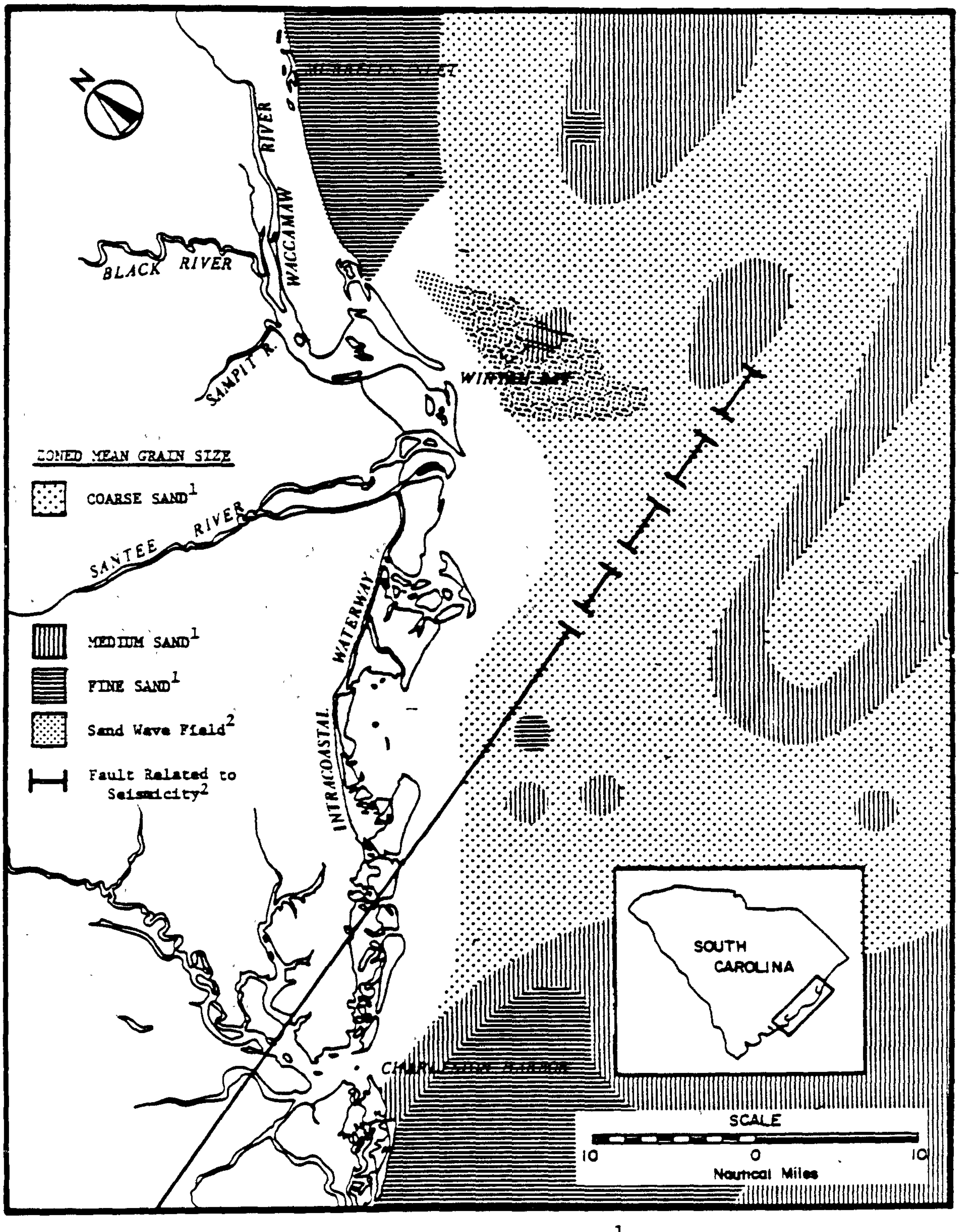

Figure 12 Areal distribution of mean grain size: [1]Pilkey et al., 1979; [2]MMS, 1982.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

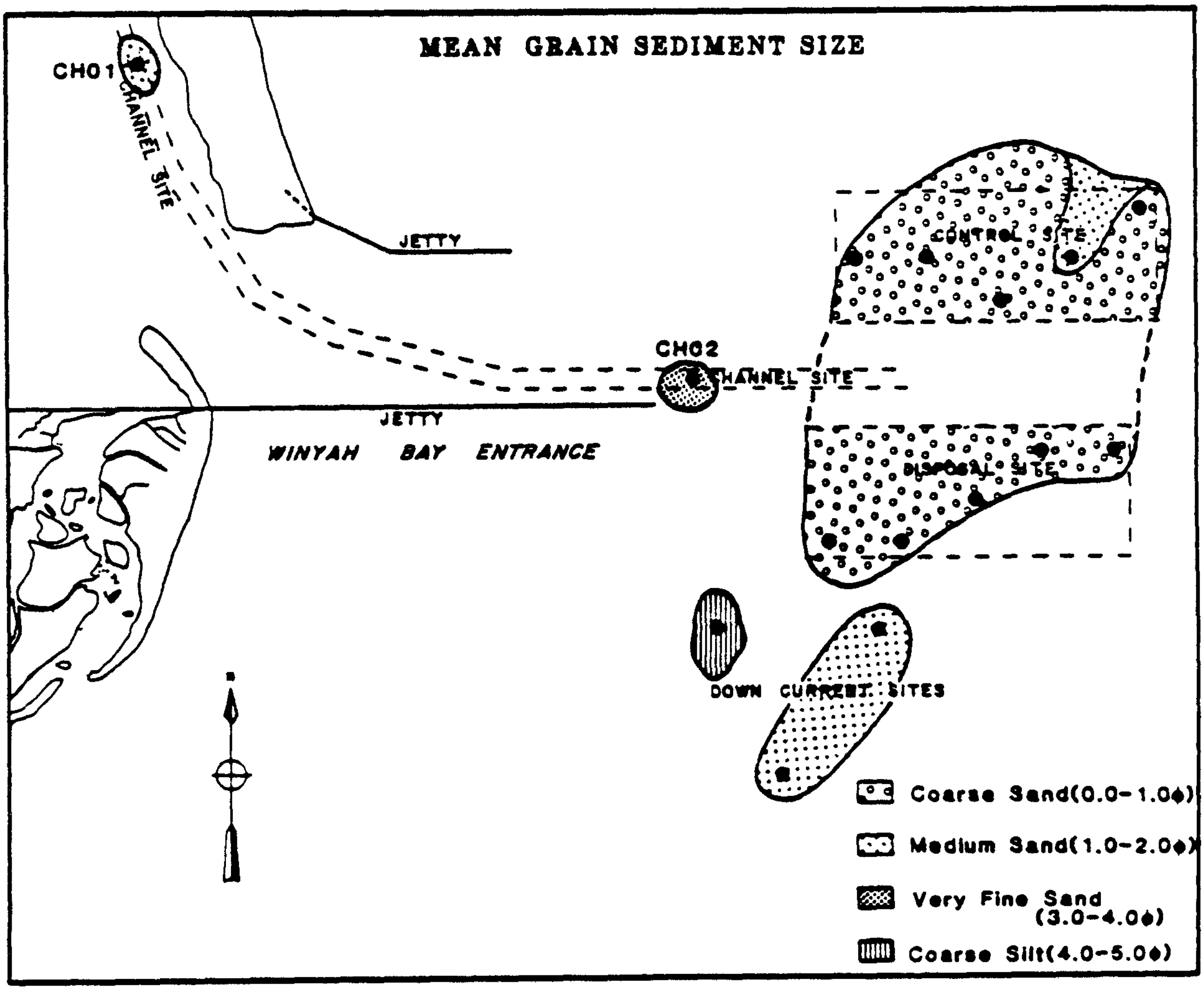

Figure 13 Distribution of mean grain size of sediments collected from the Georgetown DMDS and vicinity.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

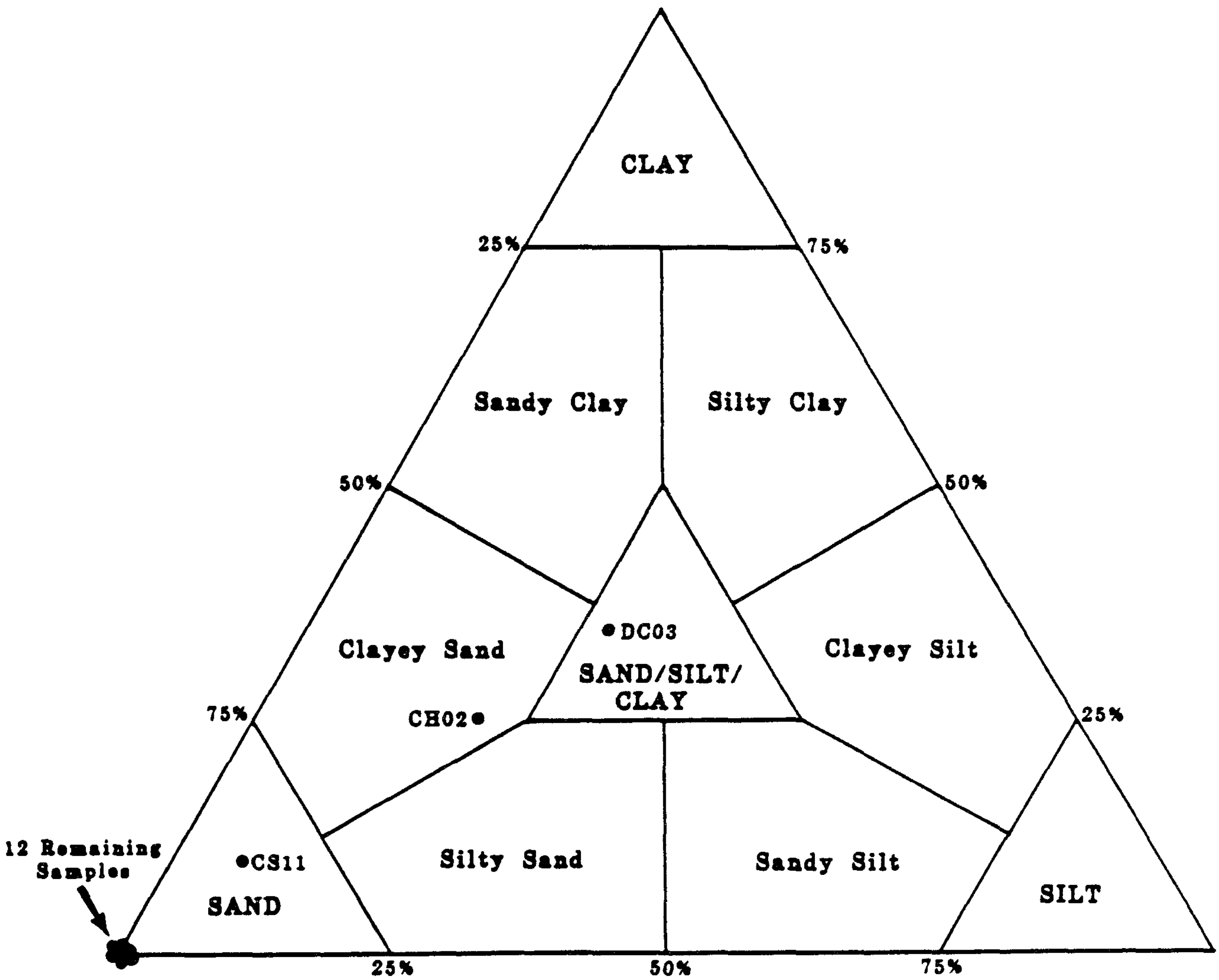

Figure 14 Shepard's classification of sediment types at stations in the Georgetown DMDS and vicinity.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

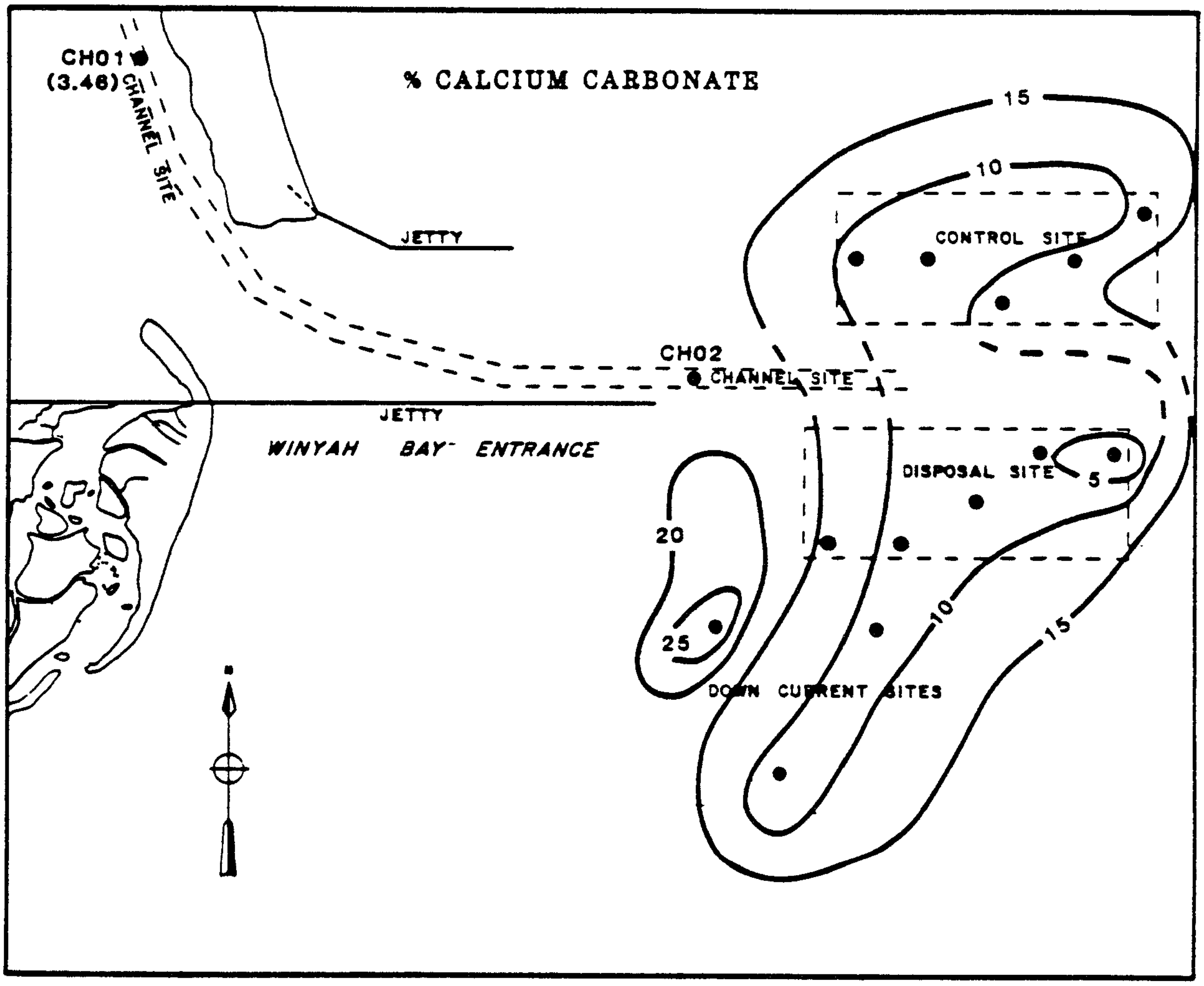

Figure 15 Distribution of percent calcium carbonate content of sediments collected from the Georgetown DMDS and vicinity.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Figure 16 Landsat photograph of Winyah Bay and nearshore coastal waters. Note the large plume of turbid water which encompasses the DMDS area. Lighter area at bottom of photograph is reflection of the sun.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 1 Oceanographic parameters of water collected from the 7 winter and 9 summer stations sampled in and near the Georgetown Harbor DMDS.

WINTER

Station	Station Depth	Depth	Temp. (C)	Salinity (o/oo)	D.O. (mg/l)	Turbidity (FTU)
DS03	8.0	Surface	8.7	27.2	10.4	5.5
		Middle	8.7	33.6	10.1	3.8
		Bottom	8.8	33.8	9.5	42.0
DS13	11.0	Surface	8.5	29.7	9.3	4.8
		Middle	8.6	34.1	9.1	3.8
		Bottom	8.7	34.1	9.2	5.2
CS02	9.5	Surface	9.2	30.0	9.2	4.6
		Middle	8.9	33.9	9.4	5.3
		Bottom	8.9	33.9	9.5	11.0
CS13	11.0	Surface	8.9	32.2	9.4	2.2
		Middle	9.0	34.0	9.2	2.8
		Bottom	8.9	34.0	9.3	6.1
DC01	8.75	Surface	9.4	33.1	9.0	2.0
		Middle	9.4	33.2	9.0	2.3
		Bottom	9.3	33.6	9.1	2.8
DC02	8.25	Surface	9.0	29.6	9.2	4.3
		Middle	9.0	30.7	9.0	6.5
		Bottom	9.0	33.6	9.9	13.0
DC03	6.5	Surface	8.5	21.9	9.8	8.0
		Middle	8.7	33.3	8.8	12.0
		Bottom	8.9	33.6	9.2	27.0

SUMMER

Station	Station Depth	Depth	Temp. (C)	Salinity (o/oo)	D.O. (mg/l)	Turbidity (FTU)
DS03	8.5	Surface	26.8	33.7	5.9	2.6
		Middle	26.5	34.4	5.5	3.8
		Bottom	26.7	34.3	5.8	24.0
DS13	12.0	Surface	27.0	34.5	5.8	6.7
		Middle	27.2	34.5	5.8	1.8
		Bottom	27.1	34.5	5.7	1.6
CS02	9.5	Surface	27.4	32.3	5.8	4.7
		Middle	26.7	34.2	5.5	5.8
		Bottom	26.8	34.3	5.6	8.8
CS13	10.5	Surface	27.8	27.9	5.9	5.6
		Middle	27.3	33.7	6.1	3.6
		Bottom	27.0	34.3	6.2	4.8
DC01	9.5	Surface	27.8	34.3	6.1	3.3
		Middle	27.0	34.3	6.0	3.7
		Bottom	27.1	34.4	5.8	5.4
DC02	7.3	Surface	27.3	32.6	6.2	2.9
		Middle	26.8	34.3	5.8	11.0
		Bottom	26.7	33.8	5.5	11.0
DC03	7.5	Surface	27.5	34.2	5.9	2.8
		Middle	27.0	34.2	6.0	3.5
		Bottom	27.4	34.3	6.0	8.8
CH01	7.5	Surface	29.0	12.1	7.2	7.7
		Middle	29.0	13.5	6.4	10.0
		Bottom	28.9	14.5	5.6	20.0
CH02	9.5	Surface	27.3	33.6	5.8	5.8
		Middle	27.1	33.7	5.5	13.0
		Bottom	26.9	34.1	5.4	28.0

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 2 Maximum concentrations of various substances measured in sediment, water, and tissue samples collected from the vicinity of the Georgetown DMDS.

PARAMETER	SEDIMENT	WATER	TISSUE
Oil and grease	CH02 687 mg/kg	DS,DC 4.0 mg/l	ND
Nitrate as NO_3	CS13 533.33 mg/kg	NA	ND
Nitrite as NO_2	CH01 106.28 mg/kg	NA	ND
Total Kjeldahl Nitrogen	DC01 994 mg/kg	NA	ND
Soluble Phosphorus as PO_4	DS03 1.72 mg/kg	NA	ND
Total Phosphorus as PO_4	DC01 53.13 mg/kg	NA	ND
Total Organic Carbon	DC01 0.810% mg/g	NA	ND
Cadmium	ND	CS05 7.1 mg/l	ND
Arsenic	CS13 1.47 μg/g	CS05 92.8 mg/l	DS 2.34 mg/g
Chromium	ND	CS05 5.3 mg/l	ND
Nickel	ND	ND	ND
Copper	DC03 4.02 μg/g	ND	DS 9.65 mg/g
Iron	DC03 15,473 μg/g	ND	ND
Lead	ND	ND	ND
Mercury	DS08 0.61 μg/g	ND	ND
Zinc	CH02 41.04 μg/g	CH01 265 mg/l	DS 53.61 mg/g
Pesticides	ND	ND	ND
Total resolved Hydrocarbons	CS02 8.95 μg/g	CH01 416.63 mg/l	ND

ND - Not Detectable
NA - Not Analyzable

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 3 Comparisons of geochemical analyses of sediments for Georgetown and Charleston Harbor areas.

	GEORGETOWN DMDS				IEC * CHARLESTON ODMDS	SCWMRD ** CHARLESTON HARBOR ODA
	CHANNEL	CONTROL	DISPOSAL	DOWN CURRENT		
PCBs Aroclor 1254 µg/g	ND	ND	ND	ND	0.000492	NA
DDE µg/g	ND	ND	ND	ND	0.000027 - 0.00005	NA
TOC %	0.086 - 0.549	0.047 - 0.529	0.057 - 0.120	0.060 - 0.810	0.05 - 12.5	< 1.0
Oil and grease mg/kg	< 6 - 687	8 - 206	< 6 - 105	< 10 - 507	9 - 63	< 10 - 22
Nitrate as NO_3 mg/kg	57.97 - 278.57	15.44 - 533.33	17.55 - 32.66	50.77 - 392.0	NA	0.2 - 1.9
Nitrite as NO_2 mg/kg	10.0 - 106.28	0.34 - 8.04	0.21 - 81.31	3.96 - 27.45	NA	0.1 - 0.2
Total Kjeldahl Nitrogen mg/kg	40 - 546	29 - 266	20 - 807	31 - 994	NA	< 100 - < 1000
Soluble Phosphorus as PO_4 mg/kg	1.20 - 1.63	0.231 - 1.01	0.849 - 1.72	0.304 - 1.20	NA	< 0.1 - 2.2
Total Phosphorus as PO_4 mg/kg	8.43 - 34.72	8.11 - 15.44	5.82 - 11.26	5.92 - 53.13	NA	700 - 13800
Cadmium µg/g	< 0.1	< 0.1	< 0.1	<0.1	NC	< 0.1 - 0.4
Arsenic µg/g	1.38 - 1.44	0.41 - 1.47	.36 - 1.36	1.07 - 1.38	NA	1.1 - 10.0
Chromium µg/g	1.25 - 14.9	<0.1 - 8.50	1.16 - 2.46	1.22 - 9.05	NA	7.0 - 38.0
Nickel µg/g	<0.5 - 9.95	< 0.5	<0.5 - 5.89	< 0.5	NA	< .5 - 7.3
Copper µg/g	<0.1 - 2.49	<0.1	<0.1 - 1.02	<0.1 - 4.02	NA	8.0 - 27.0
Iron µg/g	5,075 - 15,473	2,175 - 8,308	2,180 - 4,227	3,608 - 11,558	NA	1,800-6,800
Lead µg/g	< 0.5	< 0.5	< 0.5	< 0.5	NC	< 0.5 - 2.5
Mercury µg/g	0.27 - 0.51	0.11 - 0.38	0.08 - 0.61	0.21 - 0.55	0.001 - 0.005	.06 - 1.13
Zinc µg/g	9.60 - 41.04	7.64 - 22.89	5.38 - 11.14	7.83 - 23.77	NA	6.0 - 28.0

* Interstate Electronics Corp. (EPA, 1982)
** South Carolina Wildlife and Marine Resources Dept. (1979)
NA - Not Analyzed
ND - Not Detected; Detection Limit is 50 ppb.
NC - Not Comparable; differing analyses.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

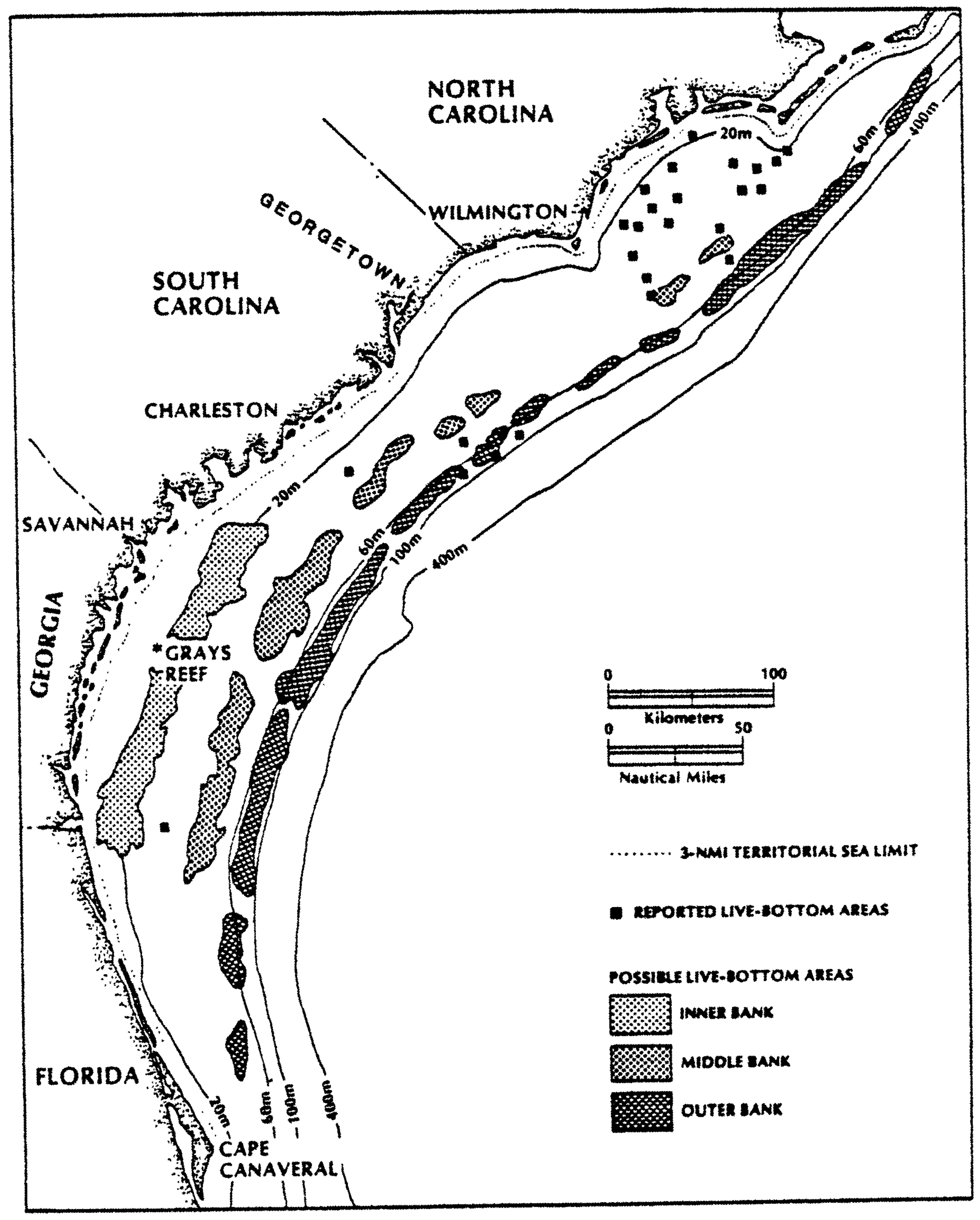

Figure 17 **Reported and Possible Hard-Bottom Areas in the South Atlantic Bight**
Source: NOAA, 1980

Source: Final EIS on Savannah, Charleston, and Wilmington ODMDS designatior

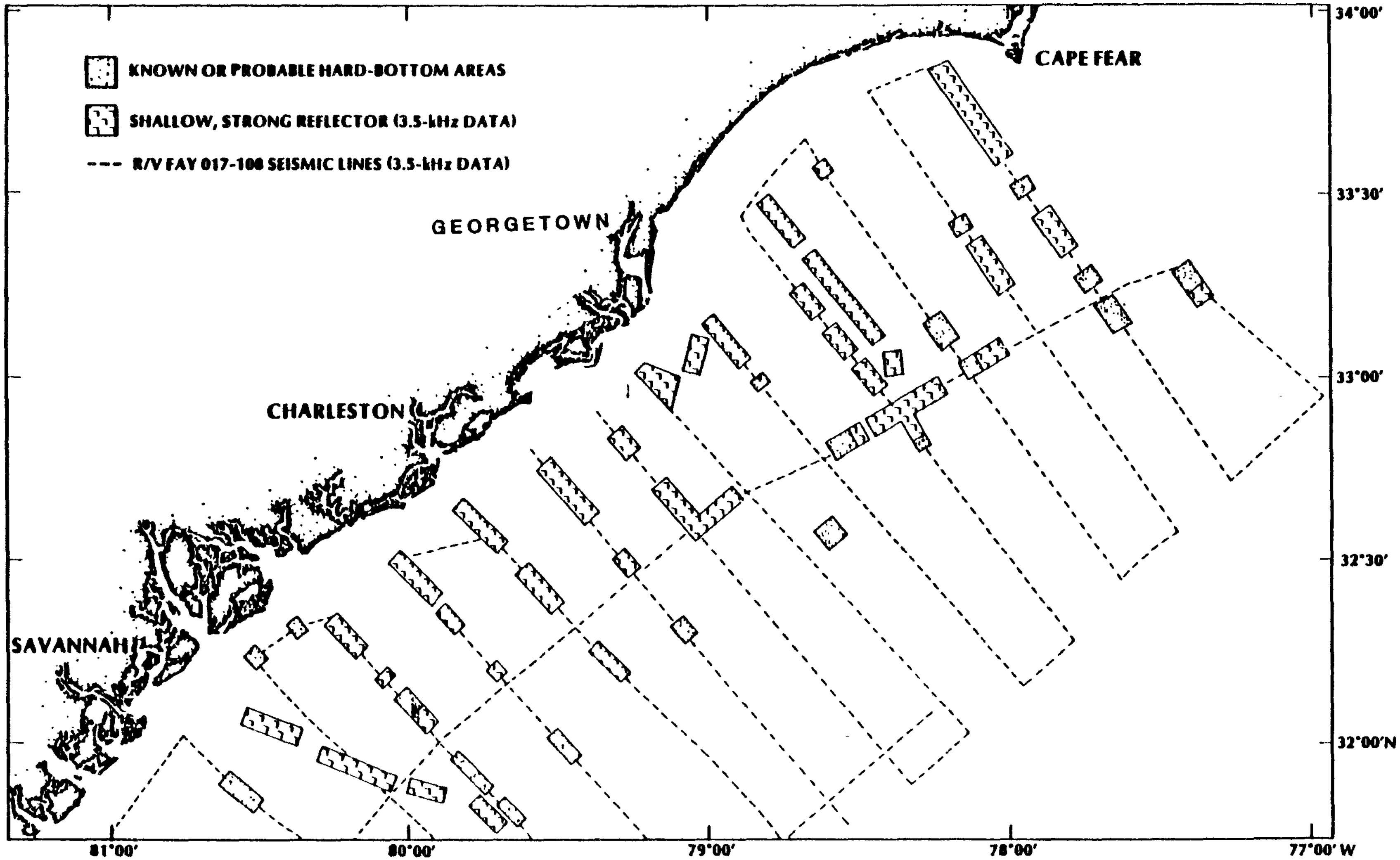

Figure 18 Hard-Bottom Areas of the South Atlantic Bight (identified from side-scan sonar and seismic profile records)
Source: Henry and Giles, 1979

Source: Final EIS on Savannah, Charleston, and Wilmington ODMDS designation

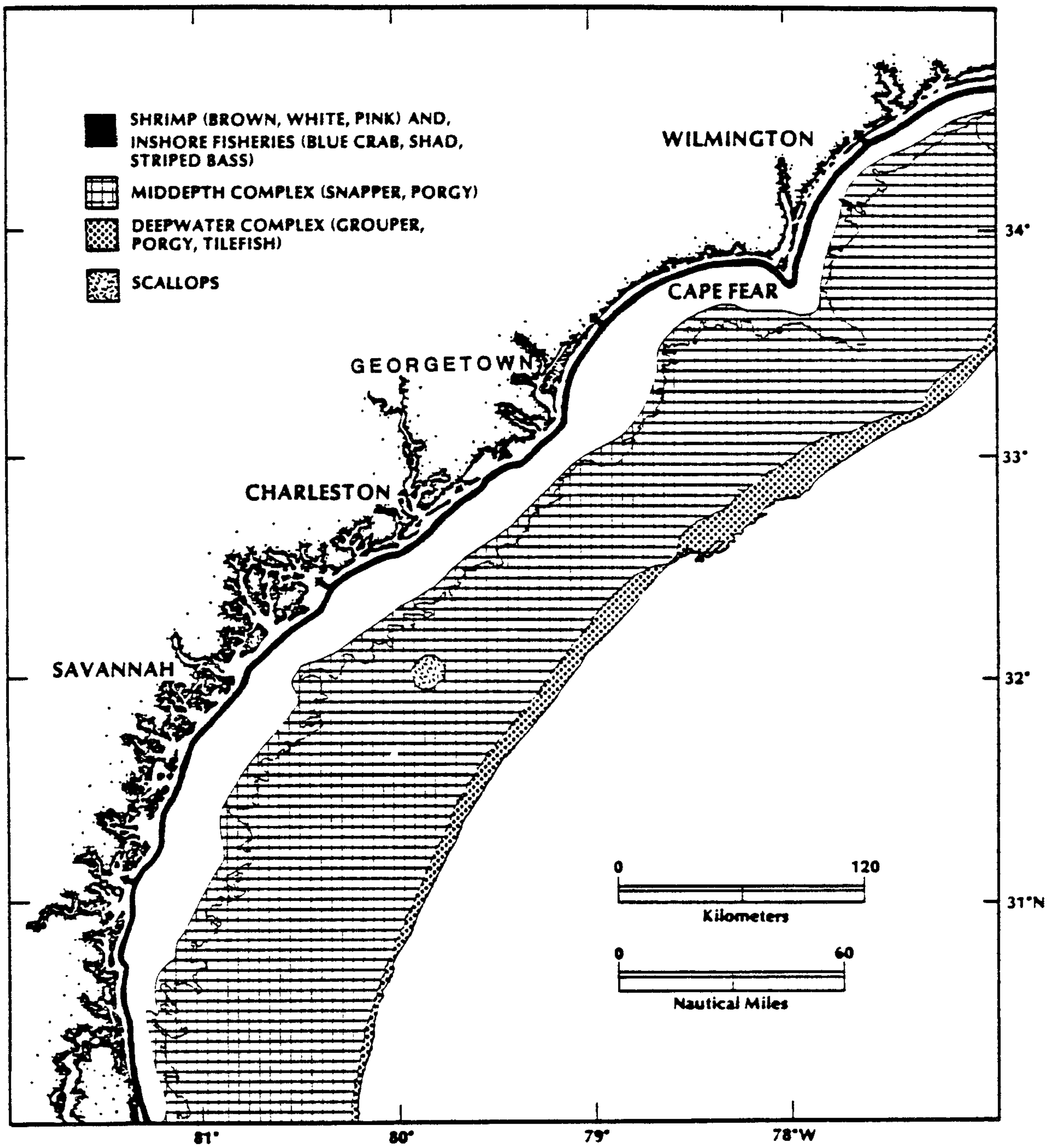

Figure 19 **Fishing Areas in the South Atlantic Bight**
Source: BLM, 1978

Source: Final EIS on Savannah, Charleston, and Wilmington ODMDS designation

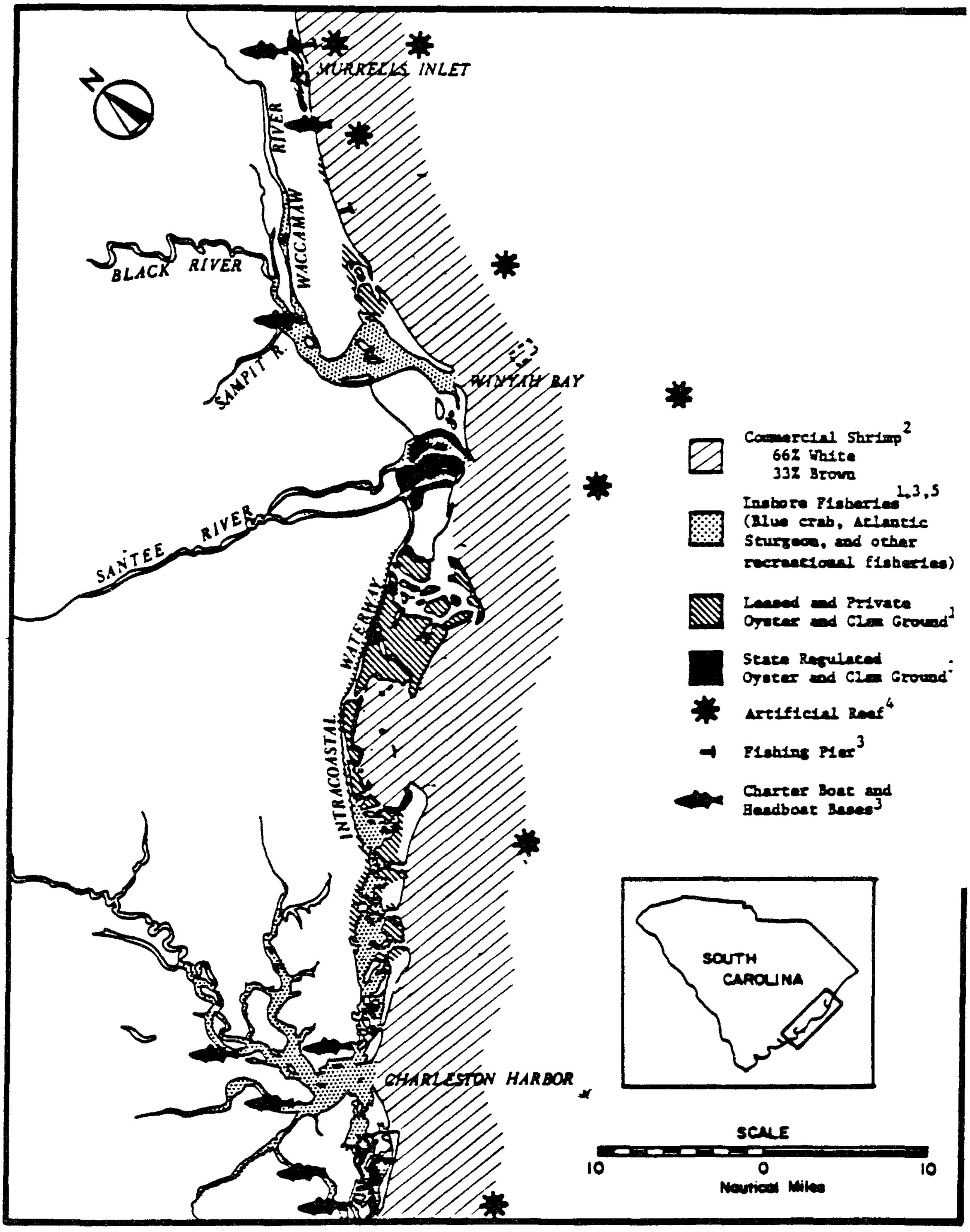

Figure 20 Location of commercial and recreational fisheries resources: [1]Davis, et al., 1980; [2]BLM, 1981; [3]Moore, 1980; [4]Myatt, 1978; [5]Smith, 1983.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

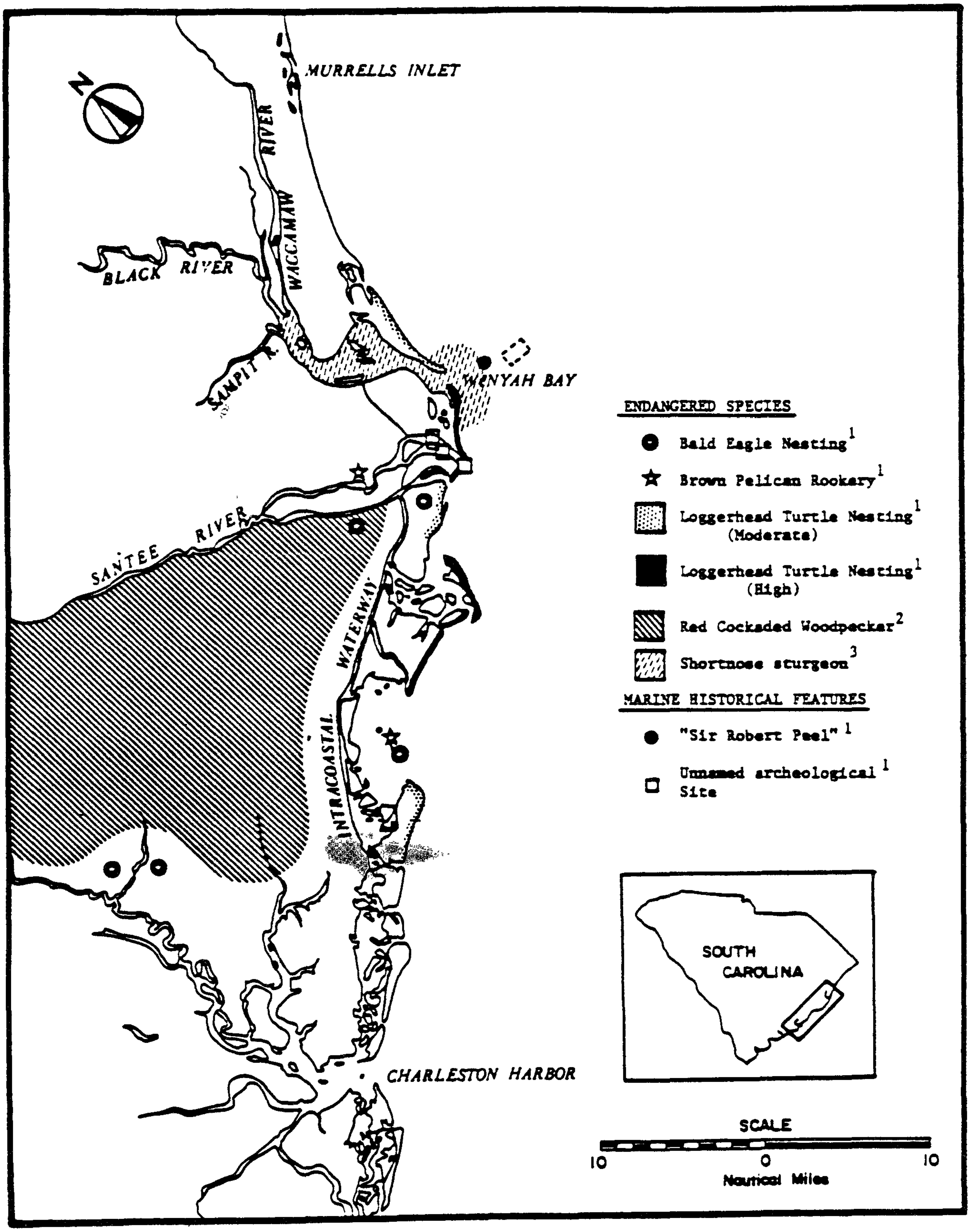

Figure 21 Location of endangered species and marine historical features: [1]Davis, et al., 1980; [2]BLM, 1981; [3]SCWMRD, unpublished.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

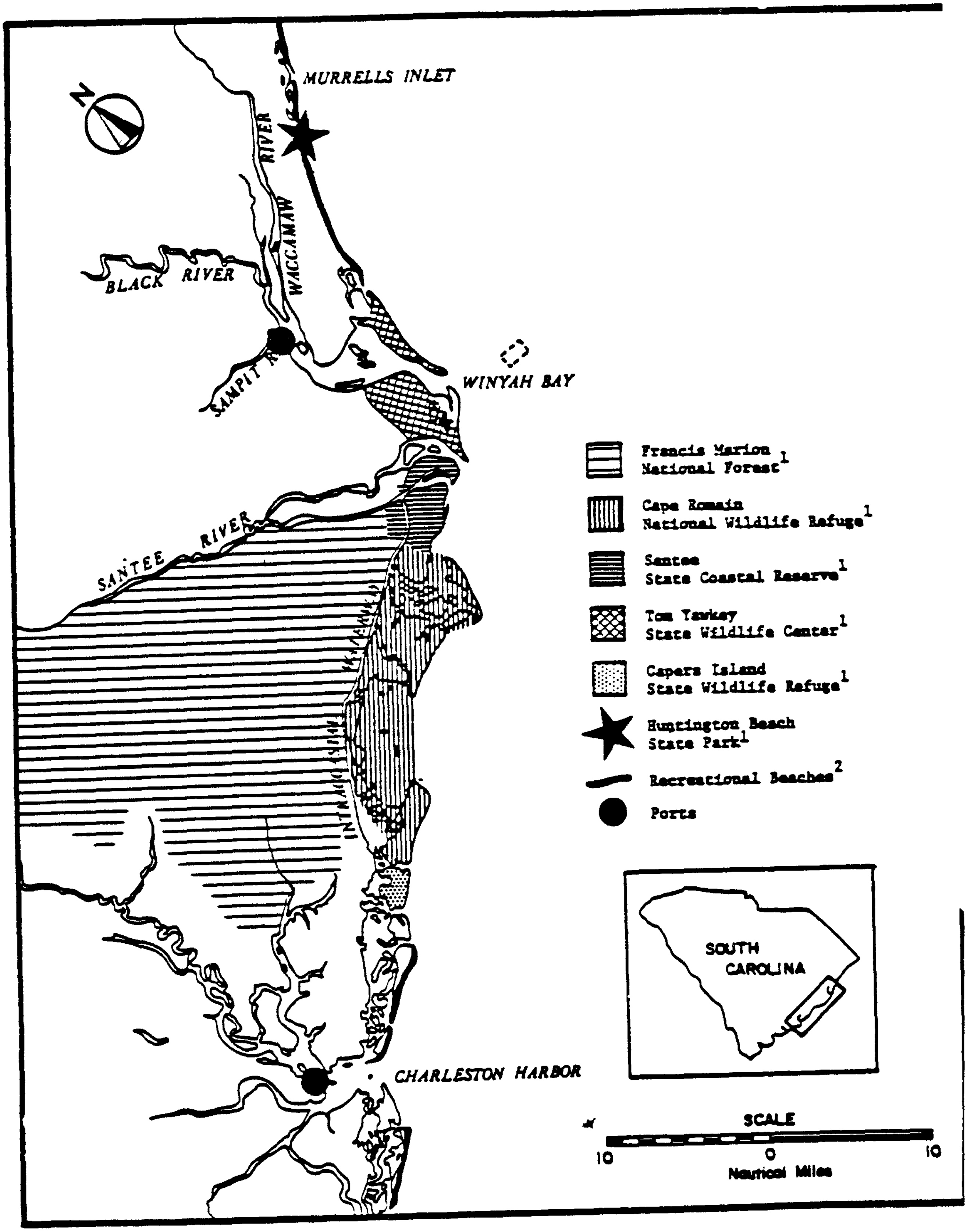

Figure 22 Location of preserves, wildlife centers, beaches and ports: [1]Davis, et al., 1980; [2]BLM, 1981.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

IV. Environmental Consequences

In discussing the environmental consequences of the proposed action (designation of the existing ODMDS) and alternatives, it is necessary to recall that the designation process only recommends ocean sites at which suitable dredged material may be dumped. Actual impacts would accrue when the disposal action occurs according to Section 103 of MPRSA. It is reasonable, therefore, to think of designation as the first step of a two step process. The impacts of disposal might be considered a consequence of site designation. No impacts due to dumping of highly toxic or otherwise unsuitable material will be considered, since such disposal is not permitted by law.

The eleven specific site selection criteria required to be considered by the regulations are presented in the Final EIS. The evaluations of the proposed ODMDS at Georgetown and mid-shelf and shelf break alternatives are generally consistent with that analysis. Further site specific environmental analysis based on the SCWMRD study is provided in the following sections.

The Existing ODMDS

The most notable finding of the detailed study of the existing ODMDS by SCWMRD was that 30 years of disposal failed to produce any observable long-term effects on the bottom contours, sediments, water quality, or benthic communities (See pages Chapter II of this Supplement). No significant long-term consequences are predicted for the continued use of this site if present dredging practices are continued.

Concern has been expressed by SCWMRD for the shrimp and sturgeon fisheries and the endangered loggerhead turtle and shortnose sturgeon, in regard to the location of ocean disposal sites. However, data does not exist to support a conclusion of significant adverse impact from continued use of the existing site. These are mobile species able to avoid direct impact. Also, the site is not large enough to block or greatly hinder sturgeon and shrimp movement into or out of the estuary nor is the site close enough to shore to obstruct female turtle movement on to beaches to nest. The sturgeon tend to gather at the coastal inlets during February and March, with a commercial fishing season from February 15 to April 15. It is possible that disposal operations during this time at the ODMDS could disrupt this fishery. No hard bottom habitat, artificial reefs or shellfishing ground would be impacted by use of this ODMDS. With the possible exception of larval shrimp, none of these species would likely be affected even by disposal of finer-grained materials at the existing site. (See discussion of short-term water quality impacts below.)

Short-term impacts are normally limited to smothering of sessile aquatic organisms by burial, temporary increases in turbidity and the probable introduction of pollutants into the water column. The existing ODMDS was chosen to avoid hard bottoms and other areas where the effects of burial would be severe. The absence of significant impacts attributable to dredging on the sediments and the benthic organisms of the Georgetown ocean site, after repeated use, is evidence that these effects are short term.

Evaluation of the hydrological data collected at the ODMDS site indicates tidal influence on water circulation to be greater than ocean currents, which create predominantly southerly water movement along this area of the coast. Although dredged spoil is expected to be mostly sand fractions, finer particles will be suspended in the water and move toward the beaches or into the inlet under flooding tide conditions. This is not considered a significant adverse impact. It should not present conditions adverse to bather health, but could increase water turbidity at South Island beaches. Closest major recreational beaches are 15 miles north of Winyah Bay. Normal tidal and ocean currents are not strong enough to cause significant shoreward movement of the heavy deposits of dredged spoil. Only extreme storm events provide sufficient energy to redistribute the mass of spoil. The SCWMRD study found no evidence of mounding at the ODMDS.

Short-term effects on water quality were discussed generally in Chapter 4 of the Final EIS incorporated by reference, from which the following is taken: "Wright (1978) concluded that at most dredged material sites increases in turbidity persisted for only a few hours, and, in addition, 'storms, river discharge, and other natural phenomena resulted in turbidity increases of much greater magnitude than those associated with disposal'." This conclusion appears particularly applicable to the Georgetown ODMDS where dredged material is sandy, river discharge is extremely high (Figure 16), tidal currents that flush Winyah Bay are strong, and even normal wave action reaches the bottom sediments. Commercial trawling also creates high turbidity levels, in addition to the direct mortality of shrimp and incidental catches (including loggerhead turtles). Because of the area in which trawling takes place and its duration from May through December, its impacts on turbidity and substrate disturbance are probably much greater than those due to ocean dumping.

Detectable quantities of ammonia are sometimes released during disposal, but due to the sandy nature of the entrance channel material and the strong water mixing, any release would likely be small and quickly diluted. Samples from the channel area have been tested by Jones, Edmunds, and Associates (1979) for a recent harbor entrance channel dredging project. Using chemical bioassay, and bioaccumulation techniques; and chemical analyses of sediments, water and whelk tissue by SCWMRD the tests show the dredged material to be unpolluted relative to surrounding sediments and waters. No significant increase in dissolved metals, chlorinated hydrocarbons, or other contaminants is anticipated if only the entrance channel dredged spoil is placed in the ODMDS.

The likelihood of affecting cultural resources is remote at any of the ocean dump sites but is less at the existing ODMDS, since there is no accumulation of dredged material and little chance of burial. Areas to be dredged are required to be surveyed prior to project activity.

A nearby historical feature, the "Sir Robert Peel" wreck is located just inshore of the ODMDS (Figure 21). Spoil disposed on the proposed site will not impact this resource.

Disposal in the existing ODMDS near the entrance channel would consume less energy than disposal in the alternative sites, and would be the least costly.

There are no known indirect impacts or conflicts between Federal, or state laws and regulations, or local land use plans and any of the alternatives except the upland and inland water sites, which were rejected. Permanent designation of the existing ODMDS site (the proposed action) is believed to be consistent with South Carolina's coastal management program based on correspondence of May 30, 1979 from Duncan C. Newkirk of the South Carolina Coastal Council to William H. Brown, District Engineer for the Corps at Charleston relative to a previous dredging project at Georgetown.

ALTERNATIVES TO THE PROPOSED ACTION

The Nearshore Area, Other than the ODMDS and "Control" Site

Designation and disposal of entrance channel material at other nearshore sites would, at a minimum, result in the same short-term environmental impacts described for the existing ODMDS. In some landward locations, disposal of dredged material might cause significant adverse impacts on loggerhead turtles, shellfish, or other nearshore resources (See Figures 20-21). At other less studied nearshore sites, the impacts of disposal would be similar to those at the existing ODMDS but may be more severe. For example, disposal in an area with different currents or wave action might result in build-up of the material or alteration of a dissimilar substrate, with consequent impacts on benthic organisms. Dumping in nearshore waters which are not as frequently subjected to heavy suspended sediment loads as is the existing ODMDS might affect plankton or other biota in the water column differently. Hauling dredged material even small distances drastically increases consumption of fuel and dredging costs ($175,000 per mile for a typical contract).

Mid-Shelf and Shelf Break Regions

The one sure consequence of designating and using a mid-shelf or shelf break ODMDS in the South Atlantic Bight would be a major increase in dredging costs and consumption of energy due to the extra hauling distance. If one considers 450,000 cubic yards to be a typical dredging contract effort and applies the figure of $0.35/c.y. for hauling material to the mid-shelf and shelf break boundaries listed on page , the increase for an average contract would be between $1,000,000 and $7,000,000 for a mid-shelf site and between $7,000,000 and $10,000,000 for a shelf break site. Additional costs would be required to rig most hopper dredges for operation in offshore waters. The number of accidents and the severity of damage to men and equipment would probably increase, since the hopper would be exposed to a wider range of weather and operating conditions and would not always be able to move quickly to a safe harbor.

Environmental impacts due to ocean dumping at mid-shelf or shelf break areas would be similar to those generally described for the nearshore areas but could be more severe. The chance of inadvertently dumping dredged materials on sensitive hard-bottom areas and the chance of altering bottom sediments are greater. The consequences to benthic organisms of altering sediment texture at mid-shelf and shelf break areas are largely unknown.

None of the alternatives, with the exception of inland water site use, would result in the consumption of natural or depletable resources, other than fuel. However, as described above and in Chapter 2, fuel consumption to transport dredged material to mid-shelf, shelf break, inland, and some nearshore sites was a factor in the rejection of some sites.

Upland Disposal Sites and "Waters of the U.S."

Because of the high costs, equipment difficulties and unavailability of suitable sites, these alternatives were quickly dropped from consideration. A brief discussion of the rationale for their rejection is found in Chapter 2 and is not repeated here. Beach enrichment (deposition) adjacent to the inlet is not desired by the landowners. This alternative would increase potential adverse impact to the loggerhead turtle spawning on the beaches.

Mitigative Measures for the Proposed Project

Use of the proposed ODMDS must comply with the EPA Ocean Dumping Regulations and Criteria. Channel sediment material is tested prior to dredging to determine compliance with the criteria. The tests include toxicity to aquatic organisms and the pollutant's potential for bioaccumulation, and the presence of human pathogens.

Several measures are recommended which will help minimize potential adverse environmental impacts when the Georgetown ODMDS is used.

°Disposal operations should avoid the period of mid-February through May, which is the time of maximum Sturgeon activity at the inlet jetties and adjacent coastal waters.

°Dumping of spoil should be centered within the disposal site to minimze impact outside the designated area. The material will spread out after being dumped. The dredging operator should be required to provide precise Loran-C coordinates to indicate compliance. Additionally, the operator should be required to buoy the center of the site during disposal periods to aid visual monitoring.

°Detailed bathymetric profiles should be obtained for the ODMDS site immediately following a disposal operation, and then again at reasonable intervals to assess mounding and movement of the disposed sediments.

EPA is in the process of evaluating monitoring needs nationwide for the program. There will be subsequent recommendations for monitoring individual sites as a result of this evaluation. In all cases, the EPA requires disposal site monitoring. When conditions are deemed unacceptable, limitations will be placed on the use of the site as necessary to reduce impacts to acceptable levels.

V. PREPARERS AND REVIEWERS OF THE EIS

This Supplement to the Final EIS for Savannah, Charleston, and Wilmington ODMDS designation incorporated, directly or by reference, data, discussions, and certain site rejection rationale from the parent EIS where such information was clearly applicable to the Georgetown ocean area. A list of persons responsible for preparation and review of the parent EIS appears on pages 5-1 through 5-3 of the EIS and is not repeated here.

A study of the existing Georgetown ODMDS and surrounding area was conducted by the South Carolina Wildlife and Marine Resources Department under contract to the Charleston District, Corps of Engineers. The purpose of this study was to collect available information on the conditions and resources in the Georgetown coastal area that might be affected by ocean dumping; to make a site-specific examination of the sediments, water, and benthic communities at the ODMDS and nearby locations; and to assess the impacts of previous disposal at the existing ODMDS. A list of authors follows:

Dr. Robert F. Van Dolah, Marine Scientist with SCWMRD and Principal Investigator for the SCWMRD study

Dr. Michael Katuna, Geologist and Associate Professor, College of Charleston

Mr. David M. Knott, Marine Biologist with SCWMRD

Dr. T.M. Mathews, Marine Scientist with SCWMRD

Dr. E.L. Wenner, Marine Scientist with SCWMRD

Others on the SCWMRD technical staff who contributed significantly to the study were Mr. Martin Levisen and Ms. Caroline O'Rourke.

The organization of the information from various sources into the format of a NEPA Supplement was done by Stephen J. Morrison of the Charleston District, Corps of Engineers. This task included preparation of a Scope of Work and administration of the SCWMRD contact, analysis and summarization of the SCWMRD report, review of the Final EIS for its applicability to the Georgetown Harbor ODMDS, delineation of alternative disposal sites, and development of rationale for permanent ODMDS selection. Mr. Morrison is a biologist and water quality specialist on estuarine and ocean waters.

Staff in EPA, Region IV's Environmental Assessment Branch reviewed and revised the preliminary document written by

Mr. Morrison. They are:

Mr. Reginald G. Rogers, Ecologist and Region IV Coastal Zone Management and Ocean Dumping Coordinator

Mr. F. Theodore Bisterfeld, Life Scientist and Project Officer for EIS Preparation.

EIS Reviewers

The following federal, state and local agencies and private organizations have been supplied the DRAFT Supplement EIS for review.

Federal Agencies and Offices

Council on Environmental Quality
National Oceanic and Atmospheric Administration
Federal Maritime Commission
National Science Foundation
Department of Energy
Federal Emergency Management Agency
Army Corps of Engineers
Department of State
U.S. Coast Guard
Department of the Interior
Advisory Council on Historic Preservation
Department of Health and Human Services

State Agencies

S.C. Ports Authority
S.C. Coastal Council
State Historic Preservation Office
S.C. Department of Health and Environmental Control
S.C. Wildlife and Marine Resources Department
State Archaeologist
State Development Board
S.C. Water Resources Commission
S.C. Division of Administration

Local Agencies

Mayor of Georgetown
Waccamaw Regional Planning and Development Council

Private Organizations

Grice Marine Biological Laboratory
National Audubon Society
National Wildlife Federation
S.C. Wildlife Federation
Belle W. Baruch Institute
Sierra Club
S.C. Environmental Coalition

APPENDIX A

Graphic and Tabular Summaries

of

Beam Trawl Data from the Existing ODMDS

"Control" and "Down Current" Sites

Collected by the

South Carolina Wildlife and Marine Resources Department

During the Winter and Summer of 1983

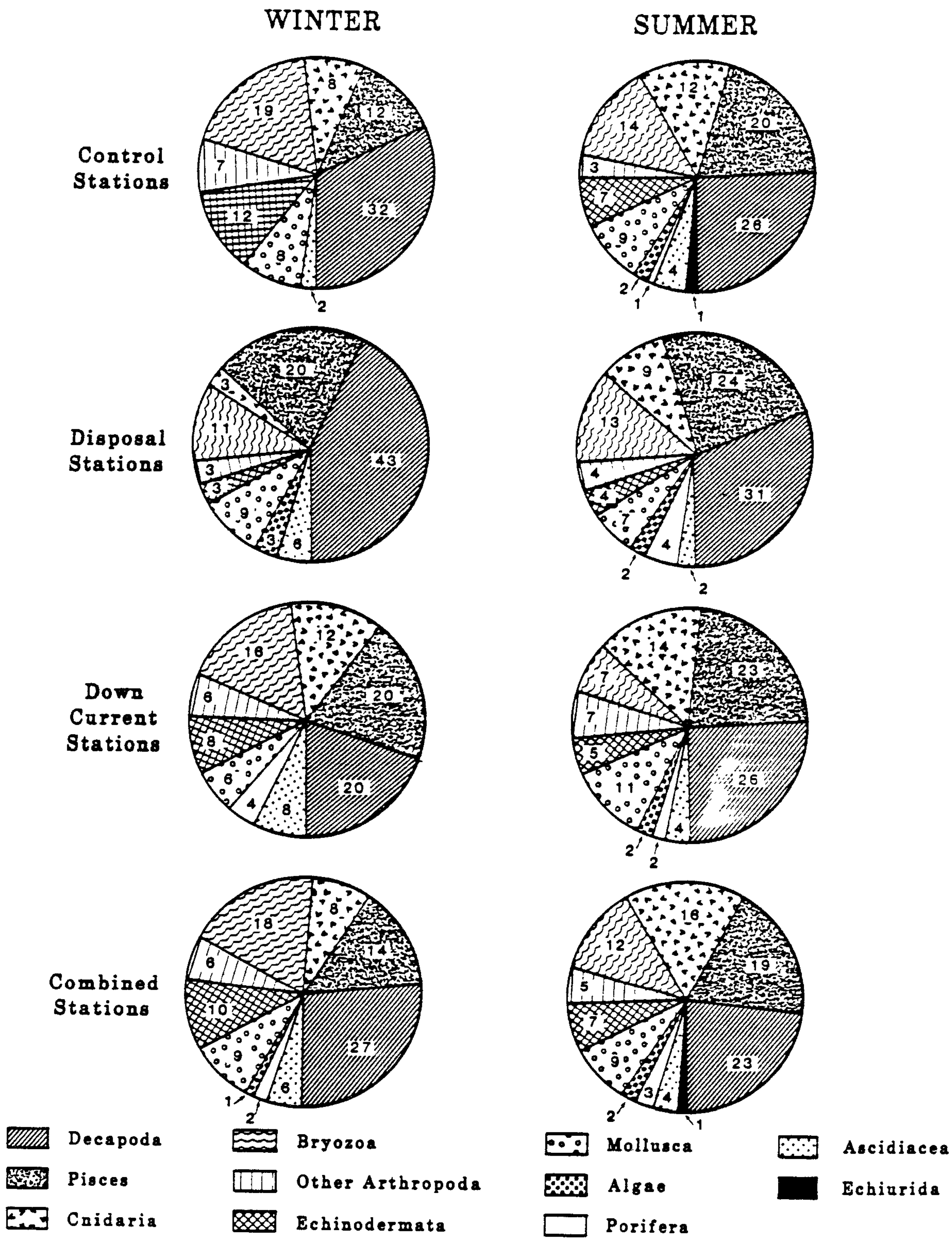

Figure 23 Percentage contribution of major taxa to the species composition of beam trawl collections.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 4 Species ranked according to their frequency of occurrence (F) in ≥ 50% of beam trawl collections. (Cn = Cnidaria, Ch = Chordata, Ar = Arthropoda, Bry = Bryozoa, Ech = Echinodermata, Mo = Mollusca, Po = Porifera, Al = Algae).

CONTROL STATIONS	F	DISPOSAL STATIONS	F	DOWN-CURRENT STATIONS	F	COMBINED STATIONS	F
				WINTER			
Halecium sp. (Cn)	5	Ovalipes stephensoni (Ar)	5	Brevoortia tyrannus (Ch)	3	Ovalipes stephensoni (Ar)	12
Brevoortia tyrannus (Ch)	4	Portunus gibbesii (Ar)	4	Anchoa mitchilli (Ch)	3	Portunus gibbesii (Ar)	11
Ovalipes stephensoni (Ar)	4	Brevoortia tyrannus (Ch)	3	Ovalipes stephensoni (Ar)	3	Halecium sp. (Cn)	11
Portunus gibbesii (Ar)	4	Trachypenaeus constrictus (Ar)	3	Ovalipes ocellatus (Ar)	3	Brevoortia tyrannus (Ch)	10
Membranipora tenuis (Bry)	4	Halecium sp. (Cn)	3	Portunus gibbesii (Ar)	3	Trachypenaeus constrictus (Ar)	8
Parasmittina nitida (Bry)	4			Halecium sp. (Cn)	3	Libinia emarginata (Ar)	7
Trachypenaeus constrictus (Ar)	3			Urophycis regius (Ch)	2	Membranipora tenuis (Bry)	7
Pagurus pollicaris (Ar)	3			Etropus crossotus (Ch)	2		
Libinia emarginata (Ar)	3			Scophthalmus aquosus (Ch)	2		
Asterias forbesii (Ech)	3			Symphurus plagiusa (Ch)	2		
				Trachypenaeus constrictus (Ar)	2		
				Libinia emarginata (Ar)	2		
				Membranipora tenuis (Bry)	2		
				SUMMER			
Pagurus pollicaris (Ar)	5	Ovalipes stephensoni (Ar)	5	Micropogonias undulatus (Ch)	3	Ovalipes stephensoni (Ar)	13
Ovalipes stephensoni (Ar)	5	Prionotus carolinus (Ch)	4	Prionotus carolinus (Ch)	3	Portunus gibbesii (Ar)	11
Calliactis tricolor (Cn)	5	Portunus gibbesii (Ar)	4	Scophthalmus aquosus (Ch)	3	Prionotus carolinus (Ch)	10
Crepidula plana (Mo)	5	Cynoscion regalis (Ch)	3	Penaeus aztecus aztecus (Ar)	3	Pagurus pollicaris (Ar)	10
Crepidula fornicata (Mo)	5	Leiostomus xanthurus (Ch)	3	Pagurus longicarpus (Ar)	3	Mellita quinquesperforata (Ech)	10
Leiostomus xanthurus (Ch)	4	Trachypenaeus constrictus (Ar)	3	Pagurus pollicaris (Ar)	3	Leiostomus xanthurus (Ch)	9
Hepatus epheliticus (Ar)	4	Callinectes similis (Ar)	3	Ovalipes stephensoni (Ar)	3	Balanus venustus (Ar)	9
Portunus gibbesii (Ar)	4	Halecium sp. (Cn)	3	Portunus gibbesii (Ar)	3	Membranipora arborescens (Bry)	9
Balanus venustus (Ar)	4	Mellita quinquesperforata (Ech)	3	Balanus venustus (Ar)	3	Crepidula fornicata (Mo)	9
Astropecten duplicatus (Ech)	4	Membranipora tenuis (Bry)	3	Mellita quinquesperforata (Ech)	3	Scophthalmus aquosus (Ch)	8
Mellita quinquesperforata (Ech)	4			Membranipora arborescens (Bry)	3	Hepatus epheliticus (Ar)	8
Membranipora tenuis (Bry)	4			Crepidula fornicata (Ar)	3	Calliactis tricolor (Cn)	8
Membranipora arborescens (Bry)	4			Raja eglanteria (Ch)	2	Membranipora tenuis (Bry)	8
Prionotus carolinus (Ch)	3			Larimus fasciatus (Ch)	2	Crepidula plana (Mo)	8
Scophthalmus aquosus (Ch)	3			Stellifer lanceolatus (Ch)	2	Micropogonias undulatus (Ch)	7
Symphurus plagiusa (Ch)	3			Symphurus plagiusa (Ch)	2	Penaeus azteus aztecus (Ar)	7
Ovalipes ocellatus (Ar)	3			Tenaciella obliqua (Po)	2	Trachypenaeus constrictus (Ar)	7
Portunus spinimanus (Ar)	3			Trachypenaeus constrictus (Ar)	2	Pagurus longicarpus (Ar)	7
Callinectes sapidus (Ar)	3			Hepatus epheliticus (Ar)	2	Ovalipes ocellatus (Ar)	7
Squilla empusa (Ar)	3			Ovalipes ocellatus (Ar)	2	Lolliguncula brevis (Mo)	7
Hydractinia echinata (Cn)	3			Arenaeus cribrarius (Ar)	2		
Astrangia astreiformis (Cn)	3			Leiostomus xanthurus (Ch)	2		
Arbacia punctulata (Ech)	3			Callinectes sp. (Ar)	2		
Parasmittina nitida (Mo)	3			Calliactis tricolor (Cn)	2		
Reptadeonella hastingsae (Mo)	3			Crepidula plana (Mo)	2		
Lolliguncula brevis (Mo)	3			Lolliguncula brevis (Mo)	2		
				Sargassum natans (Al)	2		

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

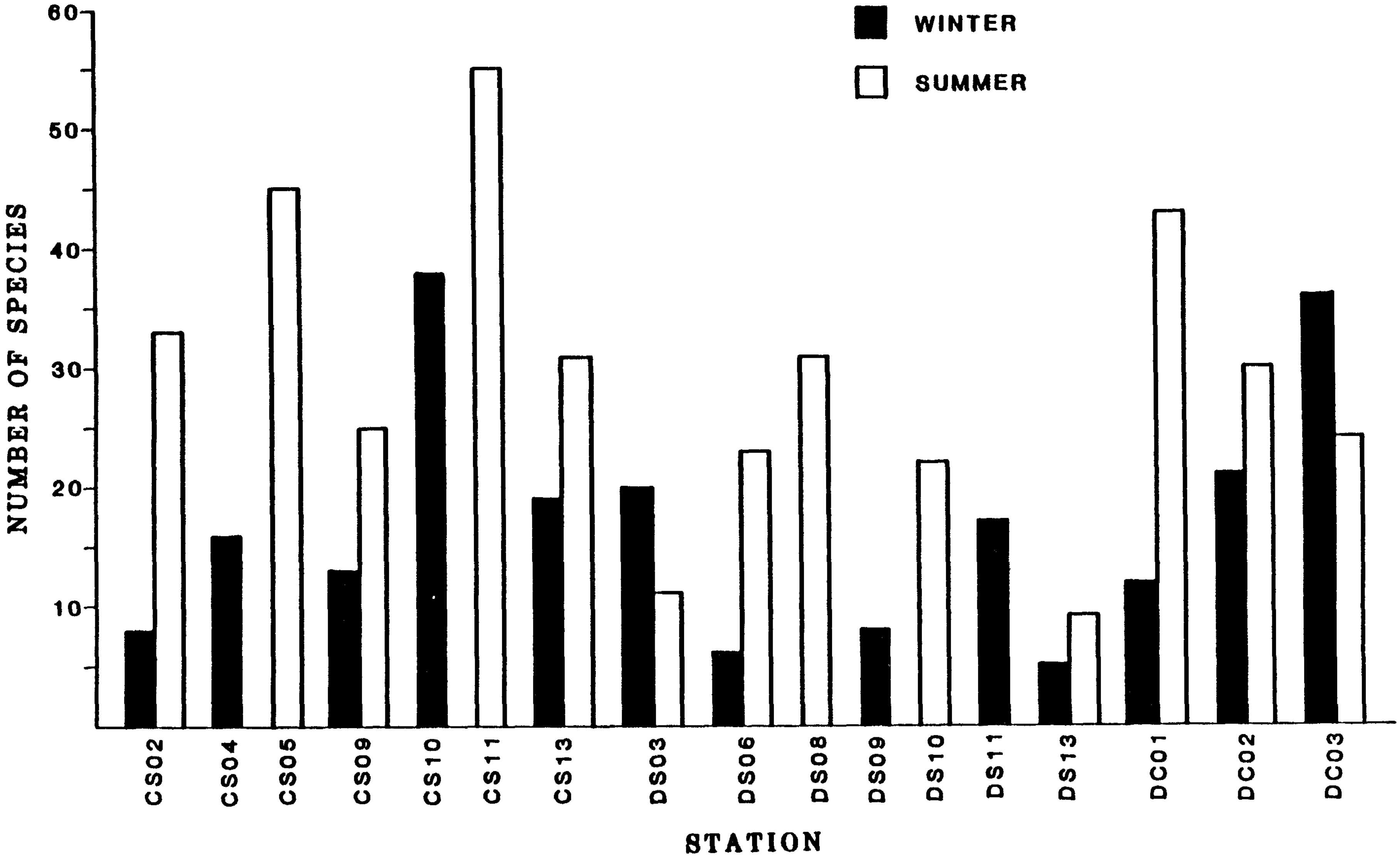

Figure 24 Number of species collected at each station by beam trawl.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 5 Species groups resulting from numerical classification of data from samples collected by beam trawl. (Al = Algae; Ar = Arthropoda; Bry = Bryozoa; Ch = Chordata; Cn = Cnidaria; Ech = Echinodermata; Mo = Mollusca; Po = Porifera).

Group A

- Pilumnus sayi (Ar)
- Telesto fruticulosa (Cn)
- Actiniaria A (Cn)
- Asterias forbesii (Ech)
- Squilla empusa (Ar)
- Urophycis regius (Ch)
- Busycon carica (Mo)

Group B

- Cancer irroratus (Ar)
- Neopanope sayi (Ar)
- Aplidium constellatum (Ch)

Group C

- Hippoporina contracta (Bry)
- Hippaliosina rostrigera (Bry)
- Centropristis striata (Ch)
- Lytechinus variegatus (Ech)
- Asteroidea A (Ech)
- Arbacia punctulata (Ech)
- Astropecten duplicatus (Ech)
- Busycon canaliculata (Mo)

Group D

- Reptadeonella hastingsae (Bry)
- Parasmittina nitida (Bry)
- Portunus spinimanus (Ar)
- Membranipora tenuis (Bry)
- Astrangia astreiformis (Cn)
- Etropus crossotus (Ch)
- Schizoporella errata (Bry)
- Hippoporina verrilli (Bry)
- Chama macerophylla (Mo)
- Electra monostachys (Bry)

Group E

- Micropogonias undulatus (Ch)
- Arenaeus cribrarius (Ar)
- Pagurus longicarpus (Ar)
- Cynoscion regalis (Ch)
- Callinectes similis (Ar)
- Hepatus epheliticus (Ar)
- Larimus fasciatus (Ch)
- Penaeus aztecus aztecus (Ar)
- Stellifer lanceolatus (Ch)
- Sclerodactyla briareus (Ech)
- Sargassum natans (Al)
- Aplidium sp. (Ch)
- Rhinoptera bonasus (Ch)

Group F

- Mellita quinquesperforata (Ech)
- Prionotus carolinus (Ch)
- Pagurus pollicaris (Ar)
- Membranipora arborescens (Bry)
- Balanus venustus (Ar)
- Crepidula plana (Mo)
- Calliactis tricolor (Cn)
- Crepidula fornicata (Mo)
- Leiostomus xanthurus (Ch)

Group G

- Symphurus plagiusa (Ch)
- Ovalipes ocellatus (Ar)
- Scophthalmus aquosus (Ch)
- Brevoortia tyrannus (Ch)
- Anchoa mitchilli (Ch)
- Ovalipes stephensoni (Ar)
- Portunus gibbesii (Ar)
- Trachypenaeus constrictus (Ar)
- Libinia emarginata (Ar)
- Halecium sp. (Cn)

Group H

- Tenaciella obliqua (Po)
- Trinectes maculatus (Ch)
- Ascidiacea A (Ch)
- Limulus polyphemus (Ar)
- Epizoanthus americanus (Cn)

Group I

- Raja eglanteria (Ch)
- Hexapanopeus angustifrons (Ar)
- Acetes americanus (Ar)
- Persephona mediterranea (Ar)
- Citharichthys macrops (Ch)
- Callinectes sapidus (Ar)
- Porcellana sayana (Ar)

Group J

- Lolliguncula brevis (Mo)
- Hydractinia echinata (Cn)
- Penaeus setiferus (Ar)
- Menippe mercenaria (Ar)

Group K

- Microporella ciliata (Bry)
- Polinices duplicatus (Mo)
- Ancylopsetta quadrocellata (Ch)
- Trypostega venusta (Bry)
- Eupleura caudata (Mo)

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

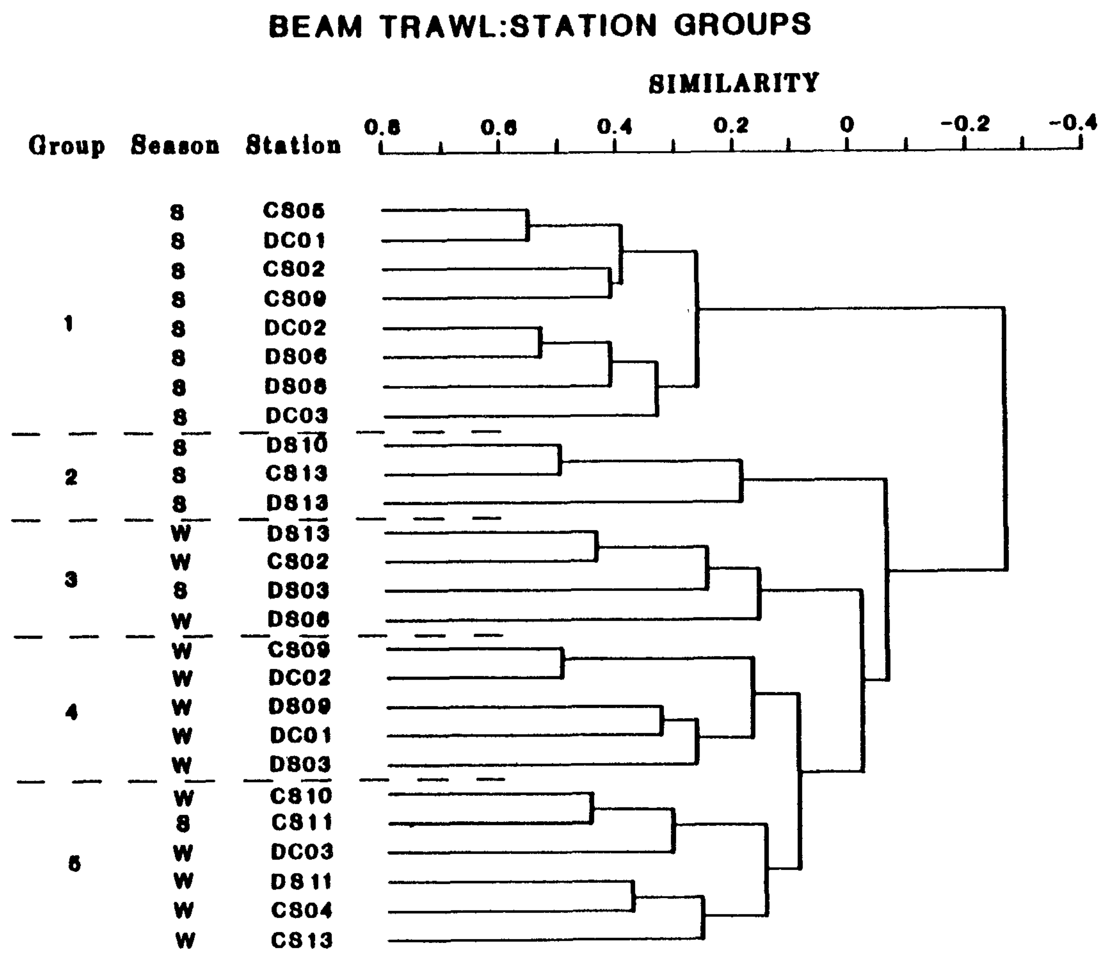

Figure 25 Normal cluster dendrogram showing station groups formed using the Jaccard similarity coefficient and flexible sorting of beam trawl collections.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

BEAM TRAWL:NODAL DIAGRAMS

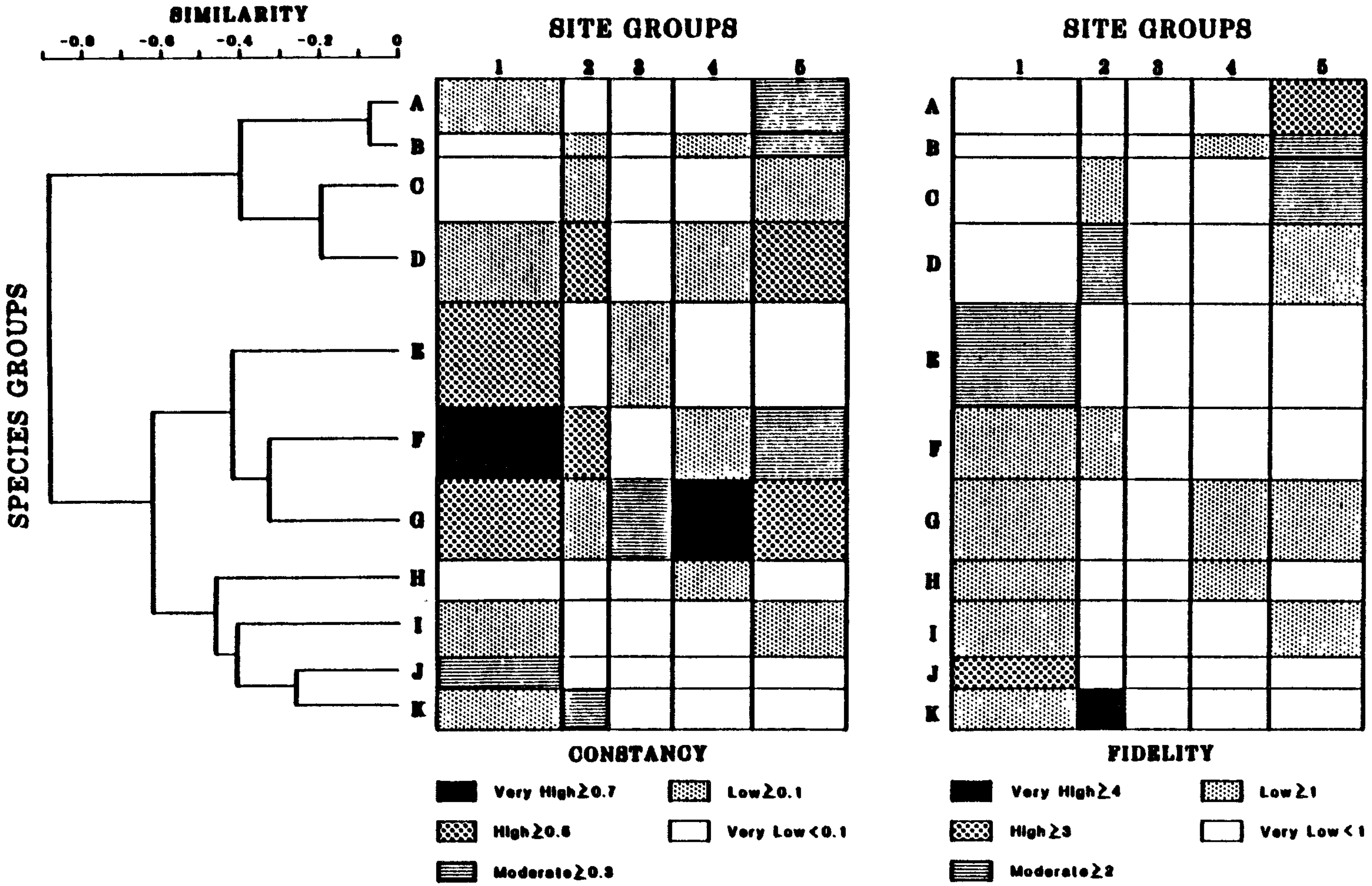

Figure 26 Inverse classification hierarchies and nodal diagram showing constancy and fidelity of station - species group coincidence based on beam trawl collections.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

APPENDIX B

Graphic and Tabular Summaries

of

Benthic Grab Samples From the Existing ODMDS,

"Control" and "Down Current" Sites

Collected by the

South Carolina Wildlife and Marine Resources Department

During the Winter and Summer of 1983

Table 6 Number of species representing each of the major macroinvertebrate taxa in grab samples from control, disposal, and "down current" sites. (* indicates a taxon that was probably represented by more species than indicated due to uncertain or incomplete identifications).

Taxa	CONTROL STATIONS Number of Species	CONTROL STATIONS Rank	DISPOSAL STATIONS Number of Species	DISPOSAL STATIONS Rank	DOWN CURRENT STATIONS Number of Species	DOWN CURRENT STATIONS Rank	COMBINED STATIONS Number of Species	COMBINED STATIONS Rank
Polychaeta	116	1	94	1	58	1	152	1
Amphipoda	37	2	22	3	16	2.5	42	2.5
Pelecypoda	30	4	30	2	16	2.5	42	2.5
Gastropoda	31	3	12	5	7	5	36	4
Decapoda	29	5	16	4	12	4	33	5
Echinodermata	7	6	5	7	2	7	9	6
Isopoda	4	9.5	6	6	1	16	7	7
Mysidacea	5	7	4	8	3	6	5	8
Sipunculida*	4	8	3	9	1	16	4	9
Cumacea	4	9.5	1	20.5	1	16	4	10
Anthozoa*	3	11	2	11	1	95	3	11
Bryozoa	2	13	3	10	1	16	3	12
Hemichordata*	2	13	1	20.5	1	16	2	13
Scaphapoda	2	13	-	-	-	-	2	14
Nemertina*	1	17	1	14	1	9.5	1	15
Oligochaeta*	1	17	1	14	1	9.5	1	16
Turbellaria*	1	17	1	14	-	-	1	17
Nematoda*	1	17	1	14	1	9.5	1	18
Ostracoda*	1	17	1	14	1	16	1	19
Tanaidacea	-	-	1	20.5	-	-	1	20
Ascidiacea	1	23	1	20.5	1	16	1	21
Brachiopoda	1	23	1	20.5	-	-	1	22
Cephalochordata	1	23	1	20.5	1	16	1	23
Stomatopoda	1	23	1	20.5	-	-	1	24
Echiurida	1	23	-	-	1	16	1	25
Pycnogonida	1	23	1	20.5	-	-	1	26
Phoronida	1	23	-	-	-	-	1	27
Total	288		210		127		357	

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 7 Number of individuals representing each of the major macroinvertebrate taxa in grab samples from control, disposal, and "down current" sites. (* = bryozoans were not enumerated in winter samples).

Taxa	CONTROL STATIONS Total Number	Rank	DISPOSAL STATIONS Total Number	Rank	DOWN CURRENT STATIONS Total Number	Rank	COMBINED STATIONS Total Number	Rank
Pelecypoda	2337	2	3197	1	893	1	6427	1
Polychaeta	3159	1	1031	3	550	2	4740	2
Amphipoda	1490	3	330	5	81	4	1901	3
Bryozoa*	204	11	1198	2	247	3	1649	4
Ascidiacea	255	8	498	4	64	6	817	5
Nematoda	498	4	88	9	67	5	653	6
Decapoda	421	5	109	7	50	7	580	7
Echinodermata	309	6	76	10	24	11	409	8
Sipunculida	245	9	151	6	10	13	406	9
Nemertinea	271	7	74	11	46	8	391	10
Oligochaeta	196	12	93	8	31	9	320	11
Gastropoda	239	10	27	14	16	12	282	12
Cumacea	113	13	26	15	2	17	141	13
Anthozoa	105	14	10	18	4	16	119	14
Isopoda	23	16	51	12	26	10	100	15
Mysidacea	43	15	47	13	7	14.5	97	16
Turbellaria	18	17	2	21	-	-	20	17
Tanaidacea	-	-	18	16	-	-	18	18
Cephalochordata	3	21	12	17	1	19	16	19
Hemichordata	3	21	3	19	7	14.5	13	20
Ostracoda	7	18	2	21	1	19	10	21
Stomatopoda	5	19	1	23.5	-	-	6	22
Brachiopoda	3	21	2	21	-	-	5	23
Echiurida	2	23.5	-	-	1	19	3	24
Pycnogonida	1	25.5	1	23.5	-	-	2	25.5
Scaphapoda	2	23.5	-	-	-	-	2	25.5
Phoronida	1	25.5	-	-	-	-	1	27
Total	9953		7047		2128		19128	

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

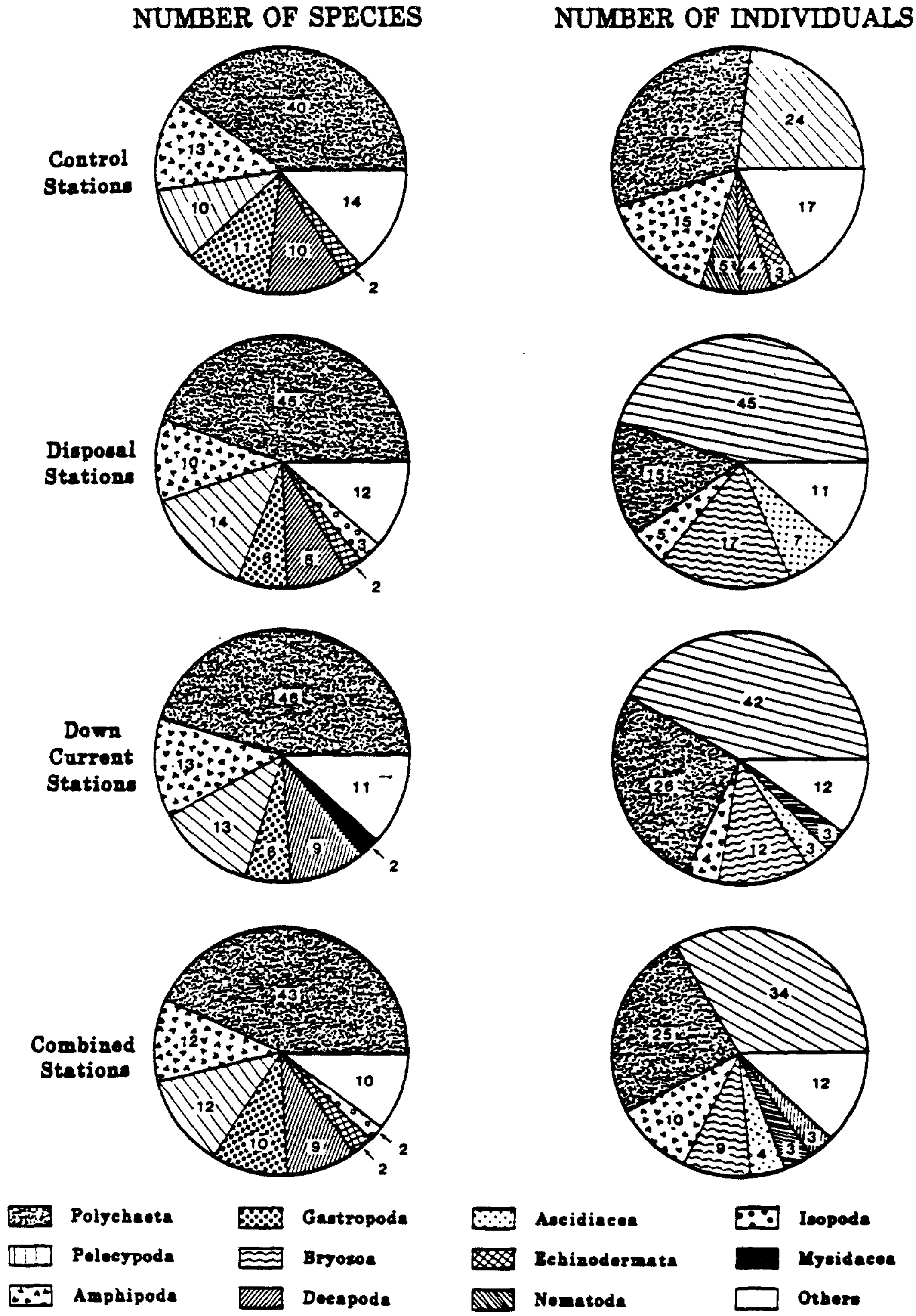

Figure 27 Percentage contribution of major taxa to the number of species and number of individuals in grab samples from control, disposal, and "down current" sites.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 8 Relative abundance of the ten dominant species at each site during each season. FT indicates the feeding type of each species (C = carnivore, D = deposit feeder, O = omnivore, S = suspension-feeder) and the numerical values represent the percentage contribution of each species to the total number at that site in a particular season.

CONTROL STATIONS			DISPOSAL STATIONS			DOWN-CURRENT STATIONS			COMBINED STATIONS		
FT	%	Species Name	FT	%	Species Name	FT	%	Species Name	FT	%	Species Name
						WINTER					
S	13.9	Ensis directus	S	40.6	Ensis directus	S	60.9	Ensis directus	S	26.2	Ensis directus
S	6.8	Crassinella lunulata	S	18.1	Crassinella martinencia	?	11.1	Polygordiidae A	S	6.8	Crassinella martinicensis
D	6.1	Batea catharinensis	S	5.9	Pleuromeris tridentata	C,D	5.1	Nematoda	S	5.0	Crassinella lunulata
S	5.7	Erichthonius brasiliensis	S	3.3	Sabellaria vulgaris	C	2.1	Nemertinea	?	4.6	Polygordiidae A
?	4.7	Polygordiidae A	S	3.1	Pyura vittata	D	1.5	Polycirrus eximius	D	3.8	Batea catharinensis
C,D	3.7	Nematoda	S	2.7	Crassinella lunulata	C	1.4	Nephtys picta	S	3.7	Erichthonius brasiliensis
S	3.2	Crassinella martinicensis	D	2.3	Acanthohaustorius millsi	S	1.2	Sabellaria vulgaris	C,D	3.3	Nematoda
C	3.0	Nemertinea	C,D	1.6	Nematoda	O	1.2	Ancinus depressus	C	2.5	Nemertinea
D	2.6	Aspidosiphon gosnoldi	?	1.4	Polygordiidae A	C	0.8	Glycera sp. A	D	2.0	Aspidosiphon gosnoldi
O	2.3	Exogone dispar	D	1.3	Aspidosiphon gosnoldi	D	0.8	Nerinides unidentata	S	1.8	Pyura vittata
						SUMMER					
C,D	7.4	Nematoda	S	25.8	Cupuladria doma	S	26.9	Cupuladria doma	S	17.6	Cupuladria doma
D	6.4	Mediomastus californiensis	S	21.9	Crassinella martinicensis	S	6.8	Ensis directus	S	12.5	Crassinella martinicensis
S	6.2	Ensis directus	S	9.5	Pyura vittata	S	6.3	Pyura vittata	S	7.2	Pyura vittata
S	4.9	Crassinella lunulata	S	3.5	Sabellaria vulgaris	D	5.8	Paraprionospio pinnata	S	3.8	Ensis directus
D	4.9	Paraprionospio pinnata	S	3.4	Crassinella lunulata	S	2.8	Crassinella martinicensis	S	3.7	Crassinella lunulata
S	4.9	Cupuladria doma	D	2.3	Aspidosiphon gosnoldi	D	2.7	Magelona phyllisae	D	3.5	Mediomastus californiensis
S	4.5	Pyura vittata	S	2.1	Pleuromeris tridentata	D	2.7	Oligochaeta	C,D	3.5	Nematoda
S	3.4	Crassinella martinicensis	D	1.9	Oligochaeta	C	2.4	Nephtys picta	D	2.6	Paraprionospio pinnata
D	2.8	Oligochaeta	S	1.8	Discoporella umbellata	S	2.4	Sabellaria vulgaris	S	2.4	Sabellaria vulgaris
O	2.5	Amphiodia pulchella	D	1.7	Mediomastus californiensis	C	2.3	Nemertinea	D	2.3	Oligochaeta

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

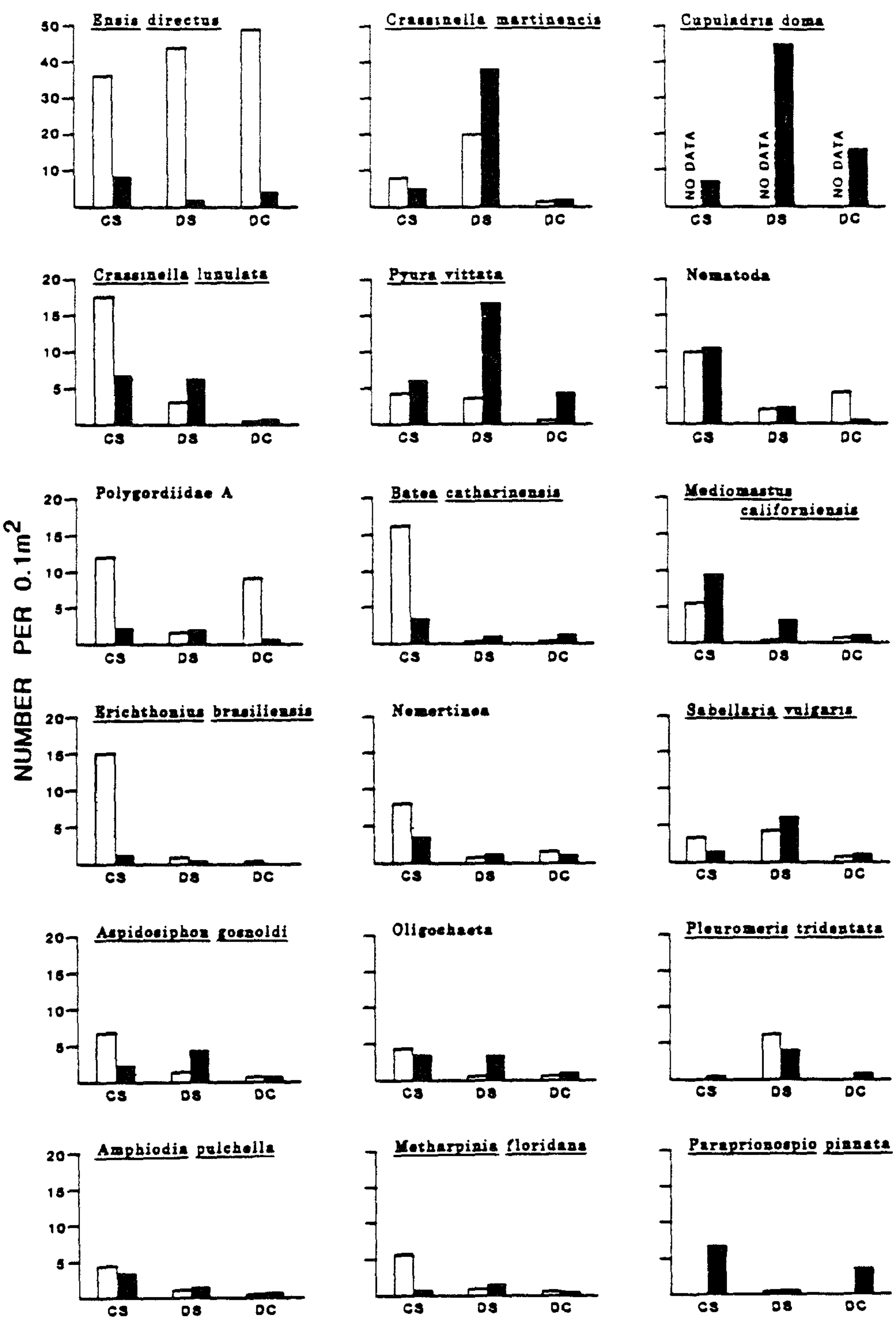

Figure 28 Comparison of the mean density of dominant macroinvertebrates from grab samples at control (CS), disposal (DS), and "down current" (DC) sites. Only species represented by more than 1% of the total number of individuals are included. (Open bars are winter, solid bars are summer).

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 9 Mean density of the dominant macroinvertebrates at control, disposal, and "down current" sites during each season. Values are the number of individuals per 0.1 m^2.

	CONTROL STATIONS		DISPOSAL STATIONS		DOWN CURRENT STATIONS	
	WINTER Mean Density	SUMMER Mean Density	WINTER Mean Density	SUMMER Mean Density	WINTER Mean Density	SUMMER Mean Density
Ensis directus	36.4	8.6	44.1	2.1	49.2	4.1
Crassinella martinicensis	8.4	4.7	19.7	38.0	0.6	1.7
Cupuladria doma	no data	6.8	no data	44.8	no data	16.5
Crassinella lunulata	17.9	6.8	2.9	5.9	0.1	0.2
Pyura vittata	3.9	6.3	3.4	16.6	0.4	3.9
Nematoda	9.6	10.3	1.7	1.8	4.1	0.3
Polygordiidae A	12.3	2.1	1.5	1.6	8.9	0.5
Batea catharinensis	15.9	2.9	t	0.8	0.1	1.1
Mediomastus californiensis	5.4	8.8	0.1	2.9	0.4	1.0
Erichthonius brasiliensis	15.0	1.6	0.4	0.2	0.2	0
Nemertinea	7.9	2.9	1.4	1.6	1.7	1.4
Sabellaria vulgaris	2.9	1.4	3.6	6.0	1.0	1.5
Aspidosiphon gosnoldi	6.8	2.2	1.4	4.0	0.3	0.3
Oligochaeta	4.0	3.8	0.4	3.3	0.4	1.7
Pleuromeris tridentata	0	0.2	6.4	3.7	0	0.5
Amphiodia pulchella	4.1	3.5	0.7	1.0	0.3	0.5
Metharpinia floridana	5.5	0.7	1.2	1.5	0.2	0.1
Paraprionospio pinnata	0	6.8	t	0.2	0	3.5

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

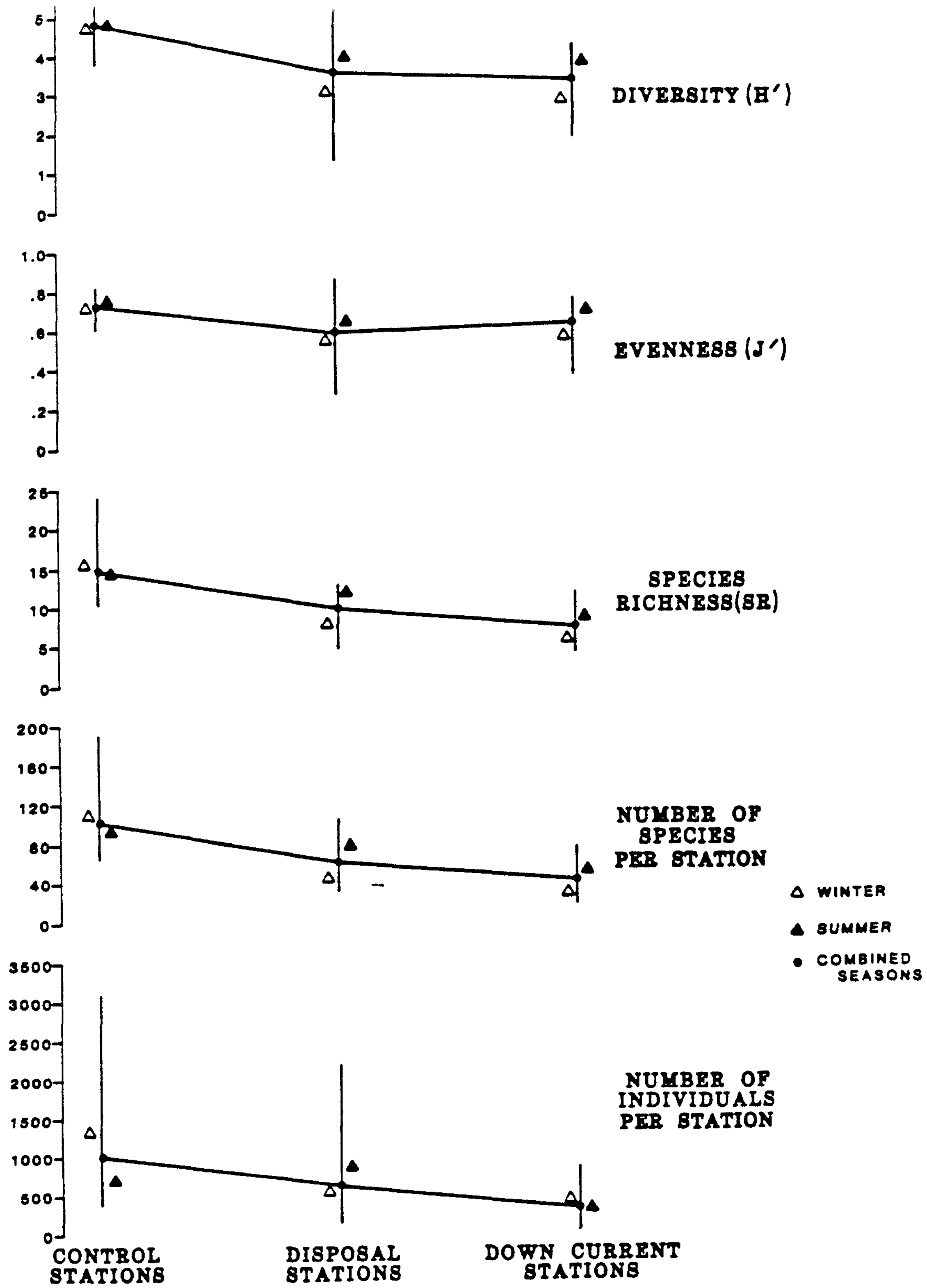

Figure 29 Average values of several community structure parameters at control, disposal, and "down current" sites. The vertical bars indicate the range of values for each site.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

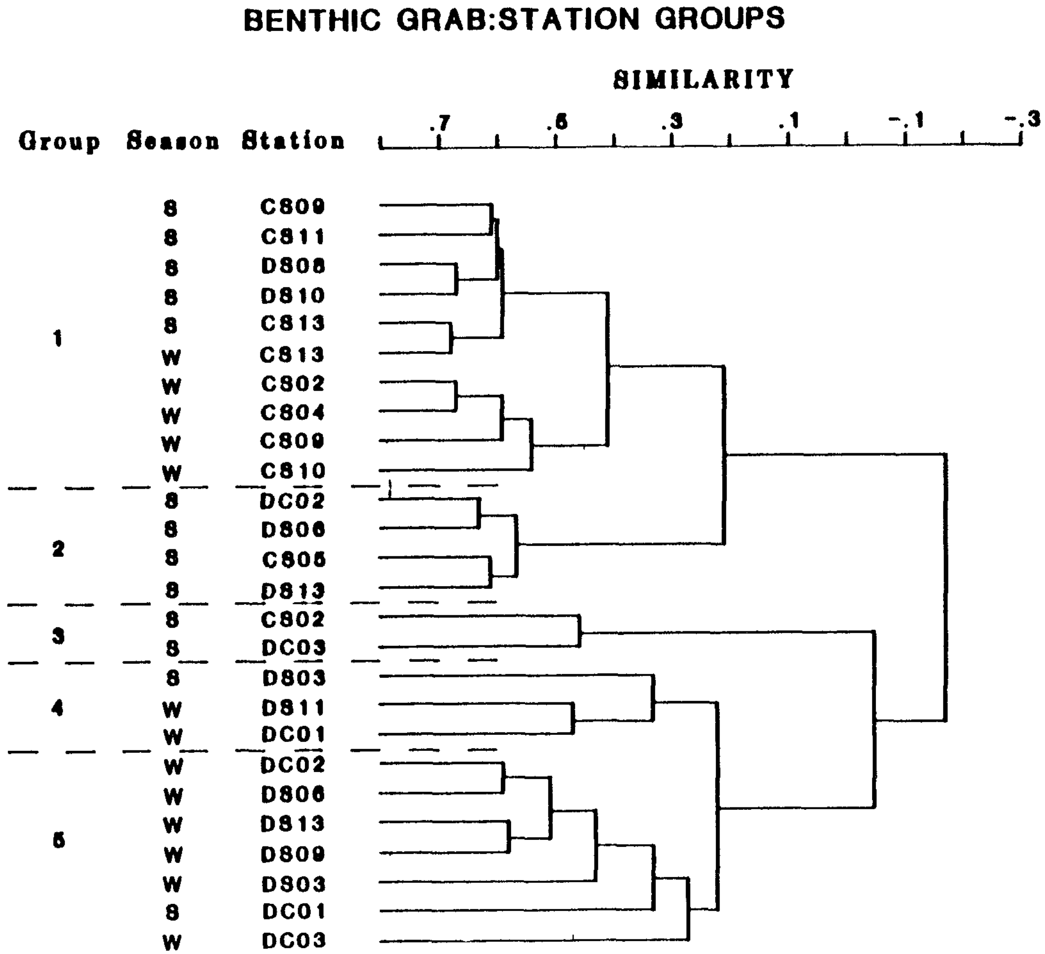

Figure 30 Normal cluster dendrogram of benthic grab samples showing the five station groups formed using flexible sorting.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

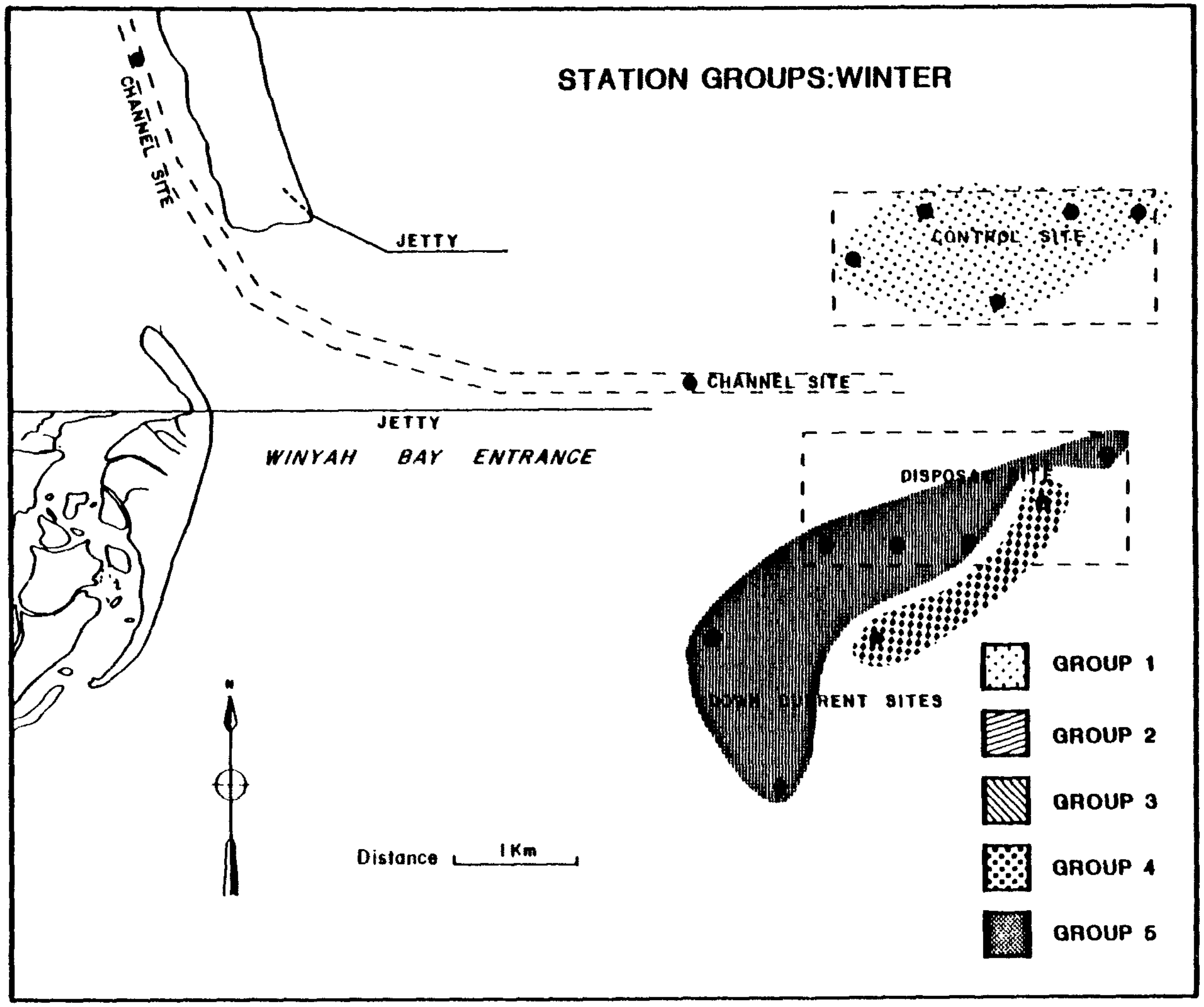

Figure 31 Location of the winter samples among station groups resulting from normal cluster analysis. See Figure 22 for levels of similarity.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

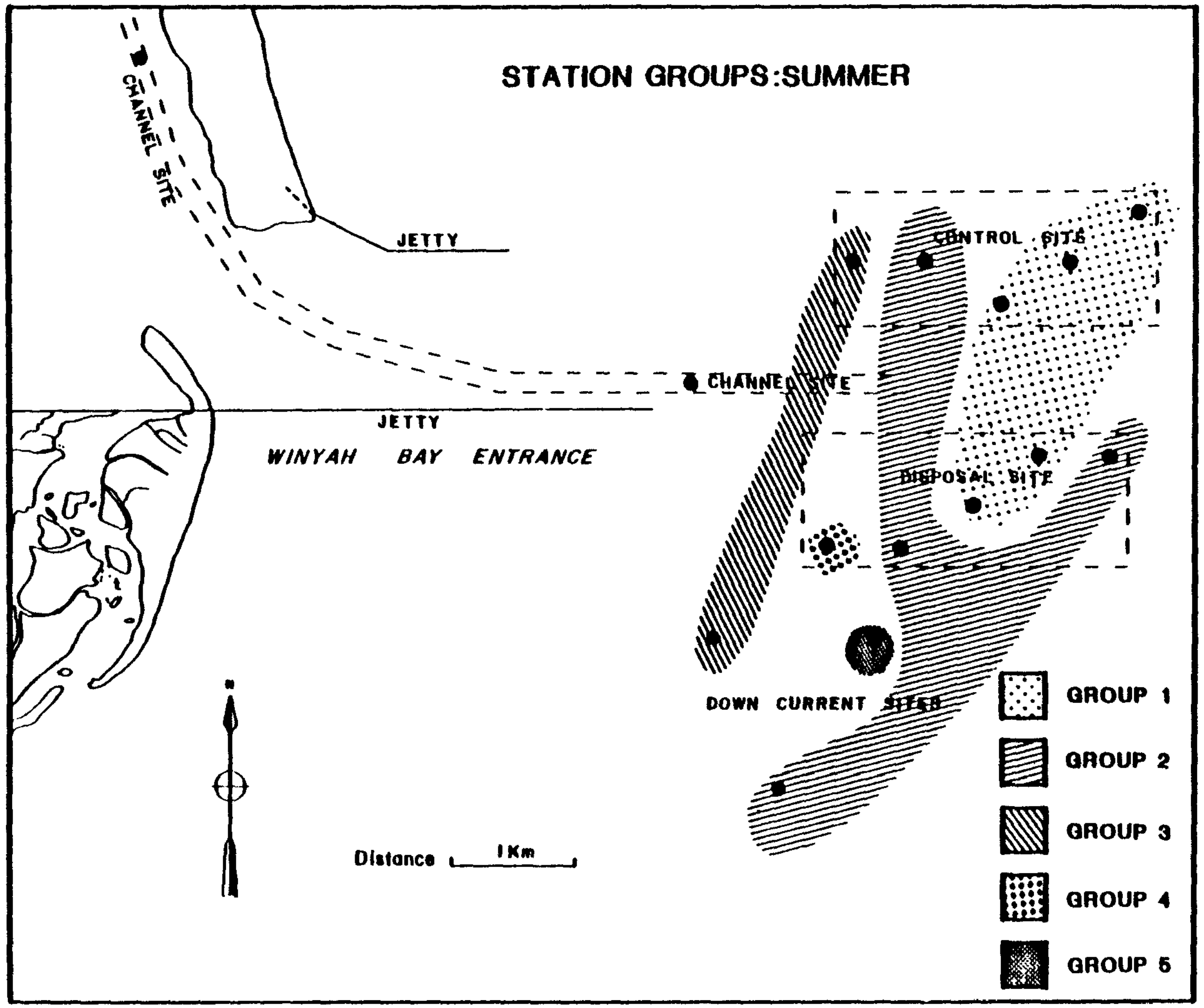

Figure 32 Location of the summer samples among station groups resulting from normal cluster analysis. See Figure 22 for levels of similarity.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

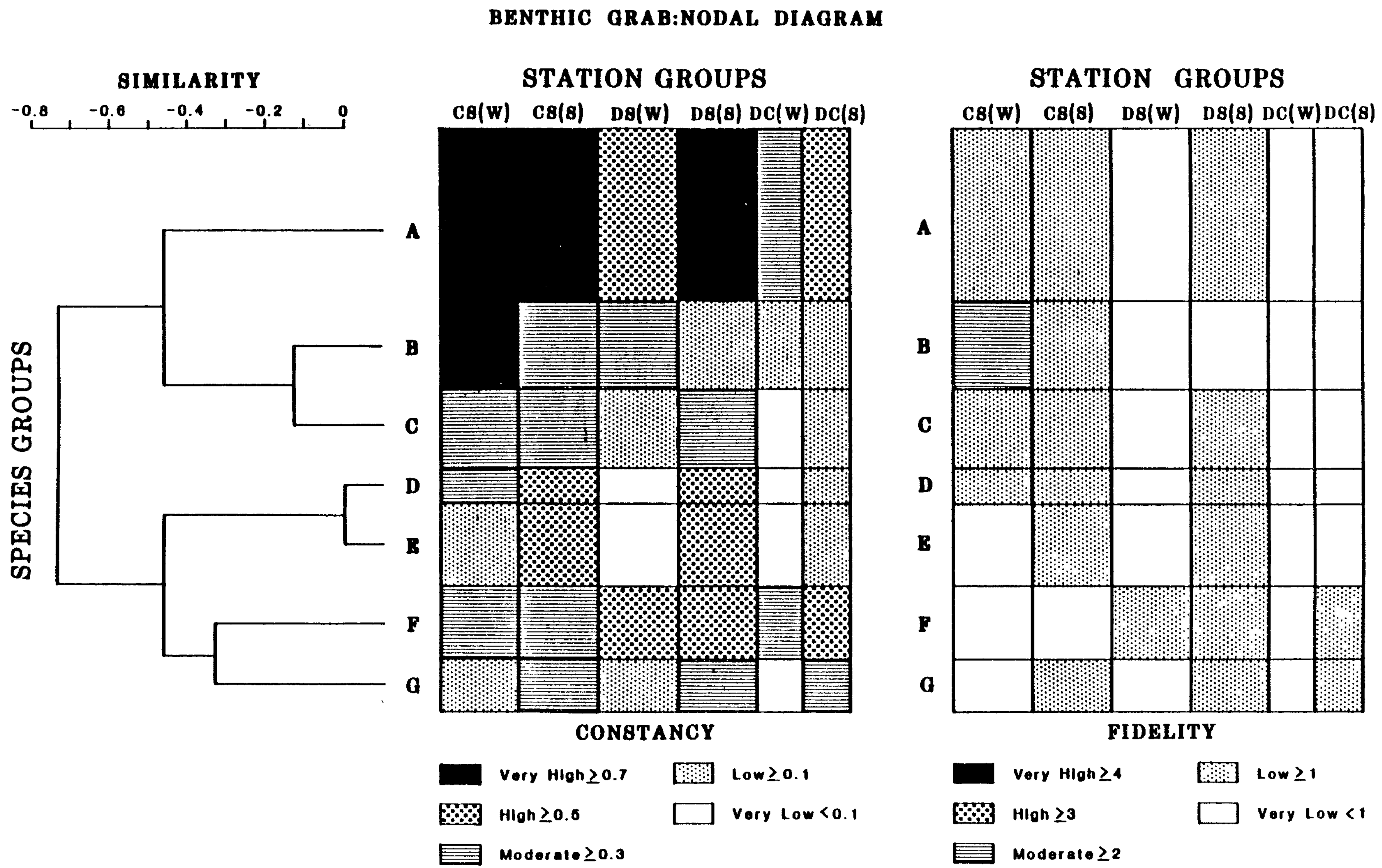

Figure 33 Inverse classification heirarchy of grab collections and nodal diagrams showing constancy and and fidelity of species groups among the sampling sites and seasons.

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

Table 10 Species groups resulting from inverse cluster analysis of grab samples. (Am = Amphipoda; As = Ascidiacea; Ce = Cephalochordata; Cu = Cumacea; D = Decapoda; E = Echinodermata; I = Isopoda; M = Mollusca; My = Mysidacea; P = Polychaeta; Si = Sipunculida).

Group A

- Oligochaeta
- Mediomastus californiensis (P)
- Nemertinea
- Nematoda
- Crassinella lunulata (M)
- Amphiodia pulchella (E)
- Hemipodus roseus (P)
- Sabellaria vulgaris (P)
- Pagurus hendersoni (D)
- Batea catharinensis (Am)
- Ensis directus (M)
- Polygordiidae A (P)
- Actiniaria
- Pelecypoda
- Maldanidae (P)
- Unciola serrata (Am)
- Polycirrus eximius (P)
- Automate evermanni (D)
- Eulalia sanguinea (P)
- Pinnixa sp. (D)
- Spiophanes bombyx (P)
- Nephtys picta (P)
- Glycera sp. A (P)
- Glycera dibranchiata (P)
- Erichthonius brasiliensis (Am)
- Exogone dispar (P)
- Metharpinia floridana (Am)
- Acanthohaustorius millsi (Am)
- Oxyurostylis smithi (Cu)

Group B

- Crepidula fornicata (M)
- Podarke obscura (P)
- Ophiuroidea (E)
- Bhawania goodei (P)
- Hemipholus elongata (E)
- Nereis sp. (P)
- Nereis succinea (P)
- Notocirrus spinferus (P)
- Petricola pholadiformis (M)
- Pelecypoda B
- Polydora caeca (P)
- Cirolana polita (I)
- Cirratulidae (P)
- Nucula proxima (M)
- Elasmopus levis (Am)

Group C

- Tharyx annulosus (P)
- Brania clavata (P)
- Ampelisca vadorum (Am)
- Spiophanes sp. A (P)
- Diopatra cuprea (P)
- Turbellaria
- Tharyx marioni (P)
- Invertebrata D
- Parvulicina multilineata (M)
- Pseudeurythoe ambigua (P)
- Prionospio fallax (P)
- Spio pettiboneae (P)
- Ervilia concentrica (M)

Group D

- Ancistrosyllis hartmanae (P)
- Cirrophorus lyriformis (P)
- Goniadides carolinae (P)
- Mysidopsis bigelowi (My)
- Amaena trilobata (P)
- Tiron tropakis (Am)

Group E

- Caulleriella killariensis (P)
- Sigambra bassi (P)
- Ampharete americana (P)
- Schistomeringos rudolphi (P)
- Prionospio cirrifera (P)
- Owenia fusiformis (P)
- Aspidosiphon albus (Si)
- Drilonereis magna (P)
- Paraonidae (P)
- Leptochela serratorbita (D)
- Tiron triocellatus (Am)
- Trachypenaeus constrictus (D)
- Parapionosyllis sp. A (P)
- Promysis atlantica (My)

Group F

- Natica pusilla (M)
- Travisia parva (P)
- Branchiostoma caribaeum (Ce)
- Mellita quinquiesperforata (E)
- Ancinus depressus (I)
- Eudevenopus honduranus (Am)
- Glycera oxycephala (P)
- Pleuromeris tridentata (M)
- Ophelia denticulata (P)
- Pyura vittata (As)
- Crassinella martinicensis (M)
- Aspidosiphon gosnoldi (Si)

Group G

- Magelona phyllisae (P)
- Magelona rosea (P)
- Paraprionospio pinnata (P)
- Mulinia lateralis (M)
- Pelecypoda
- Sigambra tentaculata (P)
- Bowmaniella sp. (My)
- Bowmaniella brasiliensis (My)
- Abra aequalis (M)

Source: SCWMRD Report, "Benthic and Sedimentological Studies of the Georgetown Ocean Dredged Material Disposal Site"

APPENDIX C

Ocean Dredged Material

Disposal Site Designation Criteria

Georgetown, South Carolina

EPA established eleven criteria to be used in assessing suitability of a site for dredged spoil disposal. As part of the environmental review of a proposed site designation at Georgetown, EPA, Region IV has applied the criteria which is presented below.

1. <u>Geographic position, depth of water, bottom topography and distance from coast.</u> [40 CFR §228.6(a)(1).]

   The site area is approximately one square nautical mile. Its corner coordinates are given above. Water depth ranges from 6 to 11 meters. There are no distinct features in the bottom topography of the site and no evidence of any mounding of sediments from past disposal activities.

2. <u>Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases.</u> [40 CFR §228.6(a)(2).]

   The nearshore coastal area off Georgetown Harbor is utilized for breeding, spawning and nursery by many important marine organisms. The ODMDS site is three miles offshore from the inlet of Winyah Bay, through which shrimp, and numerous finfish migrate seasonally. Atlantic sturgeon are commercially sought in and around the inlet from mid-February through mid-May. The loggerhead sea turtle, a species on the Federal endangered list is known to nest on beaches adjacent to the inlet.

   Being three miles offshore, the site is not close enough to block movement of shrimp up into the estuary or hinder the female loggerhead turtle from nesting on the beaches. However, it is possible that disposal operations during the sturgeon fishing season might affect this fishery.

3. <u>Location in relation to beaches and other amenity areas.</u> [40 CFR §228.6(a)(3).]

   The major bathing beaches are approximately 15 miles north of the proposed ODMDS* site. Sport fishing occurs in the area of the site, but typically waters further offshore are fished for open ocean species. EPA has determined that continued disposal at the proposed site will not significantly affect recreational uses of the area waters. There are no reefs near the proposed site. The nearest artificial reefs, that enhance sportfishing are approximately 5 miles to the northeast and approximately 9 miles to the south-southeast. No impacts to these reefs are expected by use of the proposed site.

4. Types and quantities of wastes proposed to be disposed of, and proposed methods of release, including methods of packing the waste, if any. [40 CFR §228.6(a)(4).]

The material to be dumped at an offshore disposal site will result from dredging the entrance channel to Winyah Bay. An annual average (based on the years 1973 through 1984) of 286,666 cubic yards of dredged material has been dumped at the proposed site.

Sediments dredged from the entrance channel are predominantly sand.

Hopper dredge is the type of vehicle for dredging and transport of the dredged material.

Dredged material may not be approved for ocean dumping unless it meets the criteria in 40 CFR Part 227.

5. Feasibility of surveillance and monitoring. [40 CFR §228.6(a)(5).]

The United States Coast Guard is not currently conducting surveillance at the existing site; however, surveillance would be relatively easy because the site is only three miles offshore. Either shore-based observers or day-use boats could be used for surveillance. Monitoring is feasible at the proposed site.

A monitoring plan for the site has not yet been developed. However, environmental monitoring will be done for as long as the site is used. Reports of the monitoring operations will be made available to the public through notice in the FEDERAL REGISTER. Such reports will be made at least at five-year intervals, and more frequently if evidence of significant adverse environmental effects is found.

6. Dispersal, horizontal transport and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any. [40 CFR §228.6(a)(6).]

Predominant nearshore currents move southerly during summer months and northerly in winter months. The area of the proposed ODMDS is under tidal influence particularly during ebbing flows. Current velocities measured at the proposed site were weak to moderate ranging from 0.1-0.9 knots during winter and 0.1-1.1 knots during summer sampling periods. Tidal currents appear to have a stronger influence on waters in the vicinity of the proposed ODMDS site than nearshore ocean currents. Both hydrologic forces will cause the dumped sediments to spread in most any direction over a yearly period.

Significant Long-term accumulation or mounding of dredged material has not been detected at the existing site by high-resolution profiling at the disposal site conducted before and after disposal operations. Storm producing wave action affecting the entire water column are believed to cause spreading of the sandy sediments dumped previously at the site.

7. Existence and effects of current and previous discharges and dumping in the area (including cumulative effects). [40 CFR §228.6(a)(7).]

Annual dredged material disposal has produced no significant adverse effects on the water quality at the proposed site. Changes in water quality as a result of disposal operations have been of short duration (minutes) and have been confined to relatively small areas. No major differences in finfish and shellfish species or numbers were found in the recent SCWMRD survey within and adjacent to the existing site.

Past use of the existing site has created no persistent mounding or other disturbances of benthic infauna and demersal fish assemblages. Diversity and density of benthic communities within the disposal site are comparable to nearshore control sites that were surveyed. No adverse, cumulative affects are evident from previous disposal operations.

8. Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the ocean. [40 CFR §228.6(a)(8).]

Shipping, fishing, and recreational activities occur in the vicinity of the existing site. Previous dredged material disposal operations are not known to have interfered with these activities. No resource development occurs in the immediate vicinity of the existing site, such as mineral extraction. Although the waters and considerable land area surrounding Winyah Bay are used for environmental study, the existing site and immediate coastal waters are not of special scientific importance. Aquaculture activities presently do not occur in the vicinity of the disposal site.

9. The existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys.

Investigations of the dredged material disposal site have indicated that previous disposal has had no significant adverse effects on water quality (e.g., dissolved nutrients, trace metals, dissolved oxygen, or pH). Freshwater runoff via Winyah Bay results in varied salinity and high turbidity near the site. Trace contaminants in the water were shown to be within or below ranges noted elsewhere along the coast. Many metals were below detection limits as were PCBs and all pesticides tested.

Fish and shrimp dominate the nekton community adjacent to the existing site, and species are typical of those reported from the coastal waters all along the South Atlantic Bight. Several of these species are commercially and recreationally important, including the brown and white shrimp and various fishes. The surgeon fishery is particularly important at the inlet to Winyah Bay.

Bottom sediments were medium to coarse grain sands at the site. Comparison of pollutant content of these sediments with other data near the site and elsewhere along the coast indicated that the site's sediments can not be considered polluted.

The benthic infauna community is characteristic of coastal medium to coarse sands in the vicinity of the proposed site. Species diversities are variable from season to season, with the summer diversities quite high. Combining the summer and winter season sampling data, the proposed ODMDS ranks between the control site and the "down current" site for species diversity, species richness, number of species per station and numbers of individual organisms. Results of the study suggest that there have been no long-term effects on the benthic infauna at the proposed site resulting from past disposal acitivity. Surveys there did not detect the development or recruitment of nuisance species.

11. Existence at or in close proximity to the site of any significant natural or cultural features of historical importance. [40 CFR §228.6(a)(11).]

No historical features are known to exist within the proposed site. The "Sir Robert Peel" wreck is located just inshore of the site.

The existing site is believed to be compatible with the criteria used for site evaluation, at reasonable costs. EPA considered whether it would be preferrable to designate a deepwater site. For the following reasons, EPA believes that the existing site is the preferrable site for the disposal of dredged material. These factors are discussed in greater detail in the EIS.

The existing site is 3 nautical miles offshore from South Island whereas a mid-shelf deepwater site would be more than 25 nautical miles from shore (Criterion 1). Disposal costs and energy consumptin involved in use of a deepwater site would be significantly greater than for the proposed site due to greater transportation demands.

Dredged material has been dumped at the proposed site, and the effects of disposal have been insignificant. the bottom is sand, and the site is not located near sensitive hardbottom marine habitat.

Deepwater sites have not been used for dredged material disposal, and the environmental impact is uncertain.

*U. S. GOVERNMENT PRINTING OFFICE: 1984-752-341, 19056