

Stellwagen Bank National Marine Sanctuary

Final Environmental Impact Statement/ Management Plan

Volume I



U.S. Department of Commerce

National Oceanic and
Atmospheric Administration

Coastal Resources and
Estuaries Division



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Stellwagen Bank National Marine Sanctuary Final Environmental Impact Statement/ Management Plan

Volume I

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Sanctuaries and Reserves Division
1305 East-West Highway
Silver Spring, MD 20910

July 1993

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Sanctuaries and Reserves Division



Title: Final Environmental Impact Statement and Management Plan for the Stellwagen Bank National Marine Sanctuary

Abstract: The National Oceanic and Atmospheric Administration proposes to implement the Congressional designation of a marine area encompassing Stellwagen Bank, and situated approximately 3.5 miles northwest of Provincetown, Massachusetts as a national marine sanctuary.

The sanctuary is comprised of Federal waters and the underlying lands within a 638-square-nautical-mile area surrounding the Bank, which measures approximately 19 miles by 6.25 miles at its widest point. Water depths around the Bank range from 65 feet to over 300 feet.

The designation of Stellwagen Bank as a national marine sanctuary will provide a long-term integrated program of resource protection, research, and interpretation/education to assure comprehensive management and protection of the Stellwagen Bank system. Resource protection will involve cooperation with other agencies and organizations in formulating resource protection policies and procedures, including the enforcement of regulations affecting uses of the Bank's resources.

Cooperating agencies in the development of this final environmental impact statement/management plan document have included the U.S. Army Corps of Engineers (New England Division), U.S. Environmental Protection Agency (Region I), and the Massachusetts Coastal Zone Management Office.

Nine Sanctuary regulations are proposed for implementation. The first regulation prohibits the discharge or deposit of materials or other matter from within the Sanctuary boundary. The second regulation prohibits the discharge or deposit of materials or other matter from outside the Sanctuary boundary, that subsequently enter the Sanctuary and injure a Sanctuary resource or quality. The third regulation prohibits exploration, development, and production of "industrial materials" (e.g., sand and gravel) within the Sanctuary. The fourth regulation prohibits any construction, placement, or abandonment on the seabed of any structure or material, and prohibits any alteration of the seabed within the Sanctuary. The fifth regulation prohibits the movement, removal, or injury (or the attempt to move, remove, or injure) of any historical resource within the Sanctuary. The sixth regulation prohibits the taking of any marine reptile, marine mammal, or seabird within the Sanctuary (except as permitted by the Endangered Species Act, Marine Mammal Protection Act, or Migratory Bird Treaty Act). The seventh regulation prohibits "lightering" within the Sanctuary. The eighth regulation prohibits possession within the Sanctuary of any historical resource, or of any marine reptile, marine mammal, or seabird taken in violation of the Endangered Species Act, Marine Mammal Protection Act, or Migratory Bird Treaty Act. The ninth regulation prohibits interference with, obstruction, delay or prevention of investigations, searches, seizure or dispositions of seized property in connection with enforcement of Title III of the Marine Protection, Research and Sanctuaries Act or any regulation or permit issued under that Act.

Additionally, certain activities not currently proposed for regulation are identified in the Designation Document as subject to Sanctuary regulation if, in the future, the need to regulate is demonstrated as necessary for the protection of Sanctuary resources and qualities. Activities identified as subject to Sanctuary regulation are:

- exploration, development, or production of oil and gas resources within the Sanctuary;
- operation of vessels within the Sanctuary; and
- mariculture activities within the Sanctuary.

Alternatives to the proposed action include regulatory and non-regulatory management alternatives.

Research will include baseline studies, monitoring, and analysis and prediction projects to provide information needed in resolving management issues. Interpretive/education programs will be directed at improving public awareness of the Sanctuary's resources and the need to manage them wisely to ensure their continued viability and abundance.

Lead Agency: U.S. Department of Commerce
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National Ocean Service
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**FINAL ENVIRONMENTAL IMPACT STATEMENT AND MANAGEMENT PLAN
FOR THE STELLWAGEN BANK NATIONAL MARINE SANCTUARY**

TABLE OF CONTENTS

	<u>PAGE</u>
List of Figures	xi
List of Tables	xiii
Note to Reader	xiv
EXECUTIVE SUMMARY	1
PART ONE: INTRODUCTION _____	
A. Authority for Designation	4
B. Mission and Goals of the National Marine Sanctuary Program	4
C. Terms of the Designation	4
D. Status of the National Marine Sanctuary Program	4
E. History of the Proposal	6
F. Purpose and Need for Action	7
PART TWO: SANCTUARY MANAGEMENT PLAN _____	
Section I: Management Plan for the Stellwagen Bank National Marine Sanctuary	9
A. Introduction	9
B. Sanctuary Goals and Objectives	9
1. Resource Protection	9
2. Research	9
3. Interpretation/Education	10
4. Visitor Use	10
Section II: The Sanctuary Setting	10

A. Regional Context	11
1. Location of Sanctuary	11
2. Regional Access	11
B. Sanctuary Resources	11
1. Environmental Conditions	14
a. Geology	14
b. Bathymetry	15
c. Oceanography	16
2. Natural Resources	18
a. Phytoplankton	18
b. Zooplankton	19
c. Benthic Organisms	20
d. Fishes	22
e. Sea Turtles	24
f. Marine Mammals	25
1) Endangered Cetaceans	25
2) Non-Endangered Cetaceans	28
3) Pinnipeds	30
g. Seabirds	30
3. Historical and Cultural Resources	35
a. Prehistoric Cultural Resources	35
b. Historic Vessel Traffic	36
c. Historic Shipwreck Resources	37
d. Aircraft	38
C. Human Activities	38

1. Commercial Fishing	38
a. Regional History	38
b. Present Day Fishing in the Stellwagen Bank Area	39
c. Fishing Gear	43
d. Fisheries Management	44
2. Commercial Charterboating	46
a. Whalewatching	46
b. Sportfishing	50
3. Recreational Boating/Tourism	51
4. Commercial Shipping	52
5. Military Activity	56
6. Offshore Oil and Gas Activity	57
7. Sand and Gravel Mining	60
8. Ocean Disposal Activities	64
a. General Disposal Activities	64
b. Dredged Material	65
c. Fish Processing Wastes	67
d. Incineration of Trash	67
9. Ocean Discharges	68
10. Submerged Pipelines and Cables	71
11. Mariculture	71
13. Offshore Fixed Artificial Platforms	73
14. Research and Education	74
Section III: Sanctuary Management Plan	77
A. Overall Management and Development Concept	77

1. General Context	77
2. Existing Management Programs	77
a. Regional Management (within Massachusetts)	77
b. Commonwealth of Massachusetts	78
c. Joint State/Federal Programs	78
d. International Management: The Gulf of Maine Initiative	80
B. Resource Protection	80
1. General Context for Management	80
2. Designation Document and Sanctuary Regulations	80
a. Discharges and Deposits	80
b. Alteration of the Seabed	80
c. Development Activities for Industrial Materials	81
d. Submerged Pipelines and Cables	81
e. Incineration of Trash	81
f. Lightering	81
g. Historical and Cultural Resources	81
h. Taking of Marine Mammals, Marine Reptiles, and Seabirds	81
3. Contingency Plans for Major Emergencies	81
4. Encouraging Compatible Uses of Sanctuary	82
5. Surveillance and Enforcement	82
a. Public Education and Information	83
b. Planning and Coordination	83
C. Research	83
1. General Context for Management	83
2. Framework for Research Program	83

3. Selection and Management of Research Projects	84
a. Annual Sanctuary Research Plan	84
b. Research Project Monitoring Program	85
4. Information Exchange	85
D. Interpretation/Education	85
1. General Context for Management	85
2. Interpretive Opportunities	85
3. Interpretive Programs	86
a. On-site Visitor Programs	86
b. Visitor Center Programs	86
c. Outreach Programs	86
Section IV: Administration	87
A. Administrative Framework	87
1. Sanctuaries and Reserves Division	87
2. National Marine Fisheries Service	87
3. U.S. Coast Guard	87
4. Sanctuary Advisory Committee	87
5. Other Federal Agencies	88
6. State, Regional, and Local Agencies	88
B. Resource Protection: Roles and Responsibilities	89
1. Sanctuaries and Reserves Division	89
2. Sanctuary Manager	89
3. Sanctuary Advisory Committee	90
4. Federal Agencies	90
C. Research: Roles and Responsibilities	91

1. Sanctuaries and Reserves Division	91
2. Sanctuary Manager	91
3. Sanctuary Advisory Committee	91
D. Interpretation/Education: Roles and Responsibilities	91
1. Sanctuaries and Reserves Division	91
2. Sanctuary Manager	92
3. Sanctuary Advisory Committee	92
E. Site Administration: Roles and Responsibilities	92
1. Sanctuaries and Reserves Division	92
2. Sanctuary Manager	93
3. Federal, State, Local and Regional Agencies	93
4. Sanctuary Advisory Committee	93
F. Sanctuary Staffing	94
G. Sanctuary Facilities	94
PART THREE: ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE —	
Section I: Status Quo Alternative (No Action)	95
A. Federal Agencies	96
B. State Agencies	97
Section II: Designation of a National Marine Sanctuary (Preferred Alternative)	97
A. Boundary Alternatives	98
1. Alternative #1	98
2. Alternative #2	100
3. Alternative #3	102
4. Alternative #4	104
5. Alternative #5 (Preferred Alternative)	104

B. Management Alternatives	107
1. Alternative #1	107
2. Alternative #2 (Preferred Alternative)	108
3. Alternative #3	108
C. Regulatory Alternatives (By Activity)	109
1. Discharge or Disposal of Materials	109
a. Dredged Material Disposal	110
b. Disposal of Fish Processing Wastes	113
c. Discharge of Trash and Other Debris	114
d. Wastewater Discharges	114
2. Ocean Incineration	115
3. Offshore Industrial Materials Development	116
4. Altercation of, or Construction on, the Seabed	118
5. Mariculture Activities	118
6. Removing, Taking or Injuring Historical or Cultural Resources	119
7. Taking of Marine Reptiles, Marine Mammals, and Seabirds	120
8. Offshore Hydrocarbon Activities	120
9. Operation of Commercial Vessels	122
10. Lightering	123
11. Operation of Commercial Charterboats	123
12. Operation of Recreational Vessels	124
13. Installation or Placement of Submerged Pipelines and Cables	124
14. Fishing Activities	125

**PART FOUR: ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES
OF SANCTUARY DESIGNATION**

Section I: Environmental Consequences of Alternatives 127

A. Status Quo Alternative 127

 1. Resource Protection 128

 2. Research and Interpretation/Education 132

 3. Management 132

B. National Marine Sanctuary Designation (Preferred Alternative) 134

 1. Resource Protection Regime 135

 2. Research and Interpretation/Education 140

 3. Boundary Alternatives 141

 4. Management Alternatives 144

Section II: Unavoidable Adverse Environmental or Socioeconomic Effects 145

**Section III: Relationship Between Short-Term Uses of the Environment and
the Maintenance and Enhancement of Long-Term Productivity** 145

PART FIVE: LIST OF PREPARERS AND ACKNOWLEDGEMENTS 146

**PART SIX: LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS
RECEIVING COPIES OF THE FEIS/MP DOCUMENT** 147

PART SEVEN: APPENDICES

A. Designation Document and Proposed Regulations A1

B. Existing Federal and State Authorities Relevant to Management Jurisdiction B1

C. Abbreviations C1

D. National Register of Historic Places Criteria D1

E. References E1

F. New England Fishery Management Council Response to NOAA Consultation
Under Section 305(b)(5) of Title III F1

G. Responses to Comments Received on the DEIS/MP G1

LIST OF FIGURES

<u>Figure</u>	<u>Title</u>	<u>Page</u>
1	National Marine Sanctuary System	3
2	Regional Context of Stellwagen Bank Sanctuary	12
3	Sanctuary Boundary	13
4	Dominant Circulation of the Gulf of Maine	17
5	Area Recommended for Northern Right Whale Critical Habitat Designation	27
6	Statistical Area 514	40
7	Diagram of Existing New England Whalewatching Guidelines	42
8	Vessel Traffic Separation Scheme	53
9	Air Force Warning Areas W102 and W104A	58
10	North Atlantic OCS Planning Area	59
11	Gravel Distribution Offshore Boston Metropolitan Area	62
12	Sand Distribution Offshore Boston Metropolitan Area	63
13	Massachusetts Bay Disposal Site	66
14	Existing Wastewater Discharges into Massachusetts Bay and Cape Cod Bay	69
15	EPA Recommended MWRA Outfall Location	70
16	Offshore Fixed Artificial Platform	76
17	Massachusetts Ocean Sanctuaries	79
18	Sanctuary Boundary Alternative #1	99

LIST OF FIGURES (CONTINUED)

<u>Figure</u>	<u>Title</u>	<u>Page</u>
19	Sanctuary Boundary Alternative #2	101
20	Sanctuary Boundary Alternative #3	103
21	Sanctuary Boundary Alternative #4	105
22	Sanctuary Boundary Alternative #5 (Preferred Alternative)	106
23	Cape Cod National Seashore	133

LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
1	Macrobenthic Taxonomic Groups at Georges Bank, by Biomass and Density	21
2	Species/Species Groups of Marine Birds Occurring in the Southwestern Gulf of Maine	32
3	Commercial Fisheries Landings Data: 1988-1990	41
4	Total 1989 Bluefin Tuna Landings from Stellwagen Bank (Indicated by Port)	48
5	Total 1990 Bluefin Tuna Landings from Stellwagen Bank (Indicated by Port)	48
6	Total Number of Fish Caught in Recreational Fishery Beyond Three-Mile Jurisdiction (North Atlantic): 1987-1989	51
7	Seasonal Trends in Commercial Ship Traffic Across Stellwagen Bank (1989-90)	54

Note to Reader:A. National Environmental Policy Act (NEPA)

This document is both a management plan and a final environmental impact statement (FEIS) for the Stellwagen Bank National Marine Sanctuary. Some of the section headings, and the order in which they are presented, are different from those frequently found in other environmental impact statements. To assist NEPA reviewers, the following table has been developed. Topics normally discussed in an EIS document are listed under the heading "NEPA Requirement". The corresponding section of this document and the page numbers are provided in the other two columns.

<u>NEPA Requirement</u>	<u>Management Plan/EIS</u>	<u>Page</u>
Purpose and Need for Action	Part One: Introduction	4
Alternatives		
Preferred Alternative	Part Three: Section II	95
Other Alternatives	Part Three: Sections I, II	93, 95
Affected Environment	Part Two, Section II	9
Environmental Consequences		
General and Specific Impacts	Part Four, Section I	124
Unavoidable Adverse Environmental or Socioeconomic Effects	Part Four, Section II	142
Relationship Between Short-Term of the Environment and the Maintenance Enhancement of Long-Term Productivity	Part Four, Section III and	142
Possible Conflicts Between the Proposed Action and the Objectives of Federal, State, Regional, and Local Land Use Plans, Policies and Contacts for the Area Concerned	Part Two, Section III	75
List of Preparers	Part Five	143
List of Agencies, Organizations, and Persons Receiving Copies of the FEIS	Part Six	144

B. Endangered Species Act (ESA)

Pursuant to Section 7 of the Endangered Species Act, the Fish and Wildlife Service of the U.S. Department of the Interior, and the National Marine Fisheries Service of the U.S. Department of Commerce, were consulted in the performance of the biological assessments of possible impacts on threatened or endangered species that might result from the designation of a National Marine Sanctuary at Stellwagen Bank. These consultations confirmed that some 11 endangered (E), 3 threatened (T), and 1 proposed threatened (PT) species are either known to or may occasionally occur in the area. Informal consultation with FWS concluded that designation and promulgation of regulations for the Stellwagen Bank National Marine Sanctuary are not likely to adversely affect threatened or endangered species under FWS jurisdiction. Formal consultation with NMFS concluded that Sanctuary designation and management are not likely to jeopardize the continued existence of any threatened or endangered species under NMFS jurisdiction. The species identified are:

- | | |
|--|----|
| 1. Peregrine falcon (<i>Falco peregrinus anatum</i>) | E |
| 2. Bald eagle (<i>Haliaeetus leucocephalus</i>) | E |
| 3. Roseate tern (<i>Sterna dougallii</i>) | E |
| 4. Piping plover (<i>Charadrius melodus</i>) | T |
| 5. Humpback whale (<i>Megaptera novaeangliae</i>) | E |
| 6. Fin whale (<i>Balaenoptera physalus</i>) | E |
| 7. Northern right whale (<i>Eubalaena glacialis</i>) | E |
| 8. Sei whale (<i>Balaenoptera borealis</i>) | E |
| 9. Blue whale (<i>Balaenoptera musculus</i>) | E |
| 10. Leatherback sea turtle (<i>Dermochelys coriacea</i>) | E |
| 11. Loggerhead sea turtle (<i>Caretta</i>) | T |
| 12. Kemp's (Atlantic) ridley sea turtle
(<i>Lepidochelys kempi</i>) | E |
| 13. Green sea turtle (<i>Chelonia mydas</i>) | T |
| 14. Shortnose sturgeon (<i>Acipenser brevirostrum</i>) | E |
| 15. Harbor porpoise (<i>Phocoena phocoena</i>) | PT |

C. Resource Assessment

The Marine Protection, Research and Sanctuaries Act, as amended, requires a resource assessment report documenting present and potential uses of the proposed Sanctuary area, including uses subject to the primary jurisdiction of the U.S. Department of the Interior. This requirement has been met in consultation with the Department of the Interior, and the resource assessment report is contained in Part Two, Section II.

D. Federal Consistency Determination

Section 307 of the Coastal Zone Management Act of 1972, as amended, requires that each Federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state coastal management programs. A Federal Consistency Determination must be provided to the Massachusetts Executive Office of Environmental Affairs (EOEA), which has been a cooperating agency with NOAA in the development of this designation. To meet this requirement, NOAA has formally provided its Consistency Determination to the EOEA at the release of this Final Environmental Impact Statement/Management Plan, which finds that the designation of Stellwagen Bank as a National Marine Sanctuary is consistent, to the maximum extent practicable, with the Massachusetts Coastal Zone Management Plan.

EXECUTIVE SUMMARY

Stellwagen Bank is located in the extreme southwestern Gulf of Maine, within Massachusetts Bay. The Bank's southern end is situated approximately six miles north-northwest of Provincetown, Massachusetts. In accordance with Title III of the Marine Protection, Research and Sanctuaries Act of 1972, as amended, 16 U.S.C. 1431 *et seq.*, this Final Environmental Impact Statement and Management Plan proposes implementation of the Congressionally designated Stellwagen Bank National Marine Sanctuary to facilitate the long-term protection and management of the resources and qualities of the Stellwagen Bank system.

Part One of this document reviews the authority for national marine sanctuary designation; the mission and goals of the National Marine Sanctuary Program; the history of this proposal's development; and the purpose and need for designating a national marine sanctuary at Stellwagen Bank.

Part Two, Section I outlines Sanctuary management goals and objectives in resource protection, research, interpretation/ education, and visitor use. Part Two, Section II describes the environmental conditions, living and non-living resources of the Sanctuary area, and the human activities occurring in the vicinity.

Part Two, Section II describes the Sanctuary setting. The boundary surrounds the entire Stellwagen Bank and includes approximately 638 square nautical miles (842 square miles). The glacially-deposited Bank feature measures approximately 16.30 nautical miles (18.75 miles; 30.17 km) in length, and 5.43 nautical miles (6.25 miles; 10.01 km) in width, at its widest point. Two distinct peak productivity periods produce a complex system of overlapping mid-water and benthic habitats within the sanctuary study area. Commercially important fisheries include extensive benthic, invertebrate, and pelagic species. The Bank system also provides important feeding and nursery grounds for large and small cetacean species, several of which are endangered. Diverse bird species forage at the Bank, some in direct association with feeding cetaceans and fishing vessels.

Traditionally, the principal human activity dependent on the Bank's resources has been commercial fishing, and this tradition continues. Recently, whale-watching has also become an important commercial activity. To a lesser degree, sportfishing also generates significant economic revenues. Additional human activities involving the Bank system include recreational fishing, research, commercial shipping, and dredged materials disposal. In addition to these activities, possible sand/gravel mining, development of offshore artificial fixed platforms, and mariculture operations could affect Stellwagen Bank resources and qualities in the future.

The sanctuary management plan is presented in Part Two, Section III of this document. This plan provides guidelines to ensure that all management activities conducted during the first five years following designation are directed at addressing important issues as a means of meeting sanctuary objectives. Management actions are considered within the context of three categories of program objectives: resource protection, research, and interpretation/education. Resource protection will involve cooperation with other agencies in formulating management policies and procedures, including the enforcement of regulations. Research will include baseline, monitoring, and predictive studies to provide information needed to address management issues. Interpretation/education programs will focus on improving public awareness and understanding of sanctuary resources, and the need to protect them.

Existing regulatory authorities affecting the sanctuary area (Appendix B) will not be replaced or superseded by sanctuary designation. Rather, the effect of such existing authorities will be strengthened via cooperative efforts among implementing agencies. The following activities, however, will be regulated by NOAA under the terms of designation:

- a. Discharging or depositing of materials or substances, (either within or from outside the Sanctuary);

- b. Developing offshore industrial materials;
- c. Construction, placement, or abandonment of any substance or material on, or any alteration of, the seabed;
- d. Removing or damaging historical resources;
- e. Taking marine mammals, marine reptiles, and seabirds (except as permitted by the Marine Mammal Protection Act, the Endangered Species Act, and the Migratory Bird Treaty Act);
- f. Transferring any petroleum-based product from vessel-to-vessel ("lightering");
- g. Possessing any historical resource, or any marine mammal, marine reptile, or seabird taken in violation of the Marine Mammal Protection Act, the Endangered Species Act, or the Migratory Bird Treaty Act; and
- h. Interfering, obstructing, delaying or preventing any investigation, search, seizure or disposition of seized property in connection with enforcement of the Act.

Several activities also are identified as "subject to regulation", but will not be regulated now. These are:

- a. offshore hydrocarbon activities;
- b. mariculture activities; and
- c. vessel operation.

Sanctuary regulations are contained in the Designation Document (Appendix A).

The administrative framework for managing the sanctuary (Part Two, Section IV) recognizes the need for coordination and cooperation among all participants. The roles and responsibilities of the National Oceanic and Atmospheric Administration's Sanctuaries and Reserves Division, and National Marine Fisheries Service; the U.S. Coast Guard; the Sanctuary Manager and staff; and a Sanctuary Advisory Committee are delineated, as they relate to the areas of resource protection, research, interpretation/education, and general administration. Opportunities for cooperation with state and regional agencies, as well as private institutions and organizations, are also discussed.

NOAA considered a range of alternatives in developing the proposal for a national marine sanctuary at Stellwagen Bank. These alternatives, described in Part Three, were evaluated in terms of achieving optimum protection for the ecosystem, improving scientific knowledge of the area, and promoting public understanding of the values of the Stellwagen Bank system's resources. Sanctuary designation was selected as preferable to no action; and preferred boundary, management, and regulatory alternatives were selected. The environmental consequences of other alternatives are discussed in Part Four. Congressional designation of the Sanctuary (P. L. 102-587, §2202) establishes a boundary (depicted in this document as boundary alternative 5), and specifically prohibits exploration for and mining of sand and gravel and other minerals within the Sanctuary.

Emerging issues or changing circumstances may affect specific aspects of sanctuary management as described in this plan. The plan will be reviewed at least every five years following designation, or sooner if necessary, and management measures revised as necessary to incorporate experience gained in actual management. However, the overall goals, management objectives, and general guidelines governing the plan's development will continue to be relevant.

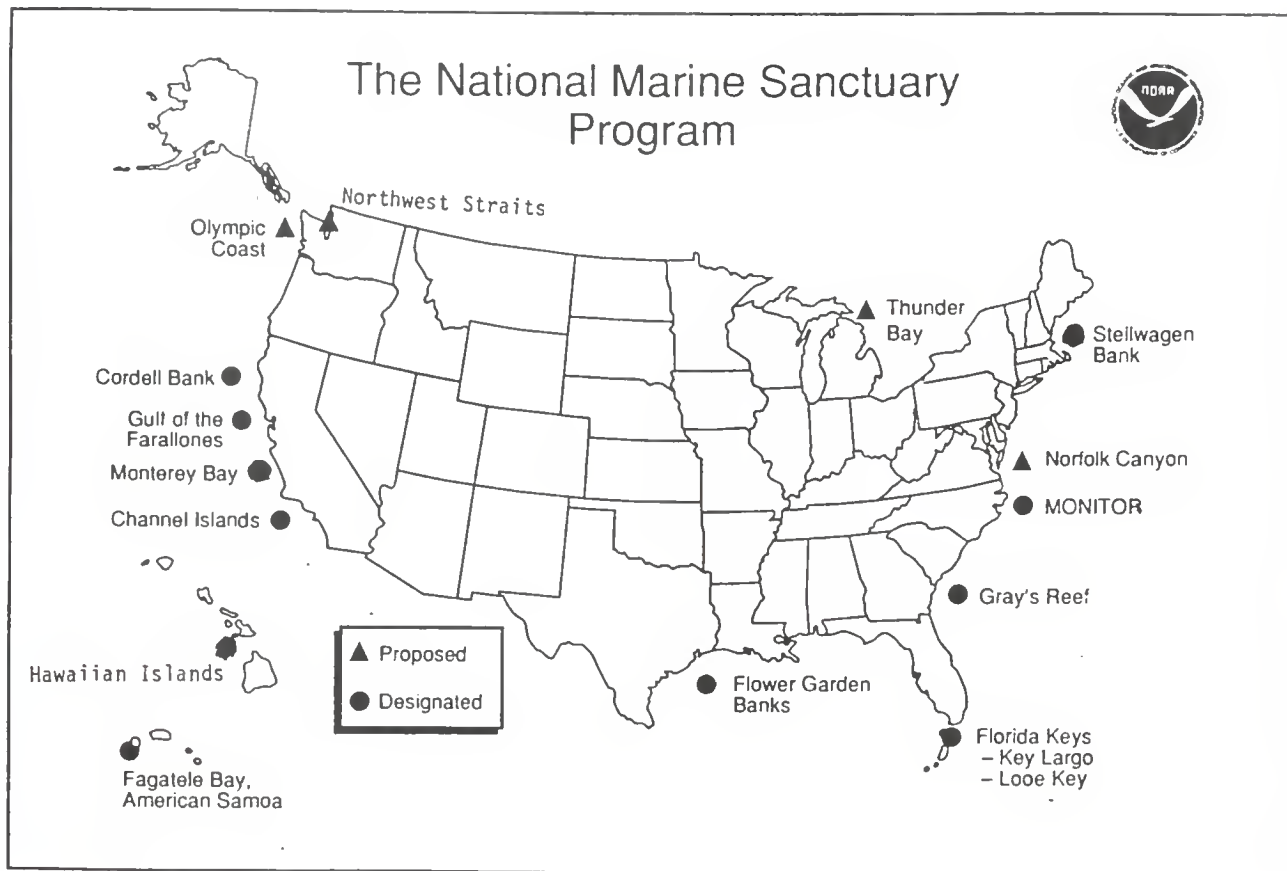


FIGURE 1: NATIONAL MARINE SANCTUARY SYSTEM

PART ONE: INTRODUCTION

A. Authority for Designation

Title III of the Marine Protection, Research and Sanctuaries Act of 1972, 16 U.S.C. 1431 *et seq.*, as amended (MPRSA) (the Act), authorizes the Secretary of Commerce to designate discrete marine areas of special national significance as national marine sanctuaries. The purpose is to promote comprehensive long-term management of their conservation, recreational, ecological, historical, research, educational, or aesthetic values. National marine sanctuaries may be designated in those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands over which the United States exercises jurisdiction, consistent with international law. National marine sanctuaries are built around the existence of distinctive natural and cultural resources whose protection and beneficial use require comprehensive planning and management. The National Oceanic and Atmospheric Administration (NOAA) administers the National Marine Sanctuary Program through the Sanctuaries and Reserves Division (SRD), in the Office of Ocean and Coastal Resource Management (OCRM).

B. Mission and Goals of the National Marine Sanctuary Program

In accordance with Title III of the MPRSA, the mission of the National Marine Sanctuary Program is to identify, designate, and comprehensively manage nationally-significant marine areas, based on the criteria noted above. National marine sanctuaries are established for the long-term benefit, use and enjoyment by the public. To meet these objectives, the following National Marine Sanctuary Program goals have been established:

1. Enhance resource protection through comprehensive and coordinated conservation and management tailored to specific resources that complements existing regulatory authorities;
2. Support, promote, and coordinate scientific research on, and monitoring of, the site-specific marine resources to improve management

decisionmaking in national marine sanctuaries;

3. Enhance public awareness, understanding, and wise use of the marine environment through public interpretive, educational, and recreational programs; and
4. Facilitate, to the extent compatible with the primary objective of resource protection, multiple uses of national marine sanctuaries.

C. Terms of Designation

Section 304(a)(4) [16 U.S.C. 1434(a)(4)] of MPRSA provides that as a condition for establishing a national marine sanctuary, the Secretary of Commerce must set forth the terms of the designation. The terms must include: (a) the geographic area included within the proposed Sanctuary; (b) the characteristics of the area that give it conservation, recreational, ecological, historical, research, educational or aesthetic value; and (c) the types of activities that will be subject to regulation in order to protect those characteristics. The terms of the designation may only be modified by the same procedure through which the original designation was made.

D. Status of the National Marine Sanctuary Program

Thirteen national marine sanctuaries have been established since the Program's inception in 1972 (Figure 1):

- The Monitor National Marine Sanctuary serves to protect the wreck of the Civil War ironclad, U.S.S. MONITOR. It was designated in January 1975, and is one square nautical mile in diameter. The Sanctuary is located 16 miles southeast of Cape Hatteras, North Carolina.
- The Key Largo National Marine Sanctuary was designated in December 1975, and provides protection and management to a 100 square-nautical-mile area of tropical coral reefs south of Miami, Florida. The Sanctuary is a seaward extension of the John Pennekamp State Coral Reef Park.

- The Channel Islands National Marine Sanctuary was designated in September 1980, and encompasses 1,252 square nautical miles off the coast of Santa Barbara, California. The Sanctuary surrounds the four northern Channel Islands and Santa Barbara Island, and provides protection to valuable habitats for marine mammals, including extensive pinniped assemblages, and seabirds.
- The Looe Key National Marine Sanctuary was designated in January 1981 and consists of a submerged section of the Florida reef southwest of Big Pine Key. The five square-nautical-mile site includes a beautiful "spur and groove" coral formation supporting a diverse marine community and a wide variety of human uses.
- The Gray's Reef National Marine Sanctuary, designated in January 1981, is a submerged live bottom area located on the South Atlantic continental shelf due east of Sapelo Island, Georgia. The Sanctuary encompasses about 17 square nautical miles, and protects a highly productive and unusual habitat for a wide variety of species including corals, tropical fish, and endangered and threatened sea turtles.
- The Gulf of the Farallones National Marine Sanctuary was designated in January 1981, and encompasses 948 square nautical miles off the northern coast of San Francisco, California. The Sanctuary includes important habitats for a diverse array of marine mammals and seabirds, as well as pelagic fish, plants, and benthic biota.
- The Fagatele Bay National Marine Sanctuary in American Samoa was designated in April 1986. The 163-acre bay site contains deepwater coral terrace formations that are unique to the high islands of the tropical Pacific. The Sanctuary protects habitat for a diverse array of marine flora and fauna, including the endangered hawksbill sea turtle and the threatened green sea turtle.
- The Cordell Bank National Marine Sanctuary, located approximately 20 miles west of Point Reyes, California, was designated in May 1989. The 397 square-nautical-mile site surrounds a granitic formation which provides habitat for an unusual assortment of marine and intertidal species, including colonies of purple hydrocorals. Abundant fish species attract feeding cetaceans and seabirds.
- The Florida Keys National Marine Sanctuary was Congressionally-designated in November 1990, and encompasses approximately 2600 square nautical miles of coral reefs, seagrass beds, and related shoreline habitats off Florida. NOAA is required to complete a comprehensive management plan including implementing regulations by May 1993. Upon its completion, existing National Marine Sanctuaries at Key Largo and Looe Key will be incorporated into this plan.
- The Flower Garden Banks National Marine Sanctuary encompasses approximately 42 square nautical miles surrounding two separate submerged features, the East and the West Flower Garden Banks, situated over 100 miles off the coast of Texas. Designated in January 1992, the Sanctuary protects the northernmost coral reefs on the North American continental shelf.
- The Monterey Bay National Marine Sanctuary encompasses 4,024 square nautical miles of coastal and ocean waters off Monterey, California. Designated in September 1992, the Sanctuary protects a variety of nearshore and offshore habitats, including Monterey Canyon, which measures over 10,000 feet in depth at its seaward edge. Abundant marine mammals, birds, fish, invertebrates and floral and faunal communities depend upon these habitats, and are important to central and northern California.
- The Stellwagen Bank National Marine Sanctuary was Congressionally designated in November 1992 and encompasses 638 square nautical miles of biologically productive waters between Cape Cod and Cape Ann, Massachusetts. The Bank feature supports plankton, invertebrate and fish species important to a variety of marine mammals, including humpback, fin, sei, and northern right whales. The Bank is heavily used for both fishing and whalewatching activities.

° The Hawaiian Islands National Marine Sanctuary was Congressionally designated in November 1992. The Sanctuary includes waters within the 100-fathom isobath of the islands of Molokai, Lanai, Maui, and a portion of Kauai. Among Sanctuary purposes are protection of humpback whales and identification of additional marine resources and ecosystems of national significance. Unless determined to be unsuitable, waters around the island of Kahoolawe will be added to the Sanctuary in January 1996.

In addition to Stellwagen Bank, the Sanctuaries and Reserves Division is actively developing designation documents for four additional proposed Sanctuaries. The proposed Sanctuaries are: Northwest Straits, Washington; Olympic Coast, Washington; Norfolk Canyon, Virginia; and Thunder Bay, Michigan.

E. History of the Proposal

In January 1982, NOAA published a Program Development Plan (PDP) for the National Marine Sanctuary Program, describing the Program's mission and goals; site identification procedures and criteria; and establishing a sanctuary nomination and designation process. Pursuant to the PDP and Program regulations, NOAA initiated a public process in February 1982 to establish a Site Evaluation List (SEL), to be comprised of highly-qualified marine sites meeting Program criteria for further evaluation as possible national marine sanctuaries. Potential SEL sites were identified and recommended to NOAA by regional resource evaluation teams, in accordance with the Program's mission and goals, as set forth in the PDP and in Program regulations.

A marine area of approximately 500 square miles (1294.99 sq. km) surrounding Stellwagen Bank (offshore Massachusetts) was nominated jointly by Defenders of Wildlife, Inc. and Dr. Charles A. Mayo, of the Provincetown Center for Coastal Studies, to the North Atlantic Regional Resource Evaluation Team for its consideration. The nomination was subsequently recommended by the evaluation team to NOAA for placement on the proposed SEL. A proposed SEL, including the

Stellwagen Bank site, was published on March 1, 1983 (48 FR 8527); and, following a public comment period, the final SEL was published August 4, 1983 (48 FR 35568).

The Secretary of Commerce (acting through NOAA), will from time to time select sites from the SEL as Active Candidates, which formally initiates evaluation of a site for possible designation, through implementation of the National Environmental Policy Act (NEPA) process. Prior to the 1988 Congressional amendments to Title III of the MPRSA, there was no time limit on NOAA's consideration of a site for national marine sanctuary designation. However, the 1988 amendments to the National Marine Sanctuary Program (Title II of Pub. L. 100-627, codified at 16 U.S.C. 1431 et seq.) establish (at Section 304(b)) a finite period of time (i.e., 30 months) from the time of Active Candidacy to a notice of designation (or findings regarding why such notice has not been published).

Additionally, the 1988 Amendments specifically require (Section 304(e)) that a prospectus on the Stellwagen Bank proposal be submitted to Congress for its review and comment no later than September 30, 1990. The prospectus on a proposed national marine sanctuary contains, among other information, the draft environmental impact statement and the draft management plan (DEIS/MP). To meet this Congressionally-mandated deadline, NOAA elevated the Stellwagen Bank proposal to Active Candidate status on April 19, 1989 (54 FR 15787).

Following the Federal Register notice announcing Stellwagen Bank as an Active Candidate for National Marine Sanctuary designation, NOAA conducted four public scoping meetings during the week of June 12-16, 1989 at Provincetown, MA; Portsmouth, NH; Gloucester, MA; and Boston, MA. The purpose of the meetings was to gather information and comments from individuals, organizations, and government agencies on the range and significance of issues related to the Sanctuary proposal. Attendees were provided information sheets on the study area for the proposal, and were asked to comment on identified management issues; to suggest additional issues for examination; and to provide information useful for

NOAA's evaluation of the site's potential as a National Marine Sanctuary.

Significant concerns were identified through this process regarding possible threats to the Stellwagen Bank environment from proposed human activities. Natural resources at risk include the Bank feature itself, as well as commercially-important fisheries and endangered cetaceans.

The DEIS/MP on the proposed Stellwagen Bank National Marine Sanctuary, and the Prospectus to Congress were published on February 8, 1991, initiating a 60-day public comment period, and a 45-day Congressional review period. During this period, a series of public hearings were conducted (March 11-18, 1991) in Portsmouth, NH; Gloucester, MA; Duxbury, MA; Provincetown, MA; and Washington, DC. Approximately 225 persons attended the public hearings, and over 860 written comments were received during this period. Additionally, petitions signed by more than 20,000 persons supporting designation of the Stellwagen Bank National Marine Sanctuary were also received by NOAA by the comment deadline of April 9, 1991.

Prior to the issuance of this FEIS/MP, the U.S. Congress passed and the President signed into law the National Marine Sanctuaries Amendments Act of 1992, which reauthorizes and amends Title III of the MPRSA (P. L. 102-587, Nov. 4, 1992). Section 2202 of P. L. 102-587 designates the Stellwagen Bank National Marine Sanctuary; establishes a Sanctuary boundary; prohibits the exploration for and mining of sand and gravel and other minerals in the Sanctuary; requires consultation with the Secretary of Commerce by Federal agencies proposing agency actions in the vicinity of the Sanctuary that may affect Sanctuary resources; authorizes funding levels for fiscal years 1993 and 1994; and directs the Secretary of Commerce to consider establishment of a satellite Sanctuary office in Provincetown, Gloucester or Hull, MA.

F. Purpose and Need for Designation

The combination of physical and oceanographic characteristics over and around the Stellwagen Bank feature produces two distinct peak productivity

periods annually. This occurs when overturn and mixing of coastal waters with nutrient-rich waters from deeper strata result in a complex system of overlapping mid-water and benthic habitats. This cyclic biological productivity supports a large variety of fishery resources, including mackerel, bluefin tuna, bluefish, shad, menhaden, herring, cod, haddock, flounders, quahog, and sea scallop. Large populations of the predominant forage fish, the sand lance, support larger fish species and seasonal populations of cetaceans. Sand lance are also responsible for seasonal concentrations of a variety of seabirds. Several species of cetaceans have been recorded at Stellwagen Bank, including Atlantic white-sided dolphins, white-beaked dolphins, harbor porpoises, orca whales, pilot whales, minke whales, humpback whales, fin whales, sei whales, and northern right whales. The latter four species are Federally-listed as "endangered."

The proximity to land and accessibility of this biologically rich and diverse system have resulted in extensive levels of human activities. The primary commercial use of the Bank's resources is fishing, which has occurred in the area for several generations. More recently, commercial whalewatching also has become a principal commercial activity. Whalewatchers visiting the Stellwagen Bank region number more than 1.25 million a year, involving more than 40 vessels.

Commercial vessel traffic lanes in and out of Boston Harbor traverse directly across the Bank feature. Waters near the Stellwagen Bank have been and continue to be used for disposal of dredged materials. There are also activities currently underway to establish an extended outfall tunnel, ending approximately 15 miles from Stellwagen Bank, to carry and release treated wastewater effluent from Boston Harbor.

Public awareness of and attention to coastal management issues, and the desire to ensure the future of such areas for commercial, recreational, and other uses, have highlighted both the importance of the Stellwagen Bank system and the current lack of comprehensive and coordinated management for this area. The Sanctuary occurs in Federal waters not fully protected from potentially harmful activities, and lacking the benefits of

coordinated, multiple-use management. Sanctuary designation will provide both the coordination of ongoing and planned human activities, and the mechanism for ensuring long-term protection of the system, through regulatory, research, monitoring, and interpretive/educational programs.

On October 7, 1992, Congress passed legislation reauthorizing and amending Title III of the Marine Protection, Research and Sanctuaries Act (Title III). This legislation was signed into law on November 4, 1992 (P. L. 102-587). Title III, as amended, designates the Stellwagen Bank National Marine Sanctuary, and additionally mandates the adoption of a Sanctuary boundary described in this document as boundary alternative 5; prohibits the exploration for, and mining of, sand and gravel and other minerals in the Sanctuary; requires consultation with the Secretary of Commerce by Federal agencies proposing agency actions in the vicinity of the Sanctuary that may affect Sanctuary resources; authorizes fiscal years 1993 and 1994 funding levels for the Sanctuary; and directs the Secretary of Commerce to consider establishment of a satellite Sanctuary office in Provincetown, Gloucester or Hull, MA (Section 2.202).

PART TWO: SANCTUARY MANAGEMENT PLAN

Section I: A Management Plan for the Stellwagen Bank National Marine Sanctuary

A. Introduction

National marine sanctuaries are established in areas of the marine environment which have been selected for their conservation, recreational, ecological, historical, research, educational, or aesthetic values. Regulations implementing the National Marine Sanctuary Program (15 CFR Part 922) require the preparation of management plans for all proposed sanctuaries. These management plans identify long-term, comprehensive strategies for the administration and operation of marine sanctuaries following designation. Strategies focus on the site's goals and objectives, management responsibilities, research and interpretation/education programs, and plan implementation policies. The management plan is also a public document, providing information to government agencies, research and education institutions, other organizations, and the interested public on how, why, and by whom the Sanctuary will be protected and managed.

The management plan establishes an administrative framework for the Sanctuary that considers the cooperation and coordination necessary to ensure effective management. The Sanctuaries and Reserves Division (SRD), of the National Oceanic and Atmospheric Administration (NOAA), however, retains overall responsibility for site management.

Program regulations also require that progress towards implementation of the management plan and the goals of a designated Sanctuary be evaluated every five years (or sooner). Evaluation takes into account the variability of funding for staff and program development, and recognizes the effects on specific aspects of plan implementation. Modifications to the scope and scale of a Sanctuary's programs may be required due to unforeseeable changes in funding levels. However, the goals and objectives of the management plan remain unchanged.

B. Sanctuary Goals and Objectives

Sanctuary goals and objectives provide the framework for developing management strategies. The goals and objectives direct Sanctuary activities towards the dual purposes of resource conservation and public use, and are consistent with the intent of the National Marine Sanctuary Program.

Management strategies planned for the Stellwagen Bank National Marine Sanctuary are focused on the goals and objectives outlined below. Although Sanctuary goals and objectives are listed discretely, their effects overlap. For instance, research and interpretation/education efforts contribute both to resource protection, and to enhancement of public use of the Sanctuary.

1. Resource Protection

The highest priority management goal is protection of the marine environment and resources of the Stellwagen Bank National Marine Sanctuary. Specific objectives of the resource protection program are to:

- Establish cooperative agreements and other mechanisms for coordination among all the agencies participating in Sanctuary management;
- Develop an effective and coordinated program for the enforcement of Sanctuary regulations;
- Promote public awareness of and voluntary user compliance with regulations through an interpretation/education program stressing resource sensitivity and wise use; and
- Reduce threats to Sanctuary resources posed by major emergencies through contingency and emergency response planning.

2. Research

Both site- and resource-specific research has been conducted in the Stellwagen Bank/Cape Cod and Massachusetts Bays areas, particularly with regard to cetacean use. Sanctuary research will build upon existing data to improve overall understanding of

the Stellwagen Bank environment and resources, and to identify and resolve specific management issues. Research results will be used in interpretation and education programs, for visitors and others interested in the Sanctuary, as well as for resource protection. Specific objectives of the research program are to:

- Establish a framework and procedures for administering research projects to ensure that they are responsive to management concerns, and that research results contribute to improved management of the Sanctuary;
- Gather necessary baseline data on the physical, chemical, and biological characteristics of the Sanctuary;
- Gather necessary baseline data on cultural and historical resources of the Sanctuary;
- Monitor and assess environmental changes as they occur;
- Identify the range of effects on the Sanctuary environment resulting from changes in human activities;
- Incorporate research results into the interpretation/education program in a format useful for resource users and the general public; and
- Encourage information exchange among all agencies and organizations conducting management-related research in the Sanctuary, to promote informed management.

3. Interpretation/Education

The interpretation/education program is directed to improving public awareness and understanding of the significance of the Sanctuary and the need to protect its resources. Specific objectives of the interpretation/education program are to:

- Provide the public with information on the Sanctuary, and its goals and objectives, with an emphasis on the need to use its resources wisely to ensure their long-term viability;

- Enhance and broaden support for the Sanctuary and Sanctuary management by offering programs suited to visitors with a range of diverse interests;
- Provide for public involvement by encouraging feedback on the effectiveness of interpretation/education programs; and
- Collaborate with other organizations to provide interpretation/education services, including extension and outreach programs and other volunteer projects, that explain the purposes of the Sanctuary and the National Marine Sanctuary Program.

4. Visitor Use

The Sanctuary's overall goal for visitor management is to encourage commercial and recreational uses of the Sanctuary, compatible with resource protection. Specific objectives of the visitor use program are to:

- Provide relevant information about Sanctuary resources and Sanctuary uses policies;
- Collaborate with public and private organizations in promoting compatible uses of the Sanctuary by exchanging information concerning its commercial and recreational potential; and
- Monitor and assess the levels of Sanctuary use to identify and control potential degradation of resources and minimize potential user conflicts.

Section II: The Sanctuary Setting

The most important factors to be considered in developing a management plan for the Stellwagen Bank National Marine Sanctuary are its location; its physical characteristics, environmental conditions, and biological resources; its human uses; and the roles of the agencies with management responsibilities in the proposal area. These factors are summarized below to provide the background context necessary for understanding the management plan.

A. The Regional Context

Stellwagen Bank is located in the southwestern Gulf of Maine, which is formed by the bight of the northwest Atlantic coastline between Cape Cod, Massachusetts and Cape Sable, Nova Scotia (Figure 2). Roughly rectangular in shape, the Gulf of Maine measures about 200 miles (321.8 km) long by 120 miles (193.1 km) wide. A series of shallow banks forms its southern border and isolates it from deeper waters of the North Atlantic, except at the Northwest Channel, where Gulf depths attain 270 meters. The Gulf and its offshore banks constitute a geographic entity that has maintained its integrity for at least the last 13,000 years (Campbell, 1987).

Between Cape Ann and Cape Cod, in the southwest corner of the Gulf, is Massachusetts Bay, 75% enclosed by land. The Bay's most prominent submarine feature is Stellwagen Bank, which lies at the Bay's eastern edge and partially blocks its mouth. The Stellwagen Bank is a shallow, glacially-deposited, primarily sandy feature, curving in a southeast-to-northwest direction for almost 20 miles. Water depths over and around the Bank range from 65 feet to more than 300 feet. Seaward of the Bank, the seafloor slopes to depths of 600 feet or more.

1. Location and Boundary of Sanctuary

The Stellwagen Bank National Marine Sanctuary is located approximately 25 nautical miles east of Boston, Massachusetts, at the eastern edge of Massachusetts Bay. The site is also located approximately 3 miles north-northwest of Race Point (Provincetown), Massachusetts; and 3 miles southeast of Cape Ann (Gloucester), Massachusetts. The Bank feature itself measures 18.75 miles in length, and roughly 6.25 miles across at its widest point, at the southern end of the Bank. The Sanctuary boundary occurs entirely within Federal waters, i.e., beyond the three-mile limit of Commonwealth jurisdiction. The Sanctuary boundary surrounds the entirety of the Stellwagen Bank feature, as well as Tillies Bank (situated to the northeast), and southern portions of Jeffreys Ledge (situated to the north). The Sanctuary's southern border follows a line tangential to the seaward limit of Commonwealth jurisdiction adjacent to the

Commonwealth-designated Cape Cod Bay Ocean Sanctuary; and is also tangential to waters designated by the Commonwealth as the Cape Cod Ocean Sanctuary. The northwest border of the Sanctuary coincides with the Commonwealth-designated North Shore Ocean Sanctuary.

The Sanctuary boundary is marked by the following coordinates, which indicate the northeast, southeast, southwest, west-northwest, and north-northwest points: 42°45'59.83"N x 70°13'01.77"W (NE); 42°05'35.51"N x 70°02'08.14"W (SE); 42°07'44.89"N x 70°28'15.44"W (SW); 42°32'53.52"N x 70°35'52.38"W (WNW); and 42°39'04.08"N x 70°30'11.29"W (NNW). The Sanctuary boundary encompasses approximately 638 square nautical miles, or 842 square miles (Figure 3).

2. Regional Access

Resources of the Stellwagen Bank area have traditionally supported an active commercial fishing industry, which reaches the Bank's fishing grounds primarily from Gloucester (approximately 12 miles northwest of the north end of the Bank), and Provincetown (approximately 6 miles south of the southern end of the Bank) (Figure 2). Additional fishing ports using the area include Boston, Chatham, New Bedford, Plymouth, Scituate, Hyannis, Fall River, Manomet, Falmouth, Wellfleet, Barnstable, Beverly, Salem, Ipswich, Rockport, Dartmouth, Westport, Fairhaven, Cuttyhunk, Duxbury, and Onset. Out-of-state fishing vessels also visit the Bank area from New Hampshire (primarily Portsmouth), Maine, and (less frequently) Connecticut. Currently, there are approximately 280 commercial fishing vessels fishing regularly in the Stellwagen Bank region. (Kellogg, 1990).

Recently, the number of both commercial and recreational vessels using the Bank for whalewatching activities has increased. These vessels operate primarily out of Provincetown and Gloucester. Overall, commercial whalewatch vessels using Stellwagen Bank seasonally number approximately 40. (MacKenzie, 1986).

B. Sanctuary Resources

Stellwagen Bank is a glacially-deposited, primarily

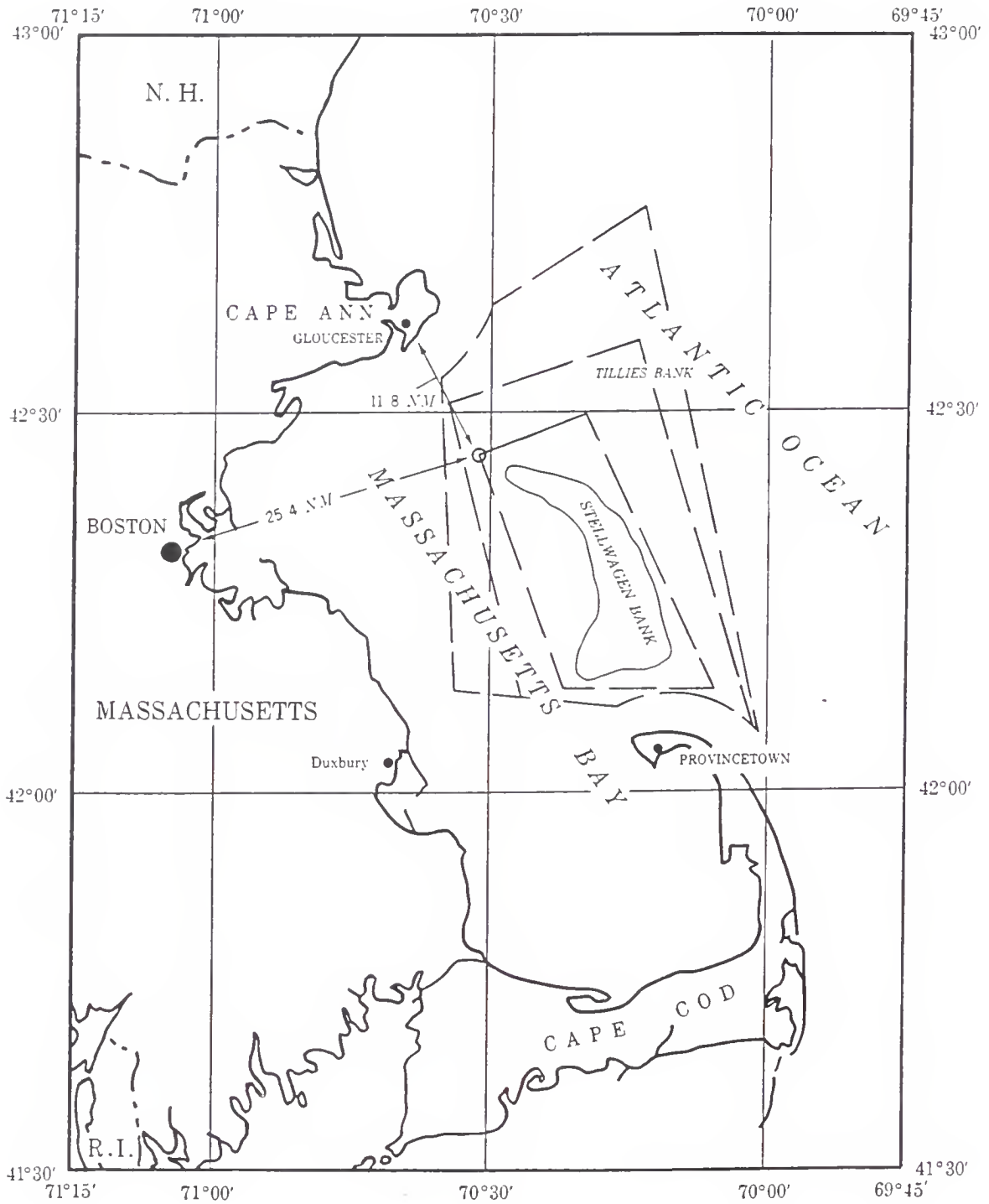


FIGURE 2: REGIONAL CONTEXT OF STELLWAGEN BANK SANCTUARY

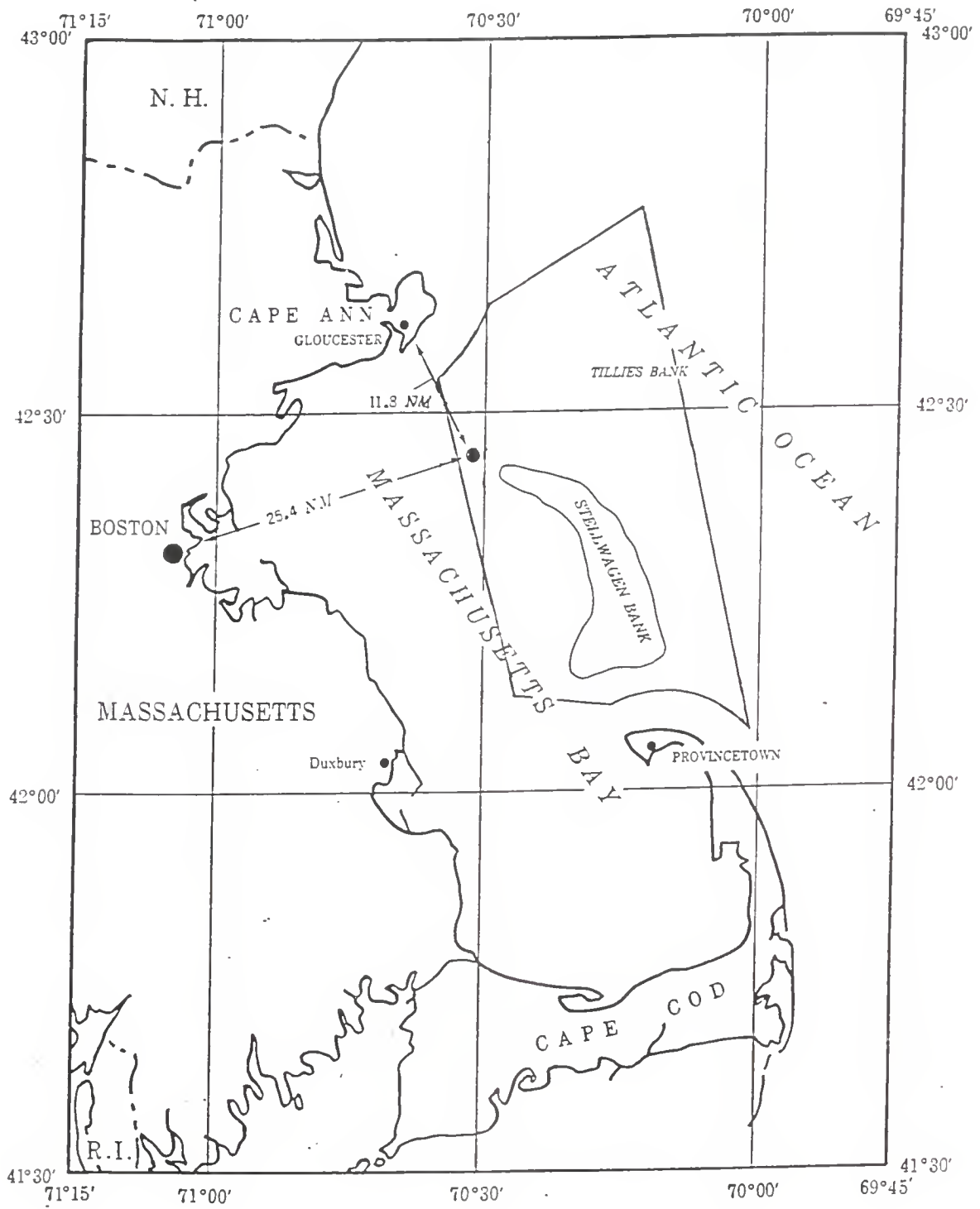


FIGURE 3: SANCTUARY BOUNDARY

sandy submerged feature measuring nearly twenty miles in length, occurring in a southeast-to-northwest direction between Cape Cod and Cape Ann, Massachusetts. Generally counterclockwise surface currents flow over the Bank, where waters depths range from 65 feet to over 300 feet. Bank waters are characterized by two distinct productivity periods annually, when overturn and mixing of coastal waters with nutrient-rich waters from deeper strata produce a complex and rich system of overlapping midwater and benthic habitats.

This cyclic biological productivity supports a large variety of commercially important fisheries, which have in turn supported generations of fishermen. The Bank's resources are also important feeding and nursery grounds for an abundance of endangered cetacean species; and provide habitat for several additional marine mammal species and associated coastal/pelagic seabirds. Because of its proximity to land, Stellwagen Bank attracts an increasing number of commercial, recreational and scientific users and visitors.

Several additional human activities occur over or near the Sanctuary, including transit of commercial vessels and ocean disposal of dredged materials.

1. Environmental Conditions

a. Geology

Like Cape Cod and the islands of Martha's Vineyard and Nantucket, Stellwagen Bank and other submerged banks and ledges off the northeastern U.S. coast were created by the advance and retreat of glaciers. The southward advance of massive ice sheets nearly 19,000 years ago was influenced by the existing topography; and the ice was shaped into huge lobes. Two of these lobes created the land masses identified above. One ice lobe was formed by what is now Cape Cod Bay; the other by the present-day Great South Channel, located to the southeast of Cape Cod. The advance of ice over the continental land mass ground the land into fragments and carried them along with the movement of the ice.

With general climatic warming between 18,000 and 15,000 years ago, the glaciers began to melt and

retreat from their coverage. The ice lobes became more pronounced, and retreated at differing rates, depending on the depths of topographical depressions within which they moved. During this process enormous amounts of pulverized continental land were released from the melting ice. These land fragments, or "outwash" from the two ice lobes formed much of the present Cape Cod peninsula.

Retreat of the ice lobe formed by the Great South Channel was sufficiently slow that much of the land fragments it carried melted out and were deposited on the sea floor. These materials formed the submerged elevation now known as Stellwagen Bank. The Bank originally was made up of sand, gravel, silt, and "rock flour" (ultra-finely ground rock); but over time, most of the finer-grained materials have been carried away by currents and deposited in basin areas on either side of the Bank (Tucholke and Hollister, 1973; Hassol, 1987; and Campbell, 1987).

The outer rim of the Gulf of Maine (including Nantucket Shoals, Georges Bank, and the Nova Scotian Shelf) is floored primarily with sand and gravel. There is a general tendency for grain size to increase from southwest to northeast along this portion of the Continental Shelf.

The Gulf of Maine basin contains mostly silty-clay, or clayey-silt sediments. Banks and ridges within the Gulf of Maine are floored with gravel and boulders; gravel and sand are usual substrates in nearshore areas.

Clayey-silt also covers most of Stellwagen Basin and Cape Cod Bay, to the west of Stellwagen Bank. Small hillocks of coarser, till-like sediment are also generally found in both areas, and these areas may act as local sources of detritus, in addition to the contiguous Stellwagen Bank, Jeffreys Ledge, Tillies Bank, and the coastal shelf.

Shallow banks and ledges in this general area are veneered by sand and mixtures of gravel and sand. Jeffreys Ledge, north of Stellwagen Bank, is composed primarily of gravel or gravelly-sand, and is flanked by a sandy apron to the southeast. Stellwagen Bank is mainly sand or pebbly-sand, flanked to the east by gravel or gravelly-sand. The

broad area between Stellwagen Bank and Jeffreys Ledge (and east of Tillies Bank) is also covered by sand mixed with small amounts of gravel. The sand cover extends from Stellwagen Bank southward into the current-swept channel between the southern edge of Stellwagen Bank and the northern tip of Cape Cod. From this channel, a cover of silty-clayey sand extends westward and northward into the southern portion of Stellwagen Basin.

Sand is the predominant sediment for the inner shelf off Cape Cod. The sand is likely derived from the reworked sandy deposits of Cape Cod. In deeper waters, sandy deposits give way to silty-clayey sand; in the center of Stellwagen Basin, sandy cover gives way to sand-silt-clay bordering clayey silt.

Broad bathymetric features such as Stellwagen, and other banks and basins, relate to sediment type, whereas smaller topographic features such as hillocks, knobs, and swales in rugged areas bordering the Massachusetts coastline, have little relation to sediment types. These latter types of areas exhibit a large variety of sediment types, and lateral changes from one type to another are rapid.

Sediment types in basins are affected by nearby sources of coarse-grained sediment. Tillies Basin, for example, is a small narrow depression surrounded by shallow banks and ledges, which are covered with coarse-grained sediment. This coarse "debris" is apparently easily moved into the adjacent Tillies Basin, as evidenced by the presence of sand in Basin floor sediments. In Stellwagen Basin and Cape Cod Bay generally, it is also possible that nearby coarse-grained glacial deposits provide a source for the coarse sediments found in these areas.

The highest concentrations of gravel in this general area are found on Jeffreys Ledge; the inshore shelf between Cohasset and Plymouth; and an area east of Stellwagen Bank. Minor amounts of gravel are associated with sand on Stellwagen Bank, and also with till-like deposits found at Fishing Ledge in Cape Cod Bay.

As mentioned above, gravel deposits were most likely transported to the Cape Cod-Cape Ann area

by glaciers. Associated with many sediment types, gravel occurs in different water current regimes. It forms a lag veneer with sand, and marks a late stage of ice deposition. Hence, gravel materials may provide a crude guide for detecting the waning stages of ice retreat from the offshore area. Assuming the basic theory of gravel's glacial deposition and of gravel's indication of ice retreat, then both Stellwagen Bank and Jeffreys Ledge may actually be offshore moraines and outwash, which have been reworked during post-glacial rises in sea level (Campbell, 1987).

Sand dominates the inshore shelf, shallow banks (such as Stellwagen and Jeffreys), and the deep water area east of Tillies Bank. Sand forms an irregular belt of deposits stretching southward from Jeffreys Ledge to Cape Cod. Although sand floors deep as well as shallow areas, it is particularly abundant around the periphery of Cape Cod Bay, and along parts of the Massachusetts coastal shelf.

The distribution of sand also provides a guide to water currents. Currents are particularly strong on Stellwagen Bank and in the channel between the Bank and the tip of Cape Cod. The inner shelf also is an area of strong coastal currents and wave action; and if sand is available as on Cape Cod, the contiguous Bay sediments contain abundant sand. Areas of sand also are found next to banks composed in part of glacial deposits, such as Jeffreys Ledge. Sand deposited by currents apparently settles the bottom of the inner shelf north of Cape Ann, where bathymetric contours are widely spaced.

b. Bathymetry

The sea floor of the general area encompassing Cape Cod to Cape Ann is dominated by two broad ridges, Stellwagen Bank and Jeffreys Ledge, located to its north. Stellwagen Bank extends some 24.85 miles (40 km) in a northwest direction between Cape Cod and Cape Ann, and occurs at depths of less than 50 meters (164 ft.). Jeffreys Ledge extends northeast from Cape Ann at depths less than 60 meters (196.8 ft.). A third, much smaller, and completely dissected bank known as Tillies Bank, is located between these two larger banks, and is oriented in roughly a north-south direction.

Tillies Bank rises to within 60 meters of the surface, and is surrounded by a "moat" which reaches a maximum depth of 200 meters (656 ft.). There is also a subparallel ridge east of Tillies Bank which rises abruptly to within approximately 65 meters of the surface. In general, most bottom areas west (or shoreward) of this bank-ledge system are smooth and gently sloping. East of the bank-ledge system, the bathymetry is more complex and exhibits steeper gradients.

Together, Stellwagen Bank, Jeffreys Ledge, and Tillies Bank partly isolate three basin areas from the outer shelf. From north to south, these areas are Scantum Basin, Tillies Basin, and Stellwagen Basin. Stellwagen Basin is bordered by the Massachusetts coastline on the south and west, and by Cape Cod and Stellwagen Bank on the east and northeast. Like Stellwagen Bank lying along its eastern and northeastern borders, the Stellwagen Basin is elliptical in configuration, with a long axis trending in a northwest direction. Much of the Bank's southwest side slopes gently toward the deep axis of the Basin at gradients of about 0.1 to 0.5 percent. The northeast side of the Basin, however, dips steeply toward the axis at gradients of up to 6 percent.

East, or seaward of the Bank-Ledge system, the ocean bottom dips irregularly, attaining a maximum depth of about 220 meters (722 feet) due east of Boston (Schlee, Folger, and O'Hara, 1973).

c. Oceanography

Stellwagen Bank is subject to the same general surface circulation patterns as the Gulf of Maine overall. In general, surface waters of the Gulf exhibit a counterclockwise flow (or gyre), which moves in a southwest direction along the coasts of Maine and New Hampshire and into Massachusetts Bay. At Massachusetts Bay, the flow turns gradually eastward, moving over the northern tip of Cape Cod and toward the northern edge of Georges Bank. Continuing east toward Nova Scotia, currents turn north toward the Maine and New Brunswick coasts. Close to the coast, currents divide and flow in different directions, with the major portion turning westward toward Maine. The smaller remainder of the currents flows north into the Bay

of Fundy. In Massachusetts Bay, some of the flow moves southward into Cape Cod Bay, moving along the western edge. On the eastern side of Cape Cod, some of the currents are directed southward and pass between Cape Cod and Georges Bank, in the Great South Channel (Figure 4).

East of Stellwagen Bank, net surface currents move to the southeast at between 1.8 to 9.3 km/day (or 2 to 10 cm/sec). West of the Bank, surface currents flow southerly in western Cape Cod Bay and Massachusetts Bay, and northerly in eastern Cape Cod Bay, forming the generally counterclockwise movement discussed above. Results of bottom drift testing indicate that residual bottom water flow over Stellwagen Bank is southeasterly. Bottom flow in much of the area west of Stellwagen Bank is usually southerly into Cape Cod Bay.

Currents on Stellwagen Bank move mostly east and west at maximum velocities of 10 to 45 cm/second. Maximum bottom current velocities show some relation to the bottom sediment type, and to the sea floor bathymetry. Maximum bottom velocities measured on Stellwagen Bank (45 cm/sec.) are adequate to move coarse sand. Similar maximum velocities have been noted in the broad sandy-covered channel separating Stellwagen Bank from the tip of Cape Cod. Bottom current velocities are less strong in Stellwagen Basin, and in the passage southeast of Cape Ann (where maximum bottom current velocities usually do not exceed 18 cm/sec.).

Internal waves are periodic phenomena occurring in all the world's oceans. Investigations have indicated that tidally-generated internal wave packets are common along the U.S. East Coast (Sawyer and Apel, 1976), as well as other locations exhibiting the right combination of bathymetry, tides, and stratification (Gregg and Briscoe, 1979; and Haury, Wiebe, Orr, and Briscoe, 1983).

During the late summer, internal wave packets occur twice daily throughout Massachusetts Bay. These high-frequency, predictable wave packets are formed over Stellwagen Bank and are transmitted into the Bay at about 60 cm/sec., finally dissipating in the shallow waters of the Bay's western edges. Dominant waves have been measured at

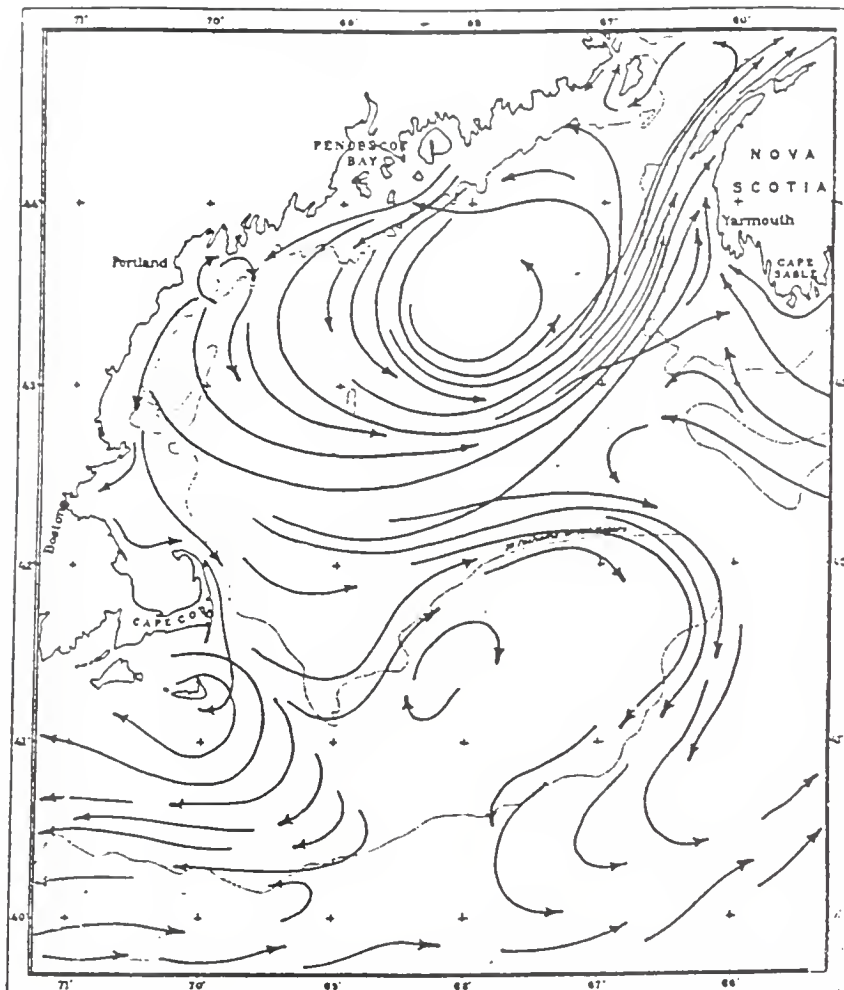


FIGURE 4: DOMINANT CIRCULATION OF THE GULF OF MAINE

(Adapted from Bigelow, 1927)

approximately 300 meters (984 ft.) in length, occurring over 8 to 10 minutes, with amplitudes of up to 30 meters (98 ft.) being exhibited. Overturning of the waves has also been acoustically recorded over Stellwagen Bank, in deep Bay center waters (80 meters or 262.5 ft.), and during dissipation in shallow western bay waters.

Phytoplankton (chlorophyll) and zooplankton are carried up and down by the overturning and mixing action of internal waves, causing the vertical distributions of plankton to be altered. Within time periods of approximately 10 minutes, displacement of plankton by as much as 30 meters occurs twice daily during late summer months in Massachusetts Bay. Thus, light levels experienced by phytoplankton cells may vary from 0.1 to 26% of the ambient surface illumination. Such rapid changes in light are thought to alter fluorescent yields of plant cells, affecting in turn, primary productivity of the Bay generally.

Water temperature and salinity are seasonally variable in the Gulf of Maine. During winter months, Gulf waters are coldest in shallow areas, with little temperature differences exhibited in high salinity waters along the eastern and western parts of the coast.

2. Natural Resources

a. Phytoplankton

The seasonal presence of more than 675 species of phytoplankton has been documented in coastal waters of the northeastern United States (Marshall and Cohn, 1982). Although several similar species are common throughout this area and throughout the year, highest concentrations of phytoplankton cells are associated with peak productivity (or outburst) periods occurring from roughly December through late March/early April. A second, less-marked growth period also occurs generally during July and August. In all seasons, diatoms generally dominate phytoplankton species.

Relative to Stellwagen Bank, periods of the year when highest phytoplankton concentrations are exhibited include: December through early April (highest concentrations); and in August (Marshall

and Cohn, 1982). The seasonal cycle of phytoplankton abundance is tied to this spring bloom, and is similar to those found in boreal waters throughout the world.

Phytoplankton abundance is low in the winter; sparse flora are dominated by Coscinodiscus and Ceratium. Spring bloom is well underway by mid-to late-March in the area between Cape Ann and Cape Elizabeth. The bloom usually starts in western Georges Bank waters, and by mid-April, peaks in Massachusetts Bay; in eastern coastal waters off Nova Scotia; and over eastern Georges Bank. By late-April, bloom has peaked over southern areas of the western basin and by early May over northern parts of the western basin and the northern coastal waters.

The annual phytoplankton cycle divides the Gulf of Maine into two areas: 1) northern coastal belt to Bay of Fundy, Georges Bank, and eastern coastal area off Nova Scotia; and 2) all other Gulf of Maine waters. Nantucket Shoals, Georges Bank, southwestern Nova Scotia, and the Maine coast northeast of Penobscot Bay are identified as highly productive in summer; and high biomass extends to the southwest over Jeffreys Basin and Ledge.

Thalassiosira nordenskioldii bloom for 2 to 4 weeks in the southwestern and eastern Gulf of Maine. This bloom is succeeded by a 4 to 6 week bloom of the genus Chaetoceros throughout the Gulf of Maine. Following late spring, moderate increases occur in phytoplankton cells during July and August over the central Gulf basin. From year to year, there is variation in the dominating genus: diatoms may dominate the flora, and in other years, Pontosphaera may replace the diatoms.

Phytoplankton blooms may occur when critical depth (above which total photosynthesis is greater than total respiration) is equal to or exceeds the mixed layer depth, assuming a sufficient supply of nutrients. Low winter phytoplankton growth in the Gulf results from low light levels, which produce shallow critical depth. Rising light levels in spring deepen the critical depth as increased temperature and fresh water runoff cause the mixed layer to shoal.

b. Zooplankton

The vast majority of zooplankton species are endemic in origin, and reproduce with sufficient frequency to maintain a local stock within the boundaries of the Gulf of Maine. The coastal zone (shallower than 100 m) is generally more productive for zooplankton (particularly for Calanus) than the central basin area. Deeper waters of the Gulf are important reproduction areas for Pseudocalanus and Oithona.

The total amount of zooplankton biomass is usually greater in deeper waters (greater than 100 m); though more concentrated in shallower waters. Massachusetts Bay is highly productive for copepods and pelagic fish eggs. Smaller copepods are found in greater concentrations in shallow waters; larger species in deeper waters. Zooplankton densities are greater in stratified western coastal areas than along the turbulent eastern coast of the Gulf.

Although the Gulf of Maine is rich in zooplankton species (more than 160 identified), fauna are dominated (over 80%) by only three or four species. Fauna are dominated by crustaceans, primarily copepods (and most prominently, Calanus finmarchicus). An exception to this dominance occurs nearshore in the spring when barnacle nauplii, or occasionally euphausiids, ctenophores and other zooplankters, may swarm locally (Fish and Johnson, 1937).

Other less numerous species of the Calanus community include the copepods, Pseudocalanus minutus and Metridia lucens. Other, less abundant species include the chaetognath, Sagitta elegans; the amphipod genus Euthemisto; and euphausiid genera Thysanoessa and Meganctiphanes; and the ctenophore, Pleurobrachia pileus (Cohen, 1975). The abundance of all zooplankton forms is greater in the western coastal sector than in the eastern coastal sector.

The two Calanus species, C. finmarchicus and Pseudocalanus minutus account for more than 70% of the zooplankton biomass in winter, spring and summer. Three species -- Pseudocalanus minutus, Temora longicornis, and Centropages typicus -- compose 85% of the zooplankton biomass during

the autumn months in the Gulf's coastal waters.

During summer months, three major groups of zooplankton can be identified based on their seasonal vertical distribution. The surface layer contains small, young forms of copepod nauplii, copepodites, fish eggs, fish larvae and small copepods. The second layer contains the boreal Calanus community, which occurs generally in mid-depths above 100-150 meters, but below the surface. The third zooplankton group occurs in deeper waters of the Gulf, and is characterized by the giant copepod, Euchaeta norvegica. Also included, in lesser amounts, are the chaetognaths Eukrohnia and Sagitta lyra; the decapod shrimp, Pasiphaea and Meganctiphanes norvegica.

Differences among these three communities are most pronounced in the summer when waters over the deep basins and in the western Gulf are markedly stratified. Differences are least apparent in well-mixed waters, i.e., shallow areas of heavy tidal mixing, and throughout the Gulf during winter and spring. In general, copepod densities are greatest at deeper levels in the nearshore areas of the Gulf (Sherman, 1976).

Gulf of Maine zooplankton generally may be divided into two fundamental ecological subsets -- neritic and oceanic -- depending upon their degree of dependence on shallow, food-rich coastal zone waters. Water depth, in fact, is the single most important parameter influencing the distribution of zooplankton in the Gulf of Maine (Sherman, 1976). Typical neritic zooplankton are larval stages of various benthic organisms, such as barnacles, worms, bivalve and gastropod mollusks, decapod crustaceans, and echinoderms. Also included in this group are pelagic eggs and larvae of all fish species that spawn in shallow waters. Oceanic zooplankton are pelagic throughout their life, and show no particular dependence on coastal areas. Neritic organisms are rarely encountered outside the 100-meter (328 ft.) isobath.

Zooplankton do not pass through the seasonal pattern of succession as phytoplankton species; rather, zooplankton stay qualitatively the same throughout the year, while experiencing quantitative changes in total biomass. Zooplankton begin spring

increases along coastal waters of Massachusetts Bay in waters north of Cape Ann sometime during March, evidenced by copepod larvae. Copepod (primarily Calanus finmarchicus) production expands seaward toward the mouth of the Bay during late April, and continues over the southwestern Gulf of Maine as spring season progresses. Peak zooplankton production occurs by the end of May. Rapid decrease in zooplankton abundance is evidenced in June. In the Gulf of Maine there is a gradual decline in zooplankton biomass from spring (i.e., June) to fall.

Hydrographic factors in the Gulf of Maine control the production, dispersal and survival of zooplankton (Fish and Johnson, 1937). For instance, water temperature dictates community type; and the horizontal distribution of zooplankton is controlled by water circulation, stability, and occasionally salinity. The dominant counter-clockwise circulation pattern in the Gulf of Maine moves all plankton, copepod eggs, and larvae in a southwestward direction (unless they are situated in areas protected from these circulation patterns).

Due to the relatively "closed" nature of the Gulf of Maine, temporal and spatial changes in zooplankton quantities are primarily the result of reproduction, growth, and mortality of endemic species, such as Calanus, Pseudocalanus, Oithona, and Microsetella.

c. Benthic Organisms

Benthic invertebrates provide food for the vast array of fish species found in the Stellwagen Bank, and larger Gulf of Maine area. Invertebrate species such as shrimps, crabs, worms, mollusks and echinoderms sustain many groundfish species. The health and availability of these food supplies are integrally important in assisting the assessment of variations in fish growth rates; changes in fish egg production and survival rates of newly-hatched young; deviations in normal fish migration routes and times of migrations; and survival of juvenile and adult fish stocks.

To date, few studies have been conducted to determine the particular composition of benthic communities on offshore banks and ridges similar in

makeup to Stellwagen Bank within the greater Gulf of Maine/Massachusetts Bay region. Baseline surveys of macrobenthic communities conducted at Jeffreys Ledge, north of Stellwagen Bank, identified 149 faunal and floral species within horizontal and vertical communities, and at various depths. At a monitoring station near Jeffreys Ledge, two major, ecologically distinct benthic communities have been identified: an algal-polychaete community, and a sponge-tunicate community (NOAA/NEFC, 1982). However, these communities exist on rock or other hard surfaces such as those comprising Jeffreys Ledge; bottom sediments at Stellwagen Bank are quite different.

Investigations conducted by NOAA's Northeast Fisheries Center into the macrobenthic communities of the Georges Bank system included sampling stations within the Stellwagen Bank vicinity; and findings are applicable to the overall New England region, as well as to the Middle Atlantic Bight (Theroux and Grosslein, 1987). There are four dominant taxonomic groups of macrobenthic invertebrates found in the Georges Bank/Gulf of Maine region: annelids, crustaceans, mollusks, and echinoderms. Dominance among these four groups, however, differs significantly depending upon whether species are ranked by biomass, or by numerical abundance (density). In general, both the largest biomass and the greater diversity tend to be supported by gravel and sandy sediments (Campbell, 1987). Coarse-sand bottom sediments have been shown to support the highest mean biomass of macrobenthic organisms, often in the range of 371 g/m² (Theroux and Grosslein, 1987). Biomass and diversity are also generally greatest around the rim of the Gulf of Maine, in waters depths less than 100 meters (Campbell, 1987).

Premised on the predominantly sand to pebbly-sand composition of Stellwagen Bank's bottom sediments, it is reasonable to suppose that macrobenthic biomass on Stellwagen Bank is quite high. Major taxonomic groups occurring on Georges Bank have been ranked by both biomass, and population density (Theroux and Grosslein, 1987: Table 1).

Table 1: Macro-benthic Taxonomic Groups at Georges Bank, by Biomass and Density

<u>Taxon</u>	<u>Total Biomass (%)</u>
Echinoidea	41.3
Bivalvia	37.8
Annelida	5.0
Ascidiacea	3.5
Ceriantharia	3.1

<u>Taxon</u>	<u>Total Density %</u>
Amphipoda	45.1
Annelida	26.3
Echinoidea	4.7
Chaetognatha	2.8
Bivalvia	2.5

Sampling data from both mud and sand reference stations in Cape Cod Bay within and outside the Massachusetts Bay Disposal Site (MBDS), situated immediately northwest of the Stellwagen Bank study area, indicate an overwhelming dominance of annelid species in both mud and sand sediments. Annelids comprised between 89.6% and 95.4% of macrobenthic species at mud reference stations; between 85.9% and 86.1% at sand reference stations (Hubbard, Penko, and Fleming, 1988). Species found at these stations are listed below.

<u>Mud Site</u>	<u>Sand Site</u>
<u>Paraonis gracilis</u>	<u>Exogone verugera</u>
<u>Heteromastus filiformis</u>	<u>Prionospio steenstrupi</u>
<u>Cossura longocirrata</u>	<u>Anobothrus gracilis</u>
<u>Spio pettiboneae</u>	<u>Nicomache spp.</u>
<u>Oligochaete spp.</u>	<u>Paraonis gracilis</u>
<u>Chaetozone setosa</u>	<u>Ampharetid spp.</u>
<u>Mediomastus ambiseta</u>	<u>Myriochele oculata</u>
<u>Myriochele oculata</u>	<u>Chone infundibuliformis</u>
<u>Trochochaeta multisetosa</u>	<u>Astarte undata</u>
<u>Prionospio steenstrupi</u>	<u>Phloe minuta</u>
<u>Thyasira flexuosa</u>	<u>Praxillura longissima</u>
<u>Aricidea quadrilobata</u>	<u>Exogone hebes</u>
<u>Sternaspos scutata</u>	<u>Mediomastus ambiseta</u>
<u>Maldane sarsi</u>	<u>Spio pettiboneae</u>
	<u>Cossura longocirrata</u>
	<u>Streblosoma spiralis</u>

Similarly, sampling conducted by NOAA's Northeast Monitoring Program at two stations in

the Gulf of Maine between 1978 and 1985 indicated dominance by polychaetes at Station 35, situated near the Massachusetts Bay Disposal Site location (NOAA/NMFS, 1990). Seasonality of polychaetes was indicated, and biomass levels were ranked between 100 and 250 g/m². Polychaetes were dominated by Spio filicornis. This and other polychaete species (sabellids and nereids) provide important prey for flounders. The echinoderms Ctenodiscus crispatus and Molpadia oolitica were also found in abundance.

The second sampling site (Station 28), located in the extreme western portion of Georges Bank, was overwhelmingly dominated by echinoderms, primarily two species: Brisaster fragilis (urchin), and Ophiura sp. (brittlestar). Ophiuroids in particular are important prey for cod and plaice.

Typical inhabitants of the Stellwagen Bank (areas primarily of sand or pebbly-sand composition) include organisms adapted to loose and occasionally shifting substrate, such as:

Echinarachnius parma, common sand dollar
Crangon septemspinosis, sand shrimp
Lunatia heros, (carnivorous gastropod mollusk)
Nassarius trivittatus, (carnivorous gastropod mollusk)
Spisula solidissima, surf clam
Astarte castanea, chestnut astarte
Leptocuma, (cumacean crustacean)
Chiridotea, (isopod crustacean)
Pagurus acadianus, Acadian hermit crab
Ophelia, (polychaete worm)
Goniadella, (polychaete worm)
Clymenella, (polychaete worm)
Heterostigma, (tunicate)
Molgula, (tunicate)
Haustorid and phoxocephalid amphipods, (beach fleas)

In the few areas of Stellwagen Bank where sediment composition is partially gravel, the following invertebrate fauna may be found:

Polymastia, (sponge)
Clionia, (sponge)
Myxilla, (sponge)
Balanus crenatus, (barnacle)
B. hameri, (barnacle)

Tubularia, (hydroid)
Eudendrium, (hydroid)
Sertularia, (hydroid)
Bougainvillia, (hydroid)
Brachiopoda terebratulina, (lampshells)
Gersemia, (soft corals)
Boltenia, (tunicate)
Ascidia amaroucium, (tunicate)
Modiolus, (bivalve mollusk)
Placopecten, (bivalve mollusk)
Anomia, (bivalve mollusk)
Musculus, (bivalve mollusk)
Serpula, (polychaete worm)
Chone, (polychaete worm)
Spiorbis, (polychaete worm)
Solaster, (starfish)
Crossaster, (starfish)
Neptunea, (gastropod)
Hyas, (toad crab)
Doris, (nudibranch)
Dendronotus, (nudibranch)
Ophiopholis, (brittlestar)
Ophiacantha, (brittlestar)

(Species list from Wigley, 1968)

Western Stellwagen Basin infauna are dominated by several polychaetes: shrimp; brittle starfish (Ophiura sarsi and O. rubusta; and pink anemone (Bolocera tuediae). A sizeable shrimp population is also located in Jeffreys Basin, between Cape Ann and Jeffreys Ledge; and another shrimp species, Dichelopandalus leptocerus, is widely-spread and abundant in the overall northeast region.

d. Fishes

The overall Gulf of Maine, encompassing Stellwagen Bank, supports a very wide variety of pelagic and demersal fish and shellfish species. Pelagic species include herring, mackerel, sharks, swordfish, bluefish, bluefin tuna, capelin, and menhaden. Demersal species include cod, haddock, hake, pollack, whiting, cusk, and several species of flatfish such as flounders and halibut.

This notable variety of species results from the geographic and thermal transition zone occurring at Cape Cod, which separates the Gulf of Maine from the Mid-Atlantic region. The transition zone

exhibits both varying composition and abundance of fish fauna; and is the cause of substantial seasonal variation of species. Most of the pelagic species exhibit clear seasonal migratory movements in response to changes in water temperatures. Seasonal movements among several demersal species are generally confined to shifts within the overall Gulf of Maine area, although some species, such as pollack, are migratory.

Generally, the Gulf of Maine is dominated by boreal, non-migratory species; and the Mid-Atlantic is largely populated by warm-water, migrating species. Spring bottom trawl surveys conducted between 1968 and 1981 indicate over 86% of species in the Gulf of Maine are boreal, or cold temperate. Autumn surveys also indicate the majority of Gulf fish species are cold temperate (79.5%) (NMFS, 1982). Typically, warm temperate species, such as bluefish (Pomatomus saltatrix), will migrate southward during cold months of the year; while some cold temperate species, such as cod (Gadus morhua), retreat northward during warm months.

Although considerable information is available on commercially-important fish fauna of the Gulf of Maine, relatively few studies have been conducted on fish fauna as a whole (Azarovitz and Grosslein, 1987). Inventory activities conducted over the larger Georges Bank area during 1968-1981 employed otter trawls, to which not all species are vulnerable (in particular, large pelagics such as tuna and billfish); therefore, the listings below of fish and invertebrate species are not complete. The diversity of fish and invertebrate fauna is highest during autumn months; approximately 100 species have been identified over the Georges Bank-Gulf of Maine area (Grosslein and Azarovitz, 1987).

Seasonal distribution and movement of fish and migratory invertebrate species are explained generally by classification of abundant species into four groups which demonstrate particular movement patterns. Groupings are based on seasonal movements within the 60-fathom (110 meter) contour.

Group 1: Residents Found in All Seasons

Little Seasonal Movement (1a)

Little skate
 Winter skate
 American sand lance
 Sea raven
 Longhorn sculpin
 Windowpane flounder
 Yellowtail flounder
 Winter flounder
 Sea scallop

Seasonal Shifts (1b)

Spiny dogfish
 Atlantic herring
 Goosefish
 Atlantic cod
 Haddock
 Ocean pout
 American lobster

Group 1 species are typically found in the overall Gulf of Maine-Georges Bank area throughout the year. Within this group, there are some species (1b) which demonstrate seasonal shifts within the general area, but not away from the Georges Bank vicinity.

Group 2: Seasonal Migrants Found Only in Warm or in Cold Months

Common in Warm Months (2a)

Silver hake
 Red hake
 White hake
 Butterfish
 Fourspot flounder
 Shortfin squid
 Longfin squid

Common in Cold Months (2b)

Pollack
 American plaice

Group 2 fishes are seasonal visitors; they are consistently found in the Gulf of Maine-Georges Bank area during one or two seasons. Those species listed as common in warm months (2a) typically move further offshore or south when temperatures cool; those species listed as common in cold months typically demonstrate opposite behavior and move north or east into deeper waters in the summer.

Group 3: Mid-Atlantic Species That Migrate to the Georges Bank - Gulf of Maine During the Warm Season

Summer flounder
 Bluefish

Scup
 Bluefin Tuna

Group 3 species are common to the Mid-Atlantic area, and migrate north to the Gulf of Maine-Georges Bank area during late summer to early autumn, usually in low numbers (Azarovitz and Grosslein, 1982).

Group 4: Cold Water Species Common in the Gulf of Maine/Deep Water Areas, But Rare on Georges Bank

Smooth skate
 Thorny skate
 Redfish
 Cusk
 Witch flounder

Species listed in Group 4 are common to deeper waters of the Gulf of Maine, or those surrounding Georges Bank. They are not normally abundant on Bank areas, but do visit in the cold season.

Spawning areas for several fish species occur generally within the southwestern Gulf of Maine, including those for pollack, Atlantic cod, herring and squid. There is also particularly strong evidence that Stellwagen Bank provides spawning habitat for the American sand lance (Ammodytes americanus), a primary forage species for humpback and fin whales. (Sherman, et al., 1981; Sherman, et al., 1984; Richards, 1965).

Many of the identified Gulf of Maine species have been traditionally important commercially, and continue to provide an important economic resource to the New England region. Commercially important species include:

<u>Common Name</u>	<u>Scientific Name</u>
American plaice (sand dab)	<u>Hippoglossoides platessoides</u>
American lobster	<u>Homarus americanus</u>
American shad	<u>Alosa sapidissima</u>
Atlantic herring	<u>Clupea harengus</u>
Atlantic mackerel	<u>Scomber scombrus</u>
Atlantic wolffish	<u>Anarhichas lupus</u>
Atlantic cod	<u>Gadus morhua</u>
Black sea bass	<u>Centropristis striata</u>
Bluefin tuna	<u>Thunnus thynnus</u>
Bluefish (snapper)	<u>Pomatomus saltatrix</u>

Butterfish	<u>Peprilus triacanthus</u>
Cusk	<u>Brosme</u>
Dogfish	<u>Squalus acanthias</u>
Haddock	<u>Melanogrammus aeglefinus</u>
Little skate	<u>Raja erinacea</u>
Northern shrimp	<u>Pandalus borealis</u>
Ocean pout	<u>Macrozoarces americanus</u>
Ocean quahog	<u>Arctica islandica</u>
Pollack	<u>Pollachius virens</u>
Red hake	<u>Urophycis chuss</u>
Redfish (Ocean perch)	<u>Sebastes</u> spp.
Scup (Porgy)	<u>Stenotomus chrysops</u>
Sea scallop	<u>Placopecten magellanicus</u>
Silver hake (Whiting)	<u>Merluccius bilinearis</u>
Squids	<u>Illex</u> spp.
Striped bass (Rockfish)	<u>Morone saxatilis</u>
Summer flounder	<u>Paralichthys dentatus</u>
White hake	<u>Urophycis tenuis</u>
Winter flounder	<u>Pleuronectes americanus</u>
Winter skate	<u>Raja ocellata</u>
Witch flounder	<u>Glyptocephalus</u> <u>cynoglossus</u>
Yellowtail flounder	<u>Pleuronectes ferrugineus</u>

(NMFS, 1988)

System boundaries for many fish species may be provided by Gulf circulation patterns which carry eggs and larvae. Many gadoid species, such as cod, haddock, silver hake, sand dabs, and witch flounder breed on Stellwagen Bank (or in nearshore coastal waters), but not over deeper Gulf waters.

Due to its location at the southwestern end of the coastal circulation pattern, all of Massachusetts Bay acts as a "catch basin" for a variety of species. Several of these demonstrate somewhat localized distributions within the Gulf of Maine, including cod, haddock, pollack, hake, and herring.

c. Sea Turtles

Although four species of sea turtles have been recorded in Gulf of Maine waters, only two, the leatherback and the Atlantic ridley, are seen with any regularity. All species are currently listed as either threatened or endangered.

Atlantic, or Kemp's ridley (Lepidochelys kempi).
Atlantic ridleys are observed in waters off

Massachusetts as juveniles, having either swum or drifted north in the Gulf Stream from hatching areas off the southern coast of Mexico. Juvenile ridleys generally measure 10" to 12", and weigh around seven pounds. Southern New England waters are important feeding grounds for ridleys and are thus considered important habitat for this endangered species. Each fall (generally between November and January), as Cape Cod Bay water temperatures decline, a number of ridleys regularly strand on Cape Cod due to cold-stunning (Prescott, 1986). Cold-stunning occurs when water temperatures fall below 12°C (57°F), and turtles are unable to swim or digest food. Between 1977 and 1987, a total of 115 juvenile ridleys were found stranded on Cape Cod beaches (Danton and Prescott, 1988).

Leatherback (Dermochelys coriacea). The endangered leatherback is a regular summer visitor to the waters around Cape Cod, the Gulf of Maine, and Nova Scotia. This is the only species of sea turtle that colonizes cold waters for feeding activities, which include jellyfish (notably the lion's mane jellyfish), comb jellies, salps, and other jelly organisms abundant in these waters during the summer. The largest and heaviest of all extant reptiles, leatherbacks may grow to 11 feet in length and weigh up to 1,900 pounds. Turtles observed in the area between Cape Cod and Newfoundland are generally single, mature animals, frequently measuring more than six feet in length and weighing over 1,000 pounds. Of all sea turtles, leatherbacks appear to migrate the farthest in search of summer food; Western North Atlantic leatherbacks breed anytime between April and November along beaches in Central and South America (with very occasional nesting activity noted in southern Florida). Females usually nest only every other year, during March and April, and may not migrate as far north as males during breeding years. This may explain why most leatherbacks observed in the Gulf of Maine are males. Sightings off Massachusetts are most frequent during late summer (July through September). The turtles usually first appear in the Gulf of Maine between May and June, and are most frequently seen in the Gulf's southerly coastal waters. In the autumn, the turtles move further offshore and begin their migration south for the winter (Payne, et al., 1986).

The physiological adaptations of leatherbacks to pelagic environments make this species poorly-equipped to deal with obstructions in shallow waters. Leatherbacks regularly become entangled in fishing nets and lobster pot lines, situations which are compounded by this species' inability to either maneuver easily or to swim backwards. In addition to these problems, leatherbacks have been reported to die from intestinal blockage following consumption of plastic bags, which they presumably mistakenly identify as jellyfish. Collisions with boats also occasionally result in leatherback mortality.

Loggerhead (*Caretta*). Although loggerhead sea turtles are the most widespread and numerous species along the eastern seaboard, they are generally absent in shelf waters north of Cape Cod, including Cape Cod Bay and the Gulf of Maine. Water temperature is the primary factor in marking Massachusetts as the northern tolerance limit for this endangered species. Following nesting activity, loggerheads disperse northward, and there are limited sightings along outer Cape Cod and the islands during mid-summer through fall. Occasionally, loggerheads become trapped inside Cape Cod Bay in late fall and winter, resulting in cold-stunning and death.

Green (*Chelonia mydas*). Juvenile green sea turtles are rare summertime stragglers as far north as Cape Cod Bay. This endangered species generally is found in waters warmer than 20°C.

f. Marine Mammals

Thirteen species of marine mammals are known to frequent the waters over and around Stellwagen Bank, and rare sightings of an additional two species have been recorded. Resources of the Bank environment provide important sources of food for a seasonal variety of large and small cetaceans, and serve as nursery grounds for some of these species. Two species of pinnipeds have also been documented in the Stellwagen Bank area.

1. Endangered Cetaceans

Humpback whales (*Megaptera novaeangliae*; 30 to 60 feet, or 9.1 to 18.3 meters in length) are perhaps the most easily identified of large cetaceans due

both to their distinctive markings and long flippers and to their highly-visible feeding and socialization behaviors. The species was first scientifically described based on observations made of an individual taken off the coast of Maine, and hence, the Latin name *novaeangliae*, which means "New England". In spite of this description, humpback whale populations may be found in all oceans, although overall numbers remain depleted compared to pre-exploitation levels. The species has been protected from commercial hunting since 1962, and classified as "endangered" under the Endangered Species Preservation Act since 1970. (The Endangered Species Preservation Act was the predecessor to the 1973 Endangered Species Act). The Western North Atlantic population of humpbacks is currently estimated at 5,505 animals (NMFS, 1991).

Migrating north from calving and mating grounds in the eastern central Caribbean, a significant number of humpback whales, estimated at around 550, arrive in the Massachusetts Bay area annually, beginning approximately in early March, when they are first observed within Cape Cod Bay waters. By April, humpbacks begin to move farther offshore toward the Bank, where they generally remain until mid-November, intensively engaged in feeding activities. Primary prey of the humpback whales in this area is the American sand lance (*Ammodytes americanus*), whose populations are seasonally prolific in the Bank environment. Other species of fish occasionally taken by humpbacks include herring, mackerel, cod, and hake. Generally, humpbacks consume 95% fish, 5% zooplankton. North of Stellwagen Bank, capelin (*Mallotus villosus*) is the preferred prey. The Bank also serves as an important nursery area for mothers with calves. This "residency" period of approximately 7-1/2 to 8 months of the year in the Stellwagen Bank vicinity is one of the longest such periods known anywhere in the world. By mid- to late-November, the humpbacks begin their annual migration south to warmer coastal waters.

Due to their distinctive fluke patterns, photo identification has been possible for at least 500 individual humpbacks by local cetacean research organizations during the past 12 years. The growing photographic and other data bases on humpback

whales in the Stellwagen Bank area have added much to understanding the biology and habitat requirements of this species. Combined with the accessibility of the Bank to land points, public observation of humpbacks has in recent years become an increasingly popular recreational activity in the New England area.

Northern right whales (*Eubalaena glacialis*; 20 to 50 feet, or 6.1 to 15.2 meters in length) are the most seriously depleted species of large cetaceans. Estimates for the two known populations (found in the Atlantic and the Pacific Oceans) indicate the total world population may number fewer than 400, and probably does not exceed 500 individuals (Marine Mammal Commission, 1991). The population for the North Atlantic stock is thought to be between 300 and 350 whales (NMFS, 1990). Although this species has been protected from almost all hunting since 1935, it has not recovered to anywhere near its pre-exploitation numbers which are thought to be around 10,000 animals (NMFS, 1989).

In May 1990 the Right Whale Recovery Team, pursuant to Section 4 of the Endangered Species Act, petitioned the National Marine Fisheries Service to designate three areas off the eastern seaboard as critical habitat for this species, including Cape Cod Bay (Figure 5). Additionally, the Recovery Team also recently published a Recovery Plan for the Northern Right Whale.

Given its endangered status, the photo-identification of at least 100 northern right whales using the Bank seasonally indicates the particular importance of this system to a significant portion of the existing total North Atlantic population for feeding and nursing activities. Right whale courtship behavior may also be observed during spring, summer and fall months, with calving occurring in coastal waters off Georgia and Florida during late winter (NMFS, 1990).

Right whales begin to enter the Massachusetts and Cape Cod Bay systems by late winter or early spring from coastal Georgia and northeast Florida waters; and from other offshore over-wintering areas. The Massachusetts/Cape Cod Bays area is one of five identified "high-use" areas for Western

North Atlantic northern right whales. (The other four areas are: coastal Florida and Georgia; the Great South Channel east of Cape Cod; the Bay of Fundy; and Browns and Baccaro Banks south of Nova Scotia.) The whales generally remain in this system until approximately July, when most begin moving further north toward the lower Bay of Fundy, or areas on the southeastern shelf off Nova Scotia. By October, the whales have generally begun migrating to wintering areas.

Northern right whales feed primarily below the surface, and exclusively on zooplankton; the primary prey at Stellwagen Bank are copepods (in particular *Calanus finmarchicus*), and juvenile euphausiids. Because of the whales' slow movement, and a tendency to rest at the surface, the species is vulnerable to collisions with ships.

Fin (or Finback) whales (*Balaenoptera physalus*; 30 to 70 feet, or 9.1 to 21.3 meters in length) are the most common species of large baleen whale in the Gulf of Maine. While the preferred feeding habitat for the North Atlantic population of fin whales is over deeper waters of the continental shelf (300 to 600 feet), they are regularly observed anywhere from coastal to very deep water areas. Some fin whales overwinter near Cape Cod; however, their abundance near Stellwagen Bank peaks between April and October. Fins' behavior around boats is usually more restless than humpbacks; however, they will sometimes approach still and quiet vessels (Katona, et al. 1983).

An asymmetric coloration of the head -- the right side (including lip and baleen areas) always white or pale gray; and the left always dark -- is unique to fin whales, and may play an important role in feeding behavior. Fin whales are often observed circling in a clockwise direction (thus with their light colored side down), herding prey fish for easier consumption. Various species, especially sand lance, capelin, and herring, form the primary diet of fin whales (90%); the species is often seen feeding with humpbacks. Smaller individuals may also consume copepods and squid.

The pre-exploitation Western North Atlantic population is not known. The current Western North Atlantic population is thought to number

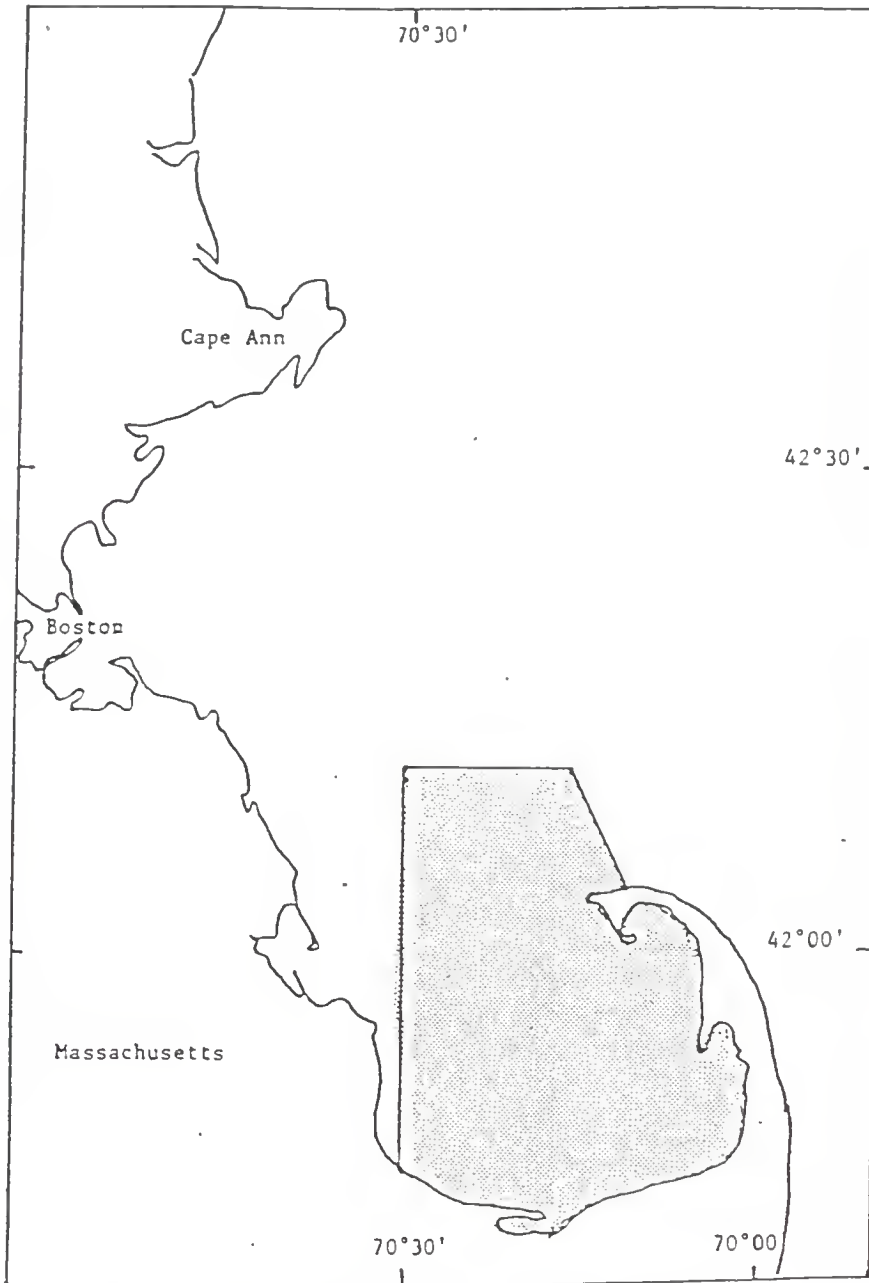


FIGURE 5: AREA RECOMMENDED FOR NORTHERN RIGHT WHALE
CRITICAL HABITAT DESIGNATION

(NMFS, 1990)

between 3,590 and 6,300 individuals (NMFS, 1991); and the worldwide population is roughly estimated at about 120,000.

Sei whales (*Balaenoptera borealis*; 25 to 50 feet, or 7.6 to 15.2 meters in length) are smaller and darker than fin whales, but difficult to identify. Sei whales were first positively observed feeding in the Stellwagen Bank area in 1986; and the numbers recorded since then have been relatively low. They feed exclusively on zooplankton, primarily copepods and euphausiids (and krill in other feeding habitats).

There are no recent population estimates for sei whales in the North Atlantic. NMFS has estimated approximately 4,000 individuals may be present in this overall area. (NMFS, 1991). In 1988, approximately 40 individual sei whales were photographically identified at Stellwagen Bank; however, a greater number were present.

Blue whales (*Balaenoptera musculus*; 25 to 100 feet, or 7.6 to 30.5 meters in length) are the largest mammals on Earth. The first documented sighting of a blue whale on the east coast of the United States was recorded in October 1986 on the western edge of Stellwagen Bank. Two additional sightings of blue whales were recorded at the Bank in 1987. In all instances, the whales were observed feeding, probably on euphausiids. Blue whales may also occasionally feed on copepods, fish, and squid.

Although blue whales have been seen regularly during summer months in the Gulf of St. Lawrence, and around southern and northern Newfoundland, there are few data available on Western North Atlantic populations. The worldwide, pre-exploitation population level is estimated at 300,000 animals. Current population estimates for the North Atlantic range between 100 and 555 individuals. (NMFS, 1991).

2. Non-Endangered Cetaceans

Minke whales (*Balaenoptera acutorostrata*; 15 to 30 feet, or 4.6 to 9.1 meters in length) are the smallest of the balaenopterid species of cetaceans. Although reliable population figures for the Western North Atlantic stock are not known, minke whales are commonly seen in the northern Stellwagen Bank

and southern Jeffreys Ledge area from March until November. The species may also overwinter in these areas; although further winter surveys would be necessary to make this determination.

Minke whale abundance in the study area is highest in the spring and the late summer/early fall. Larger concentrations of minkes appear during the latter period, frequently observed in the immediate vicinity of fin whales. It is likely that the seasonal movements of this species are similar to those of fin whales.

Minkes feed primarily on schooling fish and euphausiids, in particular herring, sand eel, capelin, cod, pollack, mackerel, squid and copepods. Although surface feeding patterns have been documented, minkes more normally feed below the surface. Calves are not generally seen in these feeding areas. Due to their inconspicuous appearance and behavior, population counts have been difficult to obtain.

Pilot whales (*Globicephala* spp.; 10 to 20 feet, or 3.0 to 6.1 meters in length) are distinguished by the species' large bulbous head. The most common species occurring in the Gulf of Maine is *Globicephala melaena*, though in the Western North Atlantic, this species is found in the same areas as short-finned pilot whales (*Globicephala macrorhyncha*). These small jet black whales are generally observed along the shelf edge in the company of bottlenose dolphins (100 to 1,000 meter contour), but may also be seen in central and northern Georges Bank/Great South Channel/Gulf of Maine areas between May and October.

Pilot whales feed almost exclusively on squid (*Illex* spp.), with fish and invertebrates as alternative prey. Average pod size is approximately 20 animals.

Orca (or killer) whales (*Orcinus orcus*; 22 to 30 feet, or 6.7 to 9.1 meters in length) are most commonly seen in the southwestern Gulf of Maine from mid-July to September, although these whales are also known to overwinter in the Gulf of Maine. Orcas have been frequently recorded on Jeffreys Ledge, between the Isles of Shoals and on Stellwagen Bank, where they are thought to follow schools of bluefin tuna. As opportunistic feeders,

orcas consume a variety of fishes including tuna, herring and mackerel, and have also been known to attack pinnipeds, seabirds, and other cetaceans.

White-sided dolphins (Lagenorhynchus acutus; 7 to 9 feet, or 2.2 to 2.7 meters in length) are widespread throughout the Gulf of Maine/Georges Bank environment all year, and are particularly abundant in the southwestern portion of the Gulf (incorporating Stellwagen Bank). These highly social cetaceans are found only in the North Atlantic, and are generally present on northern portions of the Bank and on Jeffreys Ledge at all times of the year. They are frequently seen feeding with fin whales, and may also be seen bow-riding fins or humpbacks, as well as vessels. Pods of white-sided dolphins may range in size from 10 to over 1,000 animals, although most groups number between 25 and 150. Calves are also observed in this area throughout the year. Prey species include a variety of fishes, such as herring, hake, smelt, capelin, cod, and squid.

White-beaked dolphins (Lagenorhynchus albirostris; 8 to 10 feet, or 2.4 to 3.0 meters in length), like the white-sided dolphins, are found only in the North Atlantic; although they generally follow a more northerly range, from Cape Cod to Greenland. White-beaked dolphins are considered casual visitors to the northern end of Stellwagen Bank, where sightings usually occur between April and November. While in the Gulf of Maine, white-beaked dolphins likely feed on sand eels; squid may also be consumed. In the 1950's, white-beaked dolphins were more abundant in the overall Gulf of Maine; they have been displaced by increased numbers of white-sided dolphins.

Harbor porpoises (Phocoena; 4 to 6 feet, or 1.2 to 1.8 meters in length) are locally abundant in temperate waters of the Bay of Fundy and the northern Gulf of Maine during summer months. The species exhibits seasonal patterns in spatial distribution within this general region, and is particularly concentrated in the southwestern Gulf of Maine, the Great South Channel, Jeffreys Ledge, and coastal Maine during mid-spring months. Sightings are generally recorded from south of Cape Cod north to the Bay of Fundy during spring months. Following April, harbor porpoises are

only rarely seen in Cape Cod waters, and the decrease in sighting frequency suggests a general northeast movement toward the northern Gulf of Maine and Bay of Fundy. (Cited in T. Bigford, NMFS/NER, April 1991).

The summer population estimate of approximately 16,000 harbor porpoises in the Gulf of Maine is considered somewhat unreliable, due to seasonal changes in species distribution, which make survey consolidation difficult. The Northeast Fisheries Center of NMFS planned a summer 1991 survey of harbor porpoise, which should produce more reliable population estimates. (T. Bigford, NMFS/NER, April 1991). Harbor porpoise diet consists primarily of small schooling fishes, polychaetes, and cephalopods. In the Gulf of Maine, likely prey species include mackerel, herring, squid, and sand eel.

A number of harbor porpoises annually are entangled and killed incidentally in both U.S. and Canadian gillnet fisheries in the Gulf of Maine. Although reliable estimates of affected harbor porpoises in the U.S. fishery do not exist at this time, the possibility exists that the species may be declining due in part to entanglement losses. (T. Bigford, NMFS/NER, April 1991). Through the Marine Mammal Exemption Program, (§ 114 of MMPA) and the gillnet industry, NMFS is currently seeking to assess and rectify this problem.

Bottlenose dolphins (Tursiops truncatus; 8 to 12 feet, or 2.4 to 3.7 meters in length) are occasionally seen in the Gulf of Maine during the late summer and fall. This species, generally occurring offshore along shelf areas from Cape Hatteras (North Carolina) to Georges Bank is the larger of two recognized forms of Tursiops truncatus. (The smaller form occurs more frequently in inshore areas of the mid-Atlantic south of Delaware Bay.) While in the Gulf of Maine, bottlenose dolphins feed opportunistically on a wide variety of fish, squid, and invertebrates.

Common (or Saddleback) dolphins (Delphinus delphis; 6 to 8 feet, or 1.8 to 2.4 meters in length) are occasional visitors to the Gulf, particularly in the fall and winter. Saddlebacks are generally seen over northeastern portions of Georges Bank,

feeding on fish and squid.

Striped dolphins (*Stenella coeruleoalba*; 6 to 8 feet, or 1.8 to 2.4 meters in length) are seen occasionally in the Gulf of Maine. This species generally prefers more pelagic waters, along the edge of the continental shelf. Diet consists primarily of fish and squid.

Grampus (or Risso's dolphin) (*Grampus griseus*; 9 to 13 feet, or 1.27 to 3.96 meters in length) are generally considered absent from the Gulf of Maine, although there have been several individuals recorded. More normally, this species stays outside the 100-meter contour, south of Cape Cod. Grampus feed almost exclusively on squid.

3. Pinnipeds

Two pinniped species occur commonly in the Sanctuary area: the harbor seal (*Phoca vitulina*); and the gray seal (*Halichoerus grypus*).

Harbor seals are common from Labrador to Long Island, New York (and occasionally found as far south as South Carolina and Florida). It is the most abundant pinniped species in eastern United States waters. Harbor seals are widely distributed in nearshore waters along the coast, preferring sheltered and undisturbed rocky ledge haulout areas in bays and estuaries from Maine south to Plymouth, Massachusetts.

During the first half of the 20th century, harbor seals bred as far south as Cape Cod Bay, but currently are only seasonal residents in southern New England (from late September until late May). State bounties in southern New England states existed until 1962, and probably caused not only an overall reduction in seal populations, but also a northerly shift in distribution of breeding populations. Breeding occurs from late April until late June, and exclusively north of Massachusetts.

Since the passage of the Marine Mammal Protection Act in 1972, harbor seal populations have increased steadily. In 1983, estimates of Maine's harbor seal population were 12,000 to 15,000 animals, and increasing. Approximately 4,000 of these (or 25% of the New England population)

overwinter south of Maine, and 60% of these (or 2,400 animals) occur on and around Cape Cod (Payne, et al., 1983).

Harbor seals are opportunistic feeders, preferring small schooling fishes such as herring, squid, alewife, flounder, and hake. In the relatively deep waters of southern New England, redfish, cod, herring, and yellowtail flounder are also consumed. In the shallower waters adjacent to Cape Cod, and within the Sanctuary proposal area, harbor seals feed almost exclusively on sand eel (or sand lance).

Gray seals (*Halichoerus grypus*) are the most abundant pinniped species occurring in southern areas of eastern Canada, from Labrador south through the Bay of Fundy. Population estimates for the Canadian Maritimes were 40,000 to 50,000 animals and increasing in 1983. Gray seal colonies in the Gulf of Maine, however are much smaller (approximately 600 animals in 1983).

In the 1940's, the Massachusetts population of gray seals numbered about 70 animals; and by 1963, this population was reduced to 20 or fewer seals as the result of bounty kills. The remaining resident Massachusetts population is located southwest of Nantucket Island, and is the only active breeding population in the eastern United States. Pupping occurs in mid-winter; however, pupping rates have been low. The total gray seal population overwintering in Massachusetts numbered more than 100 animals in 1986, likely due to the immigration of seals from the expanding Canadian population.

Gray seals feed both on fish and invertebrates, as they are available. The Nantucket Island population most commonly feeds on skates, alewife, and sand eel, which are abundant from mid-winter to late spring.

g. Seabirds

Over 40 species of marine birds are found throughout the year in the southwestern Gulf of Maine (Payne and Seltzer, 1986). Although they return to land to breed, seabirds spend anywhere from 50 to 90 percent of their lives at sea, foraging and competing with other predators for food (Fisher

and Lockley, 1954; Ainley, 1980). Distribution and abundance of seabird species at Stellwagen Bank are related, as they are in other parts of the Gulf of Maine, to the availability of preferred prey (e.g., fish and fish larvae, cephalopods, crustaceans, and offal). Various seabird species are often specialized in their feeding behavior, resulting in little overlap in preferred prey species. This occurs even among closely related species, such as the several species of shearwaters found in the Gulf of Maine region (Powers and Brown, 1987). The high levels of biological productivity at Stellwagen Bank, combined with the presence of fishing vessels, result in a predictable and abundant variety of associated species of both coastal and pelagic seabird species.

There are ten species groups of marine birds which are generally dominant in the southwestern Gulf of Maine (Table 2). In addition to these species groups, several species of scoters occur in the Stellwagen Bank area, as well as eiders, mergansers, and oldsquaws (Payne and Seltzer, 1986). These species include:

Melanitta deglandi, White-winged scoter (sea duck)
M. negri, Black scoter (or sea duck)
M. perspicillata, Surf scoter (or sea duck)
Somateria mollissima, Red-Breasted merganser
Clangula hyemalis, Oldsquaw

Additional occasionally-seen migratory species include the Sharp shinned hawk (Accipiter striatus), Osprey (Pandion haliaetus), Peregrine falcon (Falco peregrinus), and Atlantic brant (Branta bernicla hrota).

With a single exception (Leach's storm petrel, Oceanodroma leucorhoa), all seabirds occurring around the Stellwagen Bank area are either migrants or non-breeding residents. In general, spring months are the time of greatest seabird abundance on the Bank. (Powers and Brown, 1987)

It is possible that some limited hunting for sea duck species (such as oldsquaws, mergansers, scoters, and eiders) may occur within the area of the Sanctuary, pursuant to licenses issued under the Migratory Bird Treaty Act (MBTA). However, as most sea duck hunting occurs in sheltered bays or inlets adjacent to land, hunting near the open ocean

Stellwagen Bank is likely to occur only on an infrequent basis, if at all. (V. Lang, USFWS, pers. comm., June 1991).

U.S. Fish and Wildlife Service analysis of National Marine Fisheries Service sea sampling data (1989-1990) also indicates that incidental take of sea bird species generally resulting from commercial or recreational fishing activities does not happen frequently, or pose an exploitation threat to any species. (V. Lang, USFWS, pers. comm., June 1991).

Loons - The Common loon (Gavis immer), and the Red-throated loon (Gavis stellata) breed in northeastern North America and migrate along the Atlantic seaboard. While Red-throated loons are primarily found in nearshore waters and the western margin of the Gulf of Maine, Common loons additionally cross over Georges Bank during May and November. Loons are pursuit divers, feeding as tertiary carnivores, primarily on fishes, and as secondary carnivores on crustaceans, mollusks, and aquatic insects (Palmer, 1962). Loons have been recorded frequently offshore during spring and fall migrations.

Albatrosses - Two species of albatrosses, the Yellow-nosed (Diomedea chlororhynchos) and the Black-browed (D. melanophris), are considered rare visitors to western North Atlantic waters; at least one yellow-nosed albatross was reported on Georges Bank in 1976 (Powers and Brown, 1987).

Fulmars - The Northern fulmar (Fulmarus glacialis). The pelagic distribution of northern fulmars encompasses the North Atlantic; in the Western North Atlantic, fulmars extend as far south as the Mid-Atlantic Bight. As "opportunistic" secondary and tertiary carnivores, fulmars consume a large variety of zooplankton, fish, squid, crustaceans, and offal from fishing vessels. They are found off the New England coast throughout the year, with the exception of August, when they move northward. Peak abundance over the Stellwagen Bank/Georges Bank area is usually from approximately January to April, when flocks of several thousands have been recorded (Powers, 1983).

Table 2: Species/Species Groups of Marine Birds Occurring in the Southwestern Gulf of Maine

<u>Group</u>	<u>Species/Common Name</u>	<u>Major Food</u>
Loons	<u>Gavis immer</u> , Common Loon	Fish
	<u>G. stellata</u> , Red-throated Loon	Fish
Albatross	<u>Diomedea</u> spp.	Fish , Cephalopods
Fulmars	<u>Fulmarus glacialis</u> , Northern Fulmar	Fish, Offal
		Crustaceans, Cephalopods
Shearwaters	<u>Calonectris diomedea</u> , Corey's Shearwater	Fish, Cephalopods
	<u>Puffinus gravis</u> , Greater Shearwater	Crustaceans
	<u>P. griseus</u> , Sooty Shearwater	
	<u>P. puffinus</u> , Manx Shearwater	
Storm Petrels	<u>Oceanites oceanicus</u> , Wilson's storm petrel	Crustaceans, Fish
	<u>Oceanodroma leucorhoa</u> , Leach's storm petrel	Cephalopods
Gannets/ Cormorants	<u>Sula bassanus</u> , Northern Gannet	Fish
Phalaropes	<u>Phalacrocorax carbo</u> , Great cormorant	
	<u>P. auritus</u> , Double-crested cormorant	
Phalaropes	<u>Phalaropus fulicaria</u> , Red phalarope	Crustaceans
	<u>P. lobatus</u> , Red-necked phalarope	Fish eggs, larvae
Alcids	<u>Alca torda</u> , Razorbill	Fish
	<u>Uria aalge</u> , Thin-billed (common) murre	Crustaceans
	<u>U. lomvia</u> , Thick-billed (Brunnich's) murre	
	<u>Alle</u> , Dovekie	
	<u>Cephus grylle</u> , Black guillemot	
Gulls/Jaegers/ Skuas	<u>Fratercula arctica</u> , Atlantic (Common) puffin	
	<u>Larus hyperboreus</u> , Glaucous gull	Fish, Cephalopods
	<u>L. glaucooides</u> , Iceland gull	Offal
	<u>L. marinus</u> , Great Black-backed gull	
	<u>L. argentatus</u> , Herring gull	
	<u>L. delawarensis</u> , Ring-billed gull	
	<u>L. atricilla</u> , Laughing gull	
	<u>L. philadelphia</u> , Bonaparte's gull	
	<u>Xema sabini</u> , Sabine's gull	
	<u>Rissa tridactyla</u> , Black-legged kittiwake	
	<u>Stercorarius pomarinus</u> , Pomarine jaeger	
	<u>S. parasiticus</u> , Parasitic jaeger	
	<u>S. longicaudus</u> , Long-tailed jaeger	
	<u>Catharacta skua</u> , Great skua	
<u>C. maccormickii</u> , South polar skua		
Terns	<u>Sterna hirundo</u> , Common tern	Small Fish
	<u>S. paradisaea</u> , Arctic tern	
	<u>S. dougalli</u> , Roseate tern	
	<u>S. albifrons</u> , Least tern	
	<u>S. maxima</u> , Royal tern	
	<u>S. sandvicensis</u> , Sandwich tern	
	<u>S. anaethetus</u> , Bridled tern	
	<u>S. fuscata</u> , Sooty tern	
	<u>Chlidonias niger</u> , Black tern	

Shearwaters - Four species of shearwaters occur with regularity over the Stellwagen Bank/Georges Bank area: **Cory's shearwater** (*Calonectris diomedea*); **Greater shearwater** (*Puffinus gravis*); **Sooty shearwater** (*P. griseus*); and **Manx shearwater** (*P. puffinus*). A fifth species, **Audubon's shearwater** (*Puffinus lherminieri*), normally is found on southern edges of Georges Bank during the summer.

Cory's shearwaters are abundant in New England waters generally from July until October; and in some years significant numbers of this species have moved into the Gulf of Maine and stayed until the autumn (Powers and Brown, 1983). The largest local concentrations have occasionally been recorded at 30-100 birds/km² (Powers, 1983). The species feeds at or near the surface as secondary and tertiary carnivores on fish, fish larvae, cephalopods, and crustaceans.

The Greater shearwater is highly abundant over Georges Bank, beginning in May and peaking in June and July, when densities may reach 25 birds/km². The species is most numerous over Stellwagen Bank during summer and autumn months. Like the Cory's, the Greater shearwater feeds as a tertiary carnivore on fish and cephalopods; as a secondary carnivore on crustaceans; and as a scavenger on offal from fishing vessels.

Between May and September, Sooty shearwaters migrate in a clockwise manner around the North Atlantic basin; they are abundant on Georges Bank from late May to mid-July, and are found over Stellwagen Bank during the summer months. Typically, the species feeds at or near the surface as a secondary or tertiary carnivore on fish, cephalopods, and crustaceans; however, this species does not appear as frequently in association with fishing vessels as other shearwaters (Wahl and Heinemann, 1979).

Manx shearwaters occur over Georges Bank from June to October (Powers and Brown, 1983); and are occasionally seen over Stellwagen Bank during summer months. Like other shearwaters, the Manx is a secondary and a tertiary carnivore, feeding on small fish, cephalopods, crustaceans, and probably

offal.

Storm Petrels - Of the two species of storm petrels occurring in and around the Stellwagen Bank area, **Wilson's** (*Oceanites oceanicus*) and **Leach's** (*Oceanodroma leucorhoa*), the Wilson's is by far the more commonly-seen.

Wilson's storm petrels arrive in the Gulf of Maine by late May, and reside through the summer months; this residency largely coincides with the seasonal peak in zooplankton. The species is primarily a surface-feeder on zooplankton, euphausiids, and amphipods, and (to a lesser degree) as a tertiary carnivore on small fish and cephalopods. Also known as Mother Carey's chick (Powers and Brown, 1983), the Wilson's storm petrel is the second most abundant seabird species during the summer over the Georges Bank/Stellwagen Bank area.

Leach's storm petrels are also found in this region between April and November, although they are more abundant on the Southern Scotian Shelf, to the north. This is the only seabird species which utilizes northern areas as breeding habitat, in particular, the Bay of Fundy region (Powers and Brown, 1983).

Gannets and Cormorants - The **Northern gannet** (*Sula bassanus*) are tertiary carnivores feeding almost exclusively on fish and squid, although the species is known to scavenge offal from fishing vessels and may also take fish directly from fishing nets near the surface (Powers, 1983). Gannets are most numerous in the Gulf of Maine, and in particular over Stellwagen Bank and through the Great South Channel. During winter-spring, large concentrations of gannets have been observed feeding in association with cetaceans (Payne and Seltzer, 1986).

Two species of cormorants occur very occasionally over Stellwagen Bank; they are more typically coastal inhabitants.

The **Great cormorant** (*Phalacrocorax carbo*) and the **Double-crested cormorant** (*Phalacrocorax auritus*) exhibit migratory movements in the spring and autumn in the western Gulf of Maine, and feed

primarily on fish.

Phalaropes - Of the two species known to occur occasionally in the vicinity of Georges Bank/Stellwagen Bank, the **Red phalarope** (*Phalaropus fulicaria*) is more frequently observed than the **Red-necked, or Northern, phalarope** (*Phalaropus lobatus*). Both species are most common during April to June, and again during August to October, during migratory passages. The spring migration northward occurs largely along the outer edge of the shelf (60 to 200 meters, or 196.8 to 656 feet); although some of both species have been known to follow the coast into the western Gulf of Maine on their northward migration (Powers, 1983). Both species feed at the surface as secondary carnivores on planktonic crustaceans, fish and squid eggs, and larvae.

Alcids - At least five, and possibly six species of alcids occur in the Gulf of Maine/Stellwagen Bank vicinity. **Razorbills** (*Alca torda*) are pursuit-diving birds, feeding as secondary and tertiary carnivores on crustaceans and fish. The species is present in the area from late November to May, most commonly in shoal areas around Cape Cod, over the Great South Channel, and along northern parts of Georges Bank. The Georges Bank area appears to be an important wintering area for this species (Powers and Brown, 1983).

Two species of murres, the **Thin-billed, or Common** (*Uria aalge*) and the **Thick-billed, or Brunnich's** (*Uria lomvia*), are occasionally seen during the winter in the southern Gulf of Maine, including areas around Stellwagen Bank. By March, these species are more common on northeast Georges Bank and over the Northeast Channel to the north. Murres and razorbills are all large auks, with similar feeding habits. Murres are pursuit-divers, feeding as secondary and tertiary carnivores on crustaceans, fish and cephalopods.

Dovekies (*Alle*) are generally observed from December to May in the Gulf of Maine, and also south across the Nantucket Shoals. The species feeds as a secondary carnivore on crustaceans, and may also eat zooplankton.

Black guillemot (*Depphus grylle*) are also a

pursuit-diving birds, feeding as secondary and tertiary carnivores on benthic crustaceans and mollusks, and fish. The Black guillemot is primarily a coastal inhabitant, but is occasionally seen over Stellwagen Bank.

The **Atlantic, or Common, puffin** (*Fratercula arctica*) is found between November and early June over Georges Bank; little is known about its distribution. Like other alcids, puffins are pursuit-divers, feeding almost exclusively on fish as tertiary carnivores.

Gulls, Jaegers, and Skuas - Eight species of gulls occur with regularity in the southwestern Gulf of Maine, and over Stellwagen Bank. Among these, the **Herring gull** (*Larus argentatus*) and the **Great black-backed gull** (*Larus marinus*) occur in greatest numbers over Stellwagen Bank. Both species are omnivorous, feeding as secondary, tertiary, and upper level carnivores on crustaceans, insects, fish, squids, birds and eggs, and as scavengers on offal and carrion. Large numbers of both species are closely associated with fishing vessel activities throughout the year.

Glaucous gulls (*Larus hyperboreus*) and **Iceland gulls** (*Larus glaucooides glaucooides*) also feed as secondary, tertiary, and upper level carnivores on macrozooplankton, fish, and offal, as well as on the eggs and young of other seabirds. Both species are seen in the Gulf of Maine region from the autumn through the spring, commonly in association with Herring and Great black-backed gulls following fishing vessels.

Laughing gulls (*Larus atricilla*) are usually seen during summer months in the Gulf of Maine, surface feeding on small fish and scavenging on offal. This species is also known to take the eggs of terns on land.

Ring-billed gulls (*Larus delawarensis*), **Bonaparte's gulls** (*Larus philadelphus*), and **Sabine's gulls** (*Xema sabini*) all appear in offshore areas throughout the Gulf of Maine during migratory periods only.

Like the gulls, the **Black-legged kittiwakes** (*Rissa tridactyla*) feed as secondary and tertiary carnivores

on crustaceans, fish and squid, in addition to offal. The species is extremely abundant during November to March, particularly in the area from Jeffreys Ledge south and east across the northern portion of Georges Bank. In winter months, the density of kittiwakes over Stellwagen Bank and Jeffreys Ledge is probably higher than for any other species of seabird.

Three species of jaegers occur in the western North Atlantic, although only two are regularly observed in the southwestern Gulf of Maine, over Stellwagen Bank: the Parasitic jaeger (Stercorarius parasiticus) and the Pomarine jaeger (Stercorarius pomarinus). The Long-tailed jaeger (Stercorarius longicaudus) is only seen very occasionally in the Gulf. Jaegers are migrants across Georges Bank, principally in spring and fall months. Jaegers feed at the surface, seizing prey or snatching from other birds, such as gulls and terns. The species are secondary and tertiary carnivores feeding on crustaceans, fish and cephalopods, as well as offal.

Two species of skuas appear over Georges Bank and the surrounding areas, the Great skua (Catharacta skua) and the South polar skua (Catharacta maccormickii). The great skua is most common from October to March, although individual sightings have been made every month (Powers and Brown, 1983). The south polar skua, only recently recognized in the overall western North Atlantic, has been generally observed from May to October over Georges Bank. Like the jaegers, skuas feed primarily on fish, cephalopods, and offal.

Terns - All nine species of terns identified as occurring around the Stellwagen Bank region feed exclusively on small fish. Of the group, it is known that Common terns (Sterna hirundo), Arctic terns (Sterna paradisaea), Roseate terns (Sterna dougallii), and Least terns (Sterna albifrons) breed along Atlantic coastlines at various points, depending on the individual species, between Nova Scotia and Florida (and, in the case of the Least tern, also along the Gulf coast). Terns are typically seen around the Bank during summer and autumn months. The roseate tern is Federally-listed as an endangered species.

3. Historical/Cultural Resources

There are several known and potential submerged cultural resources within or adjacent to the Sanctuary. Given the distance from the nearest landfall, submerged cultural resources might include prehistoric materials and sites, historic and modern shipwrecks, disposal areas, and aircraft. At present, the only submerged cultural resources identified are shipwrecks and aircraft.

a. Prehistoric Cultural Resources

While no known prehistoric cultural resources, artifacts, or sites have been located in the Sanctuary area, the potential for their existence must be considered. The occasional recovery of megafauna remains (such as mammoth and mastodon skeletal materials) by fishermen demonstrates that environmental conditions were present to support Paleo-Indian populations. Recently, skeletal materials (mastodon or mammoth tooth) were recovered by commercial fishermen several miles off Provincetown (H. Arnold Carr, pers. comm., 1990). However, these discoveries do not necessarily presume the presence of Native American remains. Further, a more diverse subsistence pattern of foraging and hunting (big-game and smaller animals) was more likely for Paleo-Indian groups (Funk, 1978; Barber, 1979).

A Bureau of Land Management study of the Outer Continental Shelf (Barber, 1979) characterized two possible periods when the study area was not inundated and could have supported Native American exploitation. Between 12,000 and 9,000 B.P. (Before Present), the Stellwagen Bank area was a series of shoals and small islands. Seal hunting would have been a major subsistence activity. Between 9,000 and 6,000 B.P., the Bank appears to have been one large continuous island that may have supported Native Americans similar to the nearby Provincetown area of Cape Cod (shell middens and habitation). Sites are characterized as small in size and low in frequency.

Some researchers assert Native American populations were exploiting large marine mammals at sea prior to European contact (Proulx, 1986). Erickson (1978) observed that porpoises and seals

were hunted in the open ocean. However, exploitation of these resources appears to be restricted to nearshore or onshore activities, such as utilizing beached whales or hunting seals along the shore, rather than on the open ocean (Salwen, 1978; Snow, 1978). Therefore, there is little likelihood for the occurrence of prehistoric cultural materials in the Sanctuary area from roughly after 6000 B.P.

b. Historic Vessel Traffic

The Sanctuary area can be described as the "gateway" to maritime commerce of Massachusetts. Historically, as today, the main shipping lanes crossed over Stellwagen Bank. Until the opening of the Cape Cod Canal, this was the only access to the ports inside Massachusetts Bay, such as Boston, Plymouth, Salem, Gloucester, and Provincetown. With the opening of the Canal, vessel traffic not destined for Massachusetts Bay ports crossed the study area with much greater frequency. Further, fishing vessels utilized the study area not only as a fishing ground but also as the route to major fishing grounds on Georges Bank and the Great South Channel.

Historical fisheries and whaling activities of this region are well established. It is clear that near shore fisheries (including whaling from long boats) encompassed Stellwagen Bank (Stuart Frank, pers. comm., 1990). It was the shift from smaller vessels to the schooners which moved the majority of fisheries further offshore to areas such as Georges Bank, Great South Channel, and Grand Bank. Nearshore fisheries were typically restricted to a few small open boats engaged in market fisheries almost exclusively in the winter months up to the Civil War (Collins, 1890). It appears that Stellwagen Bank was not heavily exploited by the schooner-based fisheries because Georges Bank was more lucrative (Collins, 1889). Growth of the trawler and dragger fishing industries focused attention back to Stellwagen Bank in this century.

The late 19th/early 20th century saw the highest level of coastal shipping in the Northeast (Fish, 1989). At the turn of this century, the region saw its greatest number of shipwrecks per year (Fish, 1989). Primary causes of vessel loss (shipwrecks) fall into four broad classes: (1) acts of war - naval

engagements, piracy, law enforcement; (2) natural forces - storms (gales/hurricanes); (3) human error - seamanship, fire, collision; (4) abandonment - for the reasons stated above, plus vessel condition, economic reasons.

Bias may exist in the historical and documentary record to selectively not record location or other information on shipwreck sites which do not pose a hazard to navigation, involve human tragedy, or carry valuable cargo. Government data are aimed at identifying and locating those man-made and natural objects which are hazards to navigation. In many instances of deep water shipwrecks, the reported locations are approximated and not verified because they do not pose a hazard to navigation. Further, reliable location information is in private hands (sport divers, researchers, fishermen) whose varying purposes and needs generally preclude making this information public.

Most available published sources of shipwreck information concentrate on "romance of the sea," and/or major calamities and disasters; their audience is typically popular and not scholarly. Many of these works are laundry lists of shipwrecks often published without sources. Further, many works reflect a certain selective presentation of facts such as including only larger vessels or those carrying "valuable" cargo. Thus, vessel loss is, in general, unrecorded.

The ambiguity of location given for most maritime disasters generally precludes establishing statements of impacts to specific resources. Ambiguity exists over the reported locations of shipwrecks, particularly at sea and the types of vessel losses reported. Typically, the presumed nearest landfall is used when the shipwreck does not occur at a recognized landmark, that is, on shore, on rocks, near a buoy marker or lightship. References such as off-Provincetown, off-Cape Ann, off-Massachusetts Coast, or off-New England, or "left port never to be heard of again," are frequently the only description of shipwreck locations. Additionally, for most Colonial writers, places of loss were far less important to record than who and what were lost.

c. Historic Shipwreck Resources

While historic data strongly suggest the existence of shipwreck sites within the Stellwagen Bank Sanctuary area, few have been positively located at this time. Reliable sources place between 1500 and 3000 shipwrecks off Massachusetts coasts; yet there are no specific references to Stellwagen Bank as the resting place for wrecks (Berman, 1972; Lonsdale and Kaplan, 1964; Luther, 1958, 1965; Luther and Weeks, 1967; Marx, 1987; Fish, 1989).

The National Ocean Service's Automated Wreck and Obstruction Information System (NOS, 1988) places seven shipwrecks within or immediately adjacent to the Sanctuary area:

Shipwrecks Occurring Within the Stellwagen Bank Area

<u>Vessel Name</u>	<u>Vessel Type</u>	<u>Date Lost</u>
ALDEN	Trawler	1917
NATALIE	Schooner	1937
HAMMOND		
OCEAN	Trawler	1938
RESTLESS	Trawler	1942
YF 415	Patrol Boat	1944
AUGUSTA	?	1950
SNOW		
LEAH F	Trawler	1950

The spatial distribution of these vessels appears random. Insufficient information is presently available to discuss the potential historical importance of these shipwreck sites.

The remote sensing records of the Historic Maritime Group of New England (HMGNE) note approximately twenty-five anomalies which it considers to represent shipwrecks, as opposed to other debris or natural features (Fish, pers. comm., 1990). HMGNE has not as yet investigated each location. The distribution of these anomalies demonstrates a slight clustering to the western half of the Sanctuary study area. In addition, HMGNE places the wreck site for the recently-found wreck, the steamer PORTLAND within the Sanctuary (in particular, within boundary alternatives #3 and #5).

An historically-important shipwreck, the steamship PORTLAND was lost with over 160 lives during the Portland Gale of 1898. The side-wheeled paddle steamer was built in 1890 by the New England Shipbuilding Company of Bath, Maine. The vessel was 291 feet in length, 42 feet in breadth, 15 feet in draught and had a gross tonnage of 2283 tons. Its top speed was 15 knots, and it served the Portland Steam Packet Company in its Boston-Portland Line (Cram, 1980).

The loss of the steamer PORTLAND is one the most controversial marine mysteries in the history of the region (Fish, 1989:93). The ship's loss marked a change in coastal passenger shipping in the region. Following the loss of the PORTLAND, a duplicate passenger list was always left on shore when a passenger vessel left port (Fish, 1989:95). Changed also was the design of coastal passenger steamers. Paddle wheel steamers, like the PORTLAND, were of shallow draft which, while permitting passage up Maine's rivers did not handle well in heavy seas. Later vessels were of the propeller type rather than paddle wheel, and had deeper drafts and were more enclosed. These changes allowed for more seaworthiness in the unpredictable and often wild waters of the Northeast (Fish, 1989:95). The PORTLAND is valued as a memorial site, and has historical importance due to its effect on maritime business and technology. Its eligibility for inclusion on the National Register of Historic Places should be determined (Appendix D).

Another vessel lost during the same storm was the PENTAGOET. Built in Philadelphia in 1864, the vessel served as a gun boat during the Civil War. It was converted to the coastal trade and owned by the Manhattan Steamship Company in service for its New York - Rockland - Bangor route (Cram, 1980). Several anonymous sport diving sources place this vessel on the southern end of Stellwagen Bank; it is referred to as the "Toy or Christmas Wreck", due to its cargo of toys. If the identity and history of the vessel can be verified, it could possess potential historical importance, and its eligibility for inclusion on the National Register of Historic Places also should be determined.

d. Aircraft

At least one aircraft crash site may be located within the Sanctuary. It has been reported that a P-38 Lightning is located on the western edge of Stellwagen Bank (Grey Eagle Charters, personal communication, 1990). At this time, however, no information is available to explain the reason for its occurrence at this site, or to assess its possible importance (Lawrence Webster, pers. comm., 1990).

C. Human Activities

1. Commercial Fishing

a. Regional History

Historically, the most economically important human activity directly dependent on the resources of the entire Gulf of Maine, including Stellwagen Bank, has been commercial fishing. The yield from groundfish, invertebrate, and pelagic fisheries has been the most important commercial resource available throughout the New England region since the time of early Colonists. This traditional activity continues today as an important source of revenue to the New England coastal states.

Three hundred years ago, catch was abundant from local coastal waters; there was no need to venture to distant offshore banks. Handlines employed off of small skiffs and sail craft yielded necessary daily catches; modest weirs or traps placed at river mouths or harbors captured plentiful amounts of migratory fish; and shellfish were readily available from intertidal areas.

Colonization of the northeast seaboard was itself spurred by the discovery in 1497 by explorer John Cabot of vast codfish grounds in the northwest Atlantic. Early settlements in Maine and New Hampshire established the first fish curing stations before the arrival of the Pilgrims at Plymouth, Massachusetts in 1620. It was cod fishing that brought the first settlers to Gloucester, Marblehead, Salem, Weymouth, and Scituate, Massachusetts (McFarland, 1911). In the decade between 1765 and 1775, the business of cod fishing actively involved 20 towns, 605 vessels, 1,475 fishermen, and 9,600 others in curing, packaging, and shipping

(McFarland, 1911).

The country's growth increased pressure to extend fishing efforts to offshore locations, and necessary developments occurred in commercial gear and methodology. The technology of fishing gear advanced rapidly, starting at the turn of the century with the mechanization of equipment. Primitive nets evolved into purse seines, otter trawls, gill nets and trap and pound nets. The major advance in the fishing industry during this time was the development and use of diesel-propelled fishing vessels, which replaced steam-driven and sail craft. Fishing gear itself also became mechanized, greatly enhancing the success of various fisheries. With the introduction of electronic equipment, such as ship-to-shore telephones, loran plotters, direction finders, depth indicators and recorders, "fish finders", radar, and automatic steering devices during the 1940's, both the safety of navigation and the productivity of fishing activities were improved. Finally, the introduction of synthetic fibers now used in most fishing gear has improved fishing methods, as well as the equipment.

Commercial fishing changed at the turn of the century, with the introduction of the steam engine and mechanized otter trawl gear. The effect of these innovations was an increase in fresh fish landings from shorter trips. As the demand for fish grew, Boston became the primary fishing port, because of its position as the New England marketing and transportation center. Gloucester businesses, suffering from both the decreased demand and less expensive imports from Norway, Canada, and Iceland, nonetheless survived by improving fish processing techniques (notably "quick-freeze" methods), and shipping. Improved processing and transportation permitted the introduction of new species to both fresh and frozen fish markets in the East and the Midwest.

Large foreign trawlers began fishing on Georges Bank in 1961, primarily on non-traditional fish species, such as hake, herring, and squid. By 1973, approximately 300 vessels from 16 countries were also targeting more traditional domestic species, notably haddock, and New England fisheries began to feel the pressure. Because there was no effective management of fisheries outside the existing U.S.

12-mile contiguous zone, the Magnuson Fishery Conservation and Management Act of 1976 was passed to extend U.S. management jurisdiction out to 200 nautical miles. This action reduced the level of foreign fishing in the Gulf of Maine, and revitalized both Massachusetts and U.S. fisheries (MacIsaac and Hotz, 1982).

b. Present Day Fishing in the Stellwagen Bank Area

An extensive and active commercial fishery continues currently throughout the southwestern Gulf of Maine and surrounding waters. Stellwagen Bank is one of several areas of concentrated effort, in addition to Jeffreys Ledge, Cashes Ledge, Tillies Bank, Brown Bank, and the more expansive Georges Bank. Over 280 commercial vessels actively fished on Stellwagen Bank in 1990 (C. Kellogg, pers. comm., June 1990).

Most fish species in the Stellwagen Bank area are taken on a year-round basis; however, seasonal abundance of several species results in peak fishing activity periods for those species. Peak fishing intervals in the Stellwagen Bank area occur for the following regulated species (NMFS/NEFC, 1990):

<u>January through March</u>	<u>April through June</u>
Winter flounder	Winter flounder
Atlantic herring	Redfish
Northern shrimp	American plaice
	Witch flounder
	Atlantic cod
<u>July through September</u>	<u>October through Dec.</u>
Bluefin tuna	Silver hake
Red hake	Red hake
Summer flounder	Pollack
Striped bass	Atlantic mackerel
Redfish	Butterfish
American plaice	White hake
Witch flounder	Winter flounder
Bluefish	Atlantic herring
	American lobster
	Sea scallop

Fish species commercially taken in the Stellwagen

Bank area have been grouped into four principal categories: groundfish, pelagics, other finfish, and invertebrates (NMFS/NFC, 1988). Landings data (Table 3) are recorded within "Statistical Area 514" as developed by NMFS (Figure 6).

Groundfish Species

- Atlantic Cod, Gadus morhua
- Haddock, Melanogrammus aeglefinus
- Redfish (Ocean Perch, Rosefish), Sebastes spp.
- Silver Hake (Whiting), Merluccius bilinearis
- Red Hake (Squirrel Hake), Urophycis chuss
- Pollack, Pollachius virens
- Yellowtail Flounder, Pleuronectes ferrugineus
- Summer Flounder, Paralichthys dentatus
- American Plaice (Dab), Hippoglossoides platessoides
- Witch Flounder, Glyptocephalus cynoglossus
- Winter Flounder, Pleuronectes americanus
- Scup (Porgy), Stenotomus chrysops
- Ocean Pout (Muttonfish), Macrozoarces americanus
- White Hake, Urophycis tenuis
- Cusk, Brosme
- Atlantic Wolffish, Anarhichas lupus
- Fourspot Flounder, Paralichthys oblongus
- Windowpane Flounder (Sand Dab), Scophthalmus aquosus
- Greenland (Atlantic) Halibut, Reinhardtius hippoglossoides
- King Whiting (Kingfish), Menticirrhus saxatilis
- Sculpins, Myoxocephalus octodecimspinosus
- Sea Sturgeon, Acipenser sturio
- Tautog (Blackfish), Tautoga onitis
- Sand Eel (Sand Lance), Ammodytes americanus
- American Eel, Anguilla rostrata
- Black Sea Bass, Centropristis striata

Pelagic Fish

- Atlantic Herring, Clupea harengus
- Atlantic Mackerel, Scomber scombrus
- Butterfish, Peprilus triacanthus
- Bluefish (Snapper), Pomatomus saltatrix
- Deep Sea Angler, Ceratias holbolli
- Menhaden (Pogy), Brevoortia tyrannus
- Bluefin Tuna Thunnus thynnus
- Capelin, Mallotus villosus

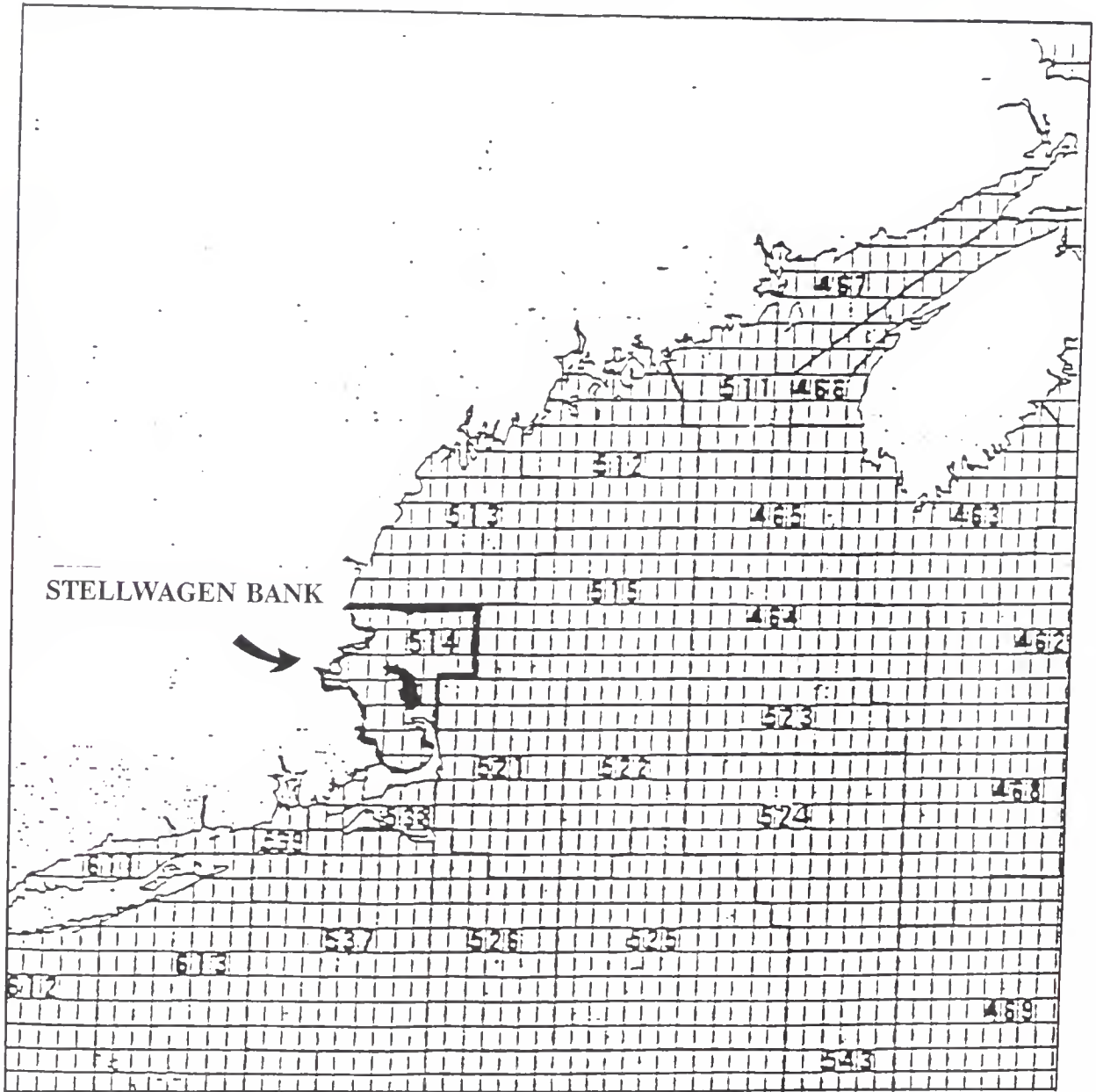


FIGURE 6: STATISTICAL AREA 514

(NMFS, 1989)

TABLE 3: Commercial Fisheries Landings Data from Statistical Area 514 (NMFS 1989, 1991)

	1988	1989	1990
<u>Groundfish Species</u>			
Live Pounds Landed	10,673,447	8,762,550	11,674,220
Pounds Sold	9,946,977	8,055,646	10,848,543
Value (Gutted)	\$ 5,109,987	4,953,756	5,979,134
<u>Pelagic Species</u>			
Live Pounds Landed	2,510,822	2,094,816	3,121,707
Pounds Sold	2,270,782	1,893,510	2,845,696
Value (Gutted)	\$ 8,850,300	9,294,267	7964,716
<u>Invertebrates</u>			
Live Pounds Landed	521,062	410,715	2,340,251
Pounds Sold	104,308	107,719	553,482
Value (Gutted)	\$ 327,221	257,203	555,582
<u>Other Finfish</u>			
Live Pounds Landed	4,799,670	5,267,744	9,380,835
Pounds Sold	3,762,228	4,395,288	7,976,452
Value (Gutted)	\$ 361,080	429,393	821,988
<u>Totals</u>			
Live Pounds Landed	18,505,001	16,535,825	26,517,013
Pounds Sold	16,084,295	14,452,163	22,517,173
Value (Gutted)	\$ 14,648,498	14,933,619	15,321,420

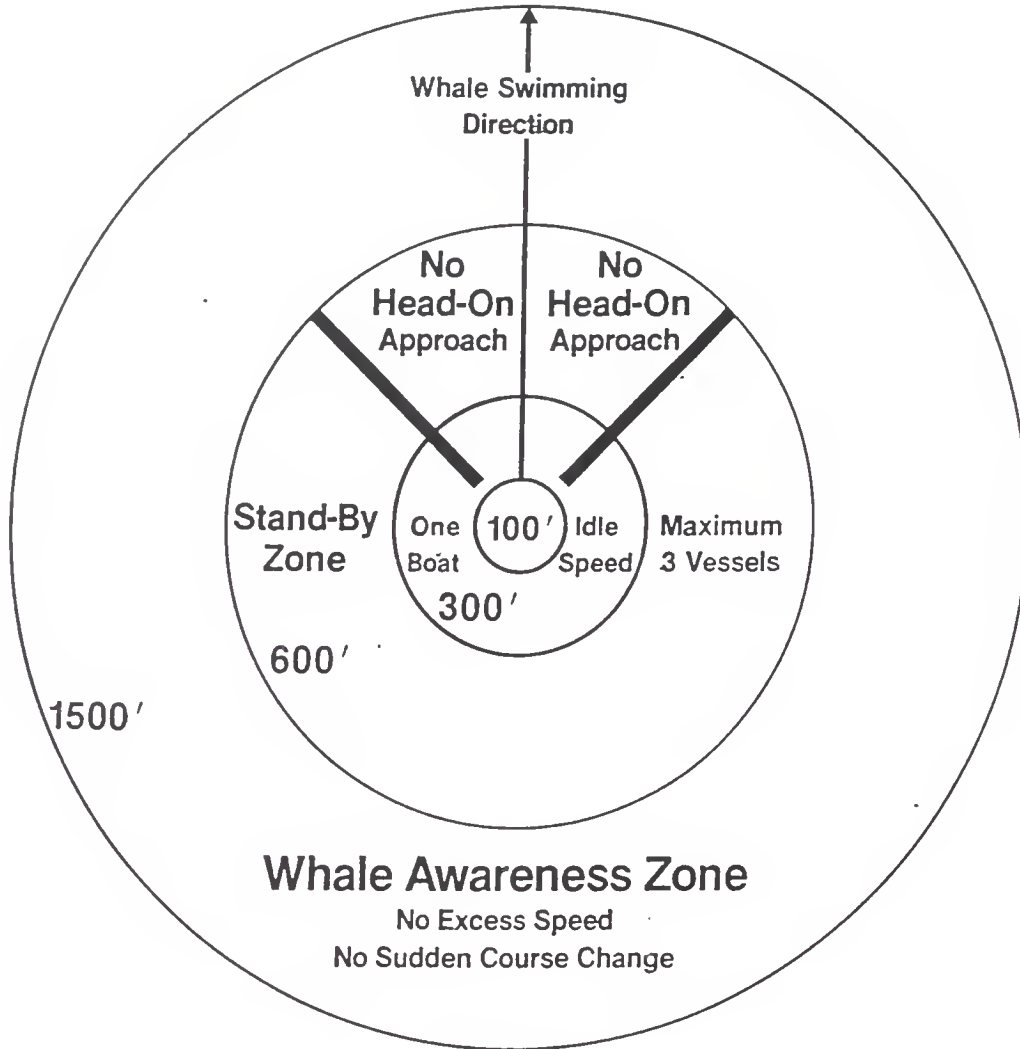


FIGURE 7: DIAGRAM OF EXISTING NEW ENGLAND WHALEWATCHING GUIDELINES

Other Finfish

American Shad, *Alosa sapidissima*
 Striped Bass (Rockfish), *Morone saxatilis*
 Spiny Dogfish, *Squalus acanthias*
 Skates, *Rajidae spp.*
 Mako Shark, *Isurus oxyrinchus*
 Atlantic Silverside (Capelin), *Menidia*

Invertebrates

Short-Finned Squid, *Illex illecebrosus*
 Long-Finned Squid, *Loligo pealei*
 American Lobster, *Homarus americanus*
 Northern Shrimp (Pink Shrimp), *Pandalus borealis*
 Surf Clam, *Spisula solidissima*
 Ocean Quahog, *Arctica islandica*
 Sea Scallop, *Placopecten magellanicus*

In its annual assessment of Northeastern fishery stocks, NMFS makes a general analysis of species/stocks, by weighing each species or stock's "stock level" against its "exploitation rate." Stock levels are categorized as "low", "medium", or "high." These are weighed against categories of exploitation rates, classified as "unknown", "protected", "not exploited", "under-exploited", "moderately-exploited", "fully-exploited", and "over-exploited." Although exploitation levels of individual species vary, the overall exploitation level for commercial species in the Stellwagen Bank/Gulf of Maine area is high. NMFS has assessed the 1990 overall status of stocks for the following species: (NOAA, 1986)

Under-exploited: Red Hake, Mackerel, Butterfish, Spiny Dogfish, Skates, Short-finned Squid, Long-finned Squid

Fully-exploited: Silver Hake, Black Sea Bass, White Hake, Atlantic Herring, Bluefish, American Lobster, Northern Shrimp, Surf Clam, Ocean Pout, Windowpane Flounder, Ocean Quahog (in some areas)

Over-exploited: Atlantic Cod, Haddock, Redfish, Pollock, Yellowtail Flounder, Summer Flounder, Witch Flounder, Winter Flounder, American Plaice, Scup, Wolffish, Sea Scallop

Protected: Striped Bass Unknown: Cusk

c. Fishing Gear

Depending on the target fishery, several types of gear traditionally have been employed, and are currently used in commercial fishing operations throughout the Gulf of Maine. "Mobile" or "fixed" fishing gear are classified by the nature of their catching properties. Specific gear types used in the Gulf of Maine, and around Stellwagen Bank are described below:

1) Mobile Gear

Otter Trawls are the most commonly-used trawl in New England, accounting for more than 50% of the gear types used at Stellwagen Bank. (C. Kellogg, NEFMC, pers. comm., 1990.) Otter trawls are conical nets towed along the seabed to catch bottom-dwelling fish, such as Atlantic cod, haddock, pollack, redfish, flounder, hakes, and other groundfish species. When fully constructed and rigged, the otter trawl takes on the shape of a funnel when towed along the ocean bottom. Floats and weights are used to keep the mouth of the net open while in motion, further aided by otterboards (or trawl doors), pulling in different directions in reaction to the water's resistance.

Scottish Seines are also conical nets used in combination with long ropes to herd bottom-dwelling fish species into the net along the seabed.

Purse Seines are encircling nets used to catch pelagic fish species that live or grow at or near the ocean's surface. Included in this group of fisheries are Atlantic mackerel and bluefin tuna.

Scallop Dredges are metal-framed devices used primarily for harvesting shellfish species from the seabed surface. Hydraulic or jet dredges are specifically designed to wash out scallops resting on the ocean floor.

Clam Dredges are essentially the same device as scallop dredges; however, the metal-framed apparatus is specifically designed to harvest shellfish from within the seabed.

2) Fixed Gear

Hook and Line are hand-held gear used for catching either groundfish or tuna.

Tub Trawls also target groundfish, using multiple hooks baited with natural or artificial lures and attached to a long line. Trawls may be anchored or permitted to drift at any level in the water.

Fish Traps/Lobster Traps are stationary gear used to harvest groundfish species, or lobsters and crabs. Traps are rigid in construction, and vary in design and dimension.

Sink Gillnets are anchored stationary nets commonly used for catching groundfish. Gillnets may be generally described as vertical "walls" of fiber netting, which capture and hold individual fishes in their meshes. Mesh size is designed for specific sizes of targeted fish species. Depending on the target species, gillnets may be suspended at the water's surface, in midwater, or close to the bottom by controlling the number and size of floats and weights. At Stellwagen Bank, sink gillnets are used for a variety of mid-water fisheries.

Harpoons in the Southern New England fishery are hand-thrown, and used in catching large fish species, such as bluefin tuna.

d. Fisheries Management

Most commercial and recreational fishing activities in the Stellwagen Bank area are regulated by fishery management plans (FMPs) developed by Fishery Management Councils. FMPs recognize the inseparable association between fishery resources and the commercial/recreational interests dependent upon them. The goal of FMPs is to preserve the fishery resource, through implementation of a management scheme which provides operational flexibility, encourages efficiency and lessens regulatory mechanisms.

Depending upon the particular target species, Stellwagen Bank fisheries are managed by the New England Fishery Management Council (NEFMC), and/or the Mid-Atlantic Fishery Management Council (MAFMC), pursuant to the provisions of the Magnuson Fishery Conservation and

Management Act (16 U.S.C. § 1801) (FCMA). Section 303 of the FCMA requires that FMPs contain conservation and management measures; assessment of present condition of the fishery and its maximum sustainable yields; the capacity and extent of fishing vessel harvest of the fishery; and information on the significance of the habitat of the fishery. Owing to the seasonal variability of specific species, the two Fishery Management Councils make recommendations to each other when additional information is required.

Once an FMP is approved by the Secretary of Commerce, implementation of its provisions is the responsibility of the National Marine Fisheries Service (NMFS), the U.S. Coast Guard (USCG), and an FMP Technical Monitoring Group.

Approved fishery management plans developed by the New England Fishery Management Council currently exist for the following species: Atlantic Salmon Fishery (August 1988); Atlantic Sea Scallop Fishery (most recently amended August 1989); American Lobster Fishery (most recently amended July 1989); and the Northeast Multispecies Fishery (most recently amended 1990, and presently being updated to incorporate silver hake, red hake, and ocean pout).

The Northeast Multispecies Fishery Management Plan establishes the following:

- minimum size regulations for several major commercial species (including but not limited to): Atlantic cod, haddock, pollack, witch flounder, yellowtail flounder, American plaice, and winter flounder.
- minimum size regulations for recreationally-caught haddock and Atlantic cod.
- closure of spawning areas over Georges Bank and southern New England.
- major increase in the mesh size of mobile trawl gear.
- marking requirement for gillnet gear.

In response to continuing documentation of

declines in groundfish populations, a lawsuit was filed in mid-1991 by the Conservation Law Foundation and the Massachusetts Audubon Society, charging NMFS with failure to prevent overfishing on New England groundfish stocks, including haddock, cod, and flounder. Pursuant to an out-of-court settlement reached in August 1991, the New England Fishery Management Council is afforded the opportunity to draft by March 1, 1992 a new multi-species FMP designed to rebuild the groundfish stocks. The Council may also present a final groundfish stock rebuilding program to the Secretary of Commerce by September 1, 1992. Failure to meet these court-established deadlines, however, will require the Secretary of Commerce, through NMFS, to put into place its own groundfish stock rebuilding program by not later than November 1, 1992.

The presently over-fished condition of groundfish species throughout the Gulf of Maine is indicated in part by the following statistics from the NEFMC: (NEFMC, October 1991)

<u>Groundfish Stock</u>	<u>% of Stock Removed/Year by Fishing Activity</u>	<u>% Required for Stock Recovery</u>
Gulf of Maine Cod	56%	30%
Georges Bank Cod	43%	27%
So. New England Yellowtail	75%	35%
Georges Bank Yellowtail	52%	40%

The NEFMC also has developed the FMPs for scallops and lobster, which establish:

- overall landing amounts allotted for the species;
- fishing practices to be used for these fisheries; and
- effort limits allotted to the fishery.

Currently, the NEFMC is developing an updated

FMP for Atlantic herring in coordination with the Atlantic States Marine Fisheries Commission (ASMFC); and has requested the lead role in developing a fishery management plan for the Arctic surf (or Stimpson) clam, for which commercial exploitation has recently been initiated in the Stellwagen Bank area. (P. Fiorelli, NEFMC, pers. comm., May 1990).

The Northern shrimp FMP was developed by the Atlantic States Fishery Management Commission (ASFMC). The ASFMC is additionally responsible for striped bass and bluefish fisheries (the plan for the latter species is developed in cooperation with the Mid-Atlantic Fishery Management Council).

The Mid-Atlantic FMC is charged with sole responsibility for management plans on summer flounder, butterfish, short and long-finned squid, surf clam, ocean quahog and mackerel.

Commercial bluefin tuna fishing, representing approximately 50% of the economic value of all fisheries in the Stellwagen Bank area, is currently regulated under the International Commission for the Conservation of Atlantic Tuna (ICCAT), as implemented via the Atlantic Tunas Convention Act of 1975. Quotas for bluefin tuna are determined by ICCAT; since 1983, the U.S. quota has remained constant at 1,529 short tons (st). NMFS allocates this quota by categories assigned to the four gear types employed in this fishery: hand-line, rod and reel, harpoon, and purse seine net. (The species also is caught incidentally by longline vessels.)

The majority of the total U.S. Atlantic bluefin tuna catch is landed in Massachusetts. Currently, there are approximately 10,000 individuals licensed in Massachusetts to participate in this fishery. In addition to Stellwagen Bank, bluefin tuna also are fished at Jeffreys Ledge, Cape Cod Bay, east of Chatham, and southwest of Martha's Vineyard Island (Table 4).

Spawning stocks for this species are considered depleted (B. Chase, 1991). Recently, management of the U.S. Atlantic bluefin tuna fishery was included in reauthorization of the Magnuson Fishery Conservation and Management Act, to enhance NMFS' ability to provide improved species

Management.

2. Commercial Charterboating

In addition to commercial fishing, numerous vessels engage in the commercial enterprises of whalewatching and sportfishing activities focused on the Stellwagen Bank area.

a. Whalewatching

Although both large and small cetacean species have been attracted to Stellwagen Bank as a feeding ground (and nursery ground for some species) for many years, the relatively recent focus of scientific attention on several endangered species of "great" whales has also drawn the public's attention and interest to these species, and in opportunities to observe them in natural habitats.

Whalewatching is more than an important economic activity; whalewatch vessels afford recreational and educational, as well as scientific opportunities to learn more about marine mammals. The combination of public interest and the accessibility of Stellwagen Bank from several ports has resulted in a commercial whalewatching industry which has steadily grown in popularity and revenues since its inception in this area in 1976.

Whalewatching trips are often combined with opportunities for observing marine birds, particularly when naturalists are aboard vessels to identify and discuss various species.

Whalewatching companies operate out of ports from Maine to Connecticut, and are largely focused on Stellwagen Bank and Jeffreys Ledge to the north (offshore of Cape Ann). By the 1985 season, at least twenty-one whalewatch companies were operating throughout these areas, employing between 40 and 48 vessels (MacKenzie, 1986). The majority of these vessels are based in Massachusetts, and operate primarily out of Gloucester and Provincetown. Trips are conducted from late April through September or early October.

Humpback whales are the primary target of whalewatch trips because of their long seasonal

residence around the Bank, and because of their highly visible markings and behavior patterns. In addition to humpbacks, fin whales, minke whales, and white-sided dolphins are commonly seen in the vicinity of Stellwagen Bank. Northern right whales are less frequently encountered, owing both to their more critically-endangered population status (i.e., fewer right whales overall frequent Stellwagen Bank), and to the shorter period of residence around the Bank (generally late winter or early spring to approximately July).

Whalewatch vessels range in size anywhere from approximately 50 feet (35-40 passenger capacity) to over 140 feet (400 passenger capacity). Depending on the originating port, a vessel may make one, two or even three trips per day to the Bank area. Hassol (1987) estimated approximately 1.5 million persons participate annually in whalewatching trips to Stellwagen Bank; and found that ticket prices averaged \$15.00 during the period of 1985 and 1986. Annual revenues from commercial whalewatching for this two-year period were thus estimated at slightly over \$20 million. (J. Hassol, 1987). A separate study has also provided an estimate of more than 9,200 vessel trips were to Stellwagen Bank in 1985, carrying approximately 1.25 million passengers (W.T. Rummage, 1990).

The number of commercial whalewatch vessels declined in 1986 due to the shift in humpback whale presence that year, a change attributed to observed changes in sand lance distribution. The following year, however, the humpbacks returned to the Bank and the commercial whalewatch business resumed at full strength. Revenues (ticket price only) projected for the 1990 season were \$17.6 million (W.T. Rummage, 1990).

Along with increased levels of commercial (as well as private) whalewatching activities, have come increased concerns regarding potentially adverse effects of such activities on the whales, and particularly on endangered or threatened whale species. Researchers, conservationists, Federal/State managers, and others have considered the possibility that any vessel activity near marine mammals may disrupt feeding behavior or cause abandonment of feeding areas; displace cow/calf pairs; or induce avoidance behavior requiring

increased energy expenditure necessitated by vessel interference in migratory paths or feeding activities. At the Stellwagen Bank area, these types of disruptions may be especially detrimental to nursing calves.

All marine mammals are protected from harassment, injury, killing, capturing, or attempts to do any of these activities by the Marine Mammal Protection Act of 1972. In addition, those species of marine mammals identified as either "threatened" or "endangered" are also protected under the Endangered Species Act of 1973. "Harassment" is defined as any intentional or negligent act that substantially disrupts the normal behavior of an animal. In the case of whales, disruption of normal behavior may be evidenced by reactions such as rapid changes in swimming direction or speed; prolonged diving; apparently evasive swimming patterns; interruption of feeding, nursing, or breeding activities; and protective movements to shield a calf from a vessel. Violation of MMPA and ESA prohibitions against harassment may result in civil penalties of up to \$10,000 per violation (under MMPA), and up to \$25,000 per violation (under ESA). Criminal penalties up to \$20,000 under MMPA, and up to \$50,000 under ESA are also possible, in addition to imprisonment and seizure of property (e.g., vessels).

The NMFS Northeast Region issued whalewatch guidelines in 1985 to help all vessel operators prevent harassment of whales (Figure 7). These guidelines, applicable to all vessels, commercial or private, are specifically focused on operation in the vicinity of endangered whales in the overall Gulf of Maine. The guidelines currently provide:

1. When in Sight of Whales (1/4 mile or 1500 ft., or 457 meters):
 - avoid excessive speed or sudden changes in speed or direction.
 - Aircraft observe the FAA minimum altitude regulation of 1,000 ft., (305 meters) over water.
2. Close Approach Procedure (300 ft. or 91.4 meters):

- Approach stationary whales at no more than idle or "no wake" speed.
 - Parallel the course and speed of moving whales.
 - Do not attempt a "head-on" approach to moving or resting whales.
3. Multi-Vessel Approach (within 300 ft., or 91.4 meters):
 - All vessels in close approach stay to the side or behind the whales so they do not box in the whales or cut off their path.
 - When one vessel is within 300 ft.(91.4 meters), other vessels stand off at least 300 ft. from the whales.
 - The vessel within 300 ft.(91.4 meters) should limit its time to 15 minutes in close approach to whales.
 4. No Intentional Approach (within 100 ft., or 30.5 meters):
 - Do not approach within 100 ft. (30.5 meters) of whales.
 - If whales approach within 100 ft. or your vessel, put engine in neutral and do not re-engage props until whales are observed at the surface, clear of the vessel.

Although the New England guidelines appear to be generally followed by commercial whalewatch vessel operators, there are still at least occasional incidents of harassment. One problem may be simply the number of vessels engaged in whalewatching activities, regardless of whether those vessels are operated in conformance with existing NMFS guidelines. Federal managers are faced not only with the problem of clearly identifying what constitutes harassment; but also with a lack of regulations which are enforceable as law. Additionally, at this point there is no uniformly-held opinion as to whether or not whalewatching activities may or may not be detrimental to whales, even if the guidelines are followed.

Table 4: Total 1989 Bluefin Tuna Landings from Stellwagen Bank (Indicated by Port) Source: MDMF 1991.

<u>PORT</u>	<u>NUMBER OF FISH</u>	<u>POUNDS</u>
New Bedford	88	50,872
Gloucester	668	283,799
Green Harbor	129	71,750
Sandwich	97	56,443
Provincetown	31	16,671
Newburyport	27	12,220
Barnstable	17	7,016
Sesuit Harbor	8	3,257
Scituate	19	10,554
Beverly	12	4,282
Wellfleet	5	1,983
South Shore	9	4,219
Boston Harbor	<u>5</u>	<u>2,210</u>
TOTALS	1,115*	525,276

* Of the 1,115 fish landed, 895 were landed by hand-gear; 220 by purse seine nets.

Table 5: Total 1990 Bluefin Tuna Landings from Stellwagen Bank (Indicated by Port)* Source: MDMF 1991.

<u>PORT</u>	<u>NUMBER OF FISH</u>	<u>POUNDS</u>
Gloucester	242	118,953
Green Harbor	231	137,141
Provincetown	38	23,939
Sandwich	15	9,618
Barnstable	9	4,458
Sesuit Harbor	7	4,072
Newburyport	3	1,424
Beverly	10	3,365
South Shore	13	7,168
Cape Cod Bay	<u>2</u>	<u>1,078</u>
TOTALS	570**	311,208

* Preliminary figures.

** Of the 570 fish landed, 551 were landed by hand-gear; 19 by purse seine nets.

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In an effort to address these and other whale-watch issues on a national basis, NMFS and the Center for Marine Conservation co-sponsored a workshop in November 1988 to review and evaluate whale-watch programs and management needs, and to provide recommendations to NMFS for possible whalewatching regulations.

Final panel recommendations resulting from that workshop are:

1. The primary focus of new regulations should be minimum approach distances based on regional considerations.
2. Include in regulations restrictions on related activities, including thrill craft, swimming and diving with whales.
3. The regulations should address behavior, such as how to operate a vessel if a whale approaches the vessel, as well as distances.
4. The regulations should provide special restrictions, as warranted, for particular areas, such as feeding or calving grounds, or special situations such as whale watching on mating pairs or cow/calf pairs.
5. The regulations should include a prohibition on whale watching activities that involve the feeding of wild populations of cetaceans. (Fed. Reg. Vol. 54, No. 201, October 18, 1989)

These recommendations have provided guidance to NMFS in the formulation of proposed regulations for whalewatching activities, whether conducted by commercial or private boaters. Proposed national whalewatching regulations are scheduled for issuance for public review and comment in 1992. During the 60-day public comment period, NMFS will also conduct public hearings on the proposed regulations. (M. Lorenz, NMFS, pers. comm., July 1991). The proposed regulations will address primarily approach distances, speed, and maneuvering by vessels operating in proximity to marine mammals. A primary advantage to promulgating regulations, rather than continuing with guidelines, is that the regulations will be enforceable, thus enabling NMFS and other

managers to better carry out the provisions of the MMPA and the ESA.

An additional observation made by participants in the 1988 Workshop and in public meetings conducted by the NMFS Northeast Region in December 1989 to discuss possible whalewatch regulations, is the need to educate private boaters, who are generally not familiar with the provisions of the MMPA and the ESA.

b. Sportfishing

Sportfishing is a major commercial activity over Stellwagen Bank and throughout Cape Cod Bay. The activity may be categorized by three types of commercial vessels:

1. Party boats are usually 50 feet or longer and carry 20 to 80 passengers, who pay a set fee for their trip;
2. Charter boats generally measure 25 to 30 feet, and carry an average of 6 paying passengers; and
3. Private rental boats measure 20 feet or longer, and are used by individual anglers and their associates. Commercial sportfishing vessels began working the Stellwagen Bank area by the mid-1970's, although a few party boats had initiated recreational ground fishery operations by the late 1940's (T. Hill, 1990). Previous to the mid-1970's, the recreational fishery was largely based in near-coastal waters, within 3 or 4 miles of shore.

Two factors occurring around 1976, however, dramatically changed the number of recreational vessels operating in the Stellwagen Bank vicinity. The first was the decline in nearshore groundfish stocks, which necessitated vessels moving farther offshore to catch these species. By 1978, a dozen party boats and several charter boats were regularly fishing on Stellwagen Bank (Jarvis, 1990). During prime groundfishing season, it is not unusual today to see 15 to 20 party boats; 25 or 30 charter boats; and up to 200 private rental boats fishing at the Bank (Jarvis, 1990).

The second factor causing large increases in the number of recreational vessels working the Bank

was the opening of the market for bluefin tuna in Japan. Before 1976, tuna was not a highly profitable fishery. However, the foreign demand for tuna by the late 1970's resulted in huge increases in prices paid for this species; and equal increases occurred in the number of vessels fishing for tuna on Stellwagen Bank. By 1976, 200 or more vessels were operating on the northwest and southwest corners of the Bank, utilizing a variety of gears (Jarvis, 1990).

Today, targeted sportfishing species, and their seasons include tuna (June to early November); all varieties of ground fish (March through June); and "sport" and bait fish (late May to September) (Jarvis, 1990). Commercial sportfishing vessels operate virtually year-round (except for the period January through February), and are always dependent on weather conditions.

In 1987, the Commonwealth of Massachusetts issued 21,475 recreational permits for shellfish; and 12,080 for lobster (Massachusetts Bays Program, 1988). A total of over 4,000 NMFS permits for tuna fishing had been issued by 1989 (Jarvis, 1990).

Although figures are not currently available indicating the economic value of commercial sportfishing operations specific to Stellwagen Bank, the level of fishing effort is indicative that the value of this activity to the regional economy is significant. On a statewide basis, the value of 195,000 charter boat trips in 1987 (out of 90 ports throughout the state), was valued at \$9.5 million (Massachusetts Bays Program, 1988). For the same year, 1.6 million private rental boat trips were made throughout the state, valued at \$167 million.

Licensing and operation of commercial sportfishing vessels, like commercial fishing vessels, are regulated by existing state and Federal authorities. Current guidelines relating to vessel operation in the vicinity of marine mammals apply to all fishing vessels, in addition to commercial whalewatch vessels and private vessels.

3. Recreational Boating/Tourism

Recreational and tourism activities directly involving waters around Stellwagen Bank include

privately-owned boats engaged primarily in fishing or whalewatching/birdwatching activities. While participation in these activities is high, there are no precisely comprehensive figures indicating levels of participation and revenues generated from these activities. However, some discussion of statewide data provides a general, if unspecified, picture of the extent of recreational activities in the Stellwagen Bank area. During 1985, tourists visiting Barnstable County (Cape Cod) spent over \$1.1 billion, representing about 17.5% of all tourist expenditures in Massachusetts for that year. (Greenbaum and O'Donnell, 1987).

With regard to recreational fishing, a total of 790,000 saltwater anglers fished during 596,644 angler days in Massachusetts during 1987, spending approximately \$803 million in related sales. (Hart, 1989; NMFS, 1988b). These figures include shore fishing (i.e., from beaches, banks, jetties, piers, docks, and bridges), and boat fishing (i.e., from private rental, charter, or party boats). Cape Cod generally is a primary tourist area during summer months, and many of its visitors, as well as residents, participate in both shore-based and boat-based recreational fishing.

Most recreational fishing within the North Atlantic (New England) area occurs in inland waters (e.g., sounds, inlets, tidal portions of rivers, bays, estuaries, and other areas of salt or brackish water), or within the territorial limit (i.e., within three miles of shore). Throughout the North Atlantic area generally, the majority of recreational fishing, regardless of the area fished, is conducted from private or rental boats. (Essig, et al., 1991).

In waters beyond the three-mile limit, which would include Stellwagen Bank, the total number of fish caught by the recreational fishery varies considerably from year to year, although generally the majority caught from year to year are from the same several species groups.

Table 6: Total Number of Fish Caught in North Atlantic Recreational Fishery Beyond Three-Mile Jurisdiction (In Thousands): 1987-1989

1987	1988	1989
9,161	7,430	3,397

The most prevalent species groups caught in the North Atlantic recreational fishery in waters beyond the three-mile jurisdictional limit for the same years are indicated as follows (compiled from Essig 1991):

1987:

<u>Species Group</u>	<u>Total Fish Caught (x 1,000)</u>
Scup	2,863
Bluefish	1,486
Atlantic Cod	1,461
Winter Flounder	1,057
Atlantic Mackerel	381
Pollock	371
Tautog	317

1988:

<u>Species Groups</u>	<u>Total Fish Caught (x 1,000)</u>
Atlantic Mackerel	2,325
Atlantic Cod	1,704
Bluefish	803
Scup	546
Dogfish Sharks	500
Winter Flounder	139
Summer Flounder	125

1989:

<u>Species Groups</u>	<u>Total Fish Caught (x 1,000)</u>
Atlantic Cod	1,217
Bluefish	529
Pollock	370
Atlantic Mackerel	349
Scup	314
Dogfish Sharks	262

As previously discussed, it appears that existing NMFS whalewatch guidelines for the Gulf of Maine are generally followed by commercial whalewatch vessel operators. However, there are at least occasional, albeit largely unconfirmed reports of whale harassment and collisions with smaller, non-commercial vessels, such as those used for recreational fishing and/or whalewatching activities. Evidence of these incidents is in large part supported by photographs of cuts and scars on the backs, flukes, and fins of cetaceans, which have been identified as likely resulting from collisions with smaller (i.e., less than 50 feet) vessels. (Center for Coastal Studies, 1991).

NMFS is developing proposed national

whalewatch regulations, which would be applicable to all vessels (regardless of their commercial or non-commercial status). It is anticipated that these proposed regulations will be published for public review and comment during 1992. Presently, however, the Gulf of Maine whalewatch guidelines issued by NMFS in 1985 remain in effect, but are not enforceable as law.

4. Commercial Shipping

Vessels crossing Stellwagen Bank come from two principal sources. The first is vessels arriving at and departing from Boston Harbor. There is an established Vessel Traffic Separation Scheme (VTSS) recommended for this approach to Boston Harbor (Figure 8). The VTSS originates in the Great South Channel, heads in a northerly direction until just off the easterly side of Provincetown (Buoy "BD"), where it proceeds in a northwesterly direction, crossing the Bank, and ending in a Precautionary Area off the entrance to Boston Harbor. The second source of vessel traffic across the Bank is from the Cape Cod Canal. Based on data provided for the Port of Boston by the Boston Shipping Association, and a review of data logs from the Cape Cod Canal Field Office of the U.S. Army Corps of Engineers, for the twelve month period May 1989 to May 1990 (Table 7), approximately 2700 vessels crossed Stellwagen Bank (average of about 225 trips per month). About half of the vessels crossing the Bank are carrying liquid petroleum products. The remainder of the cargo volume is made up of bulk materials (e.g., asphalt, gypsum, cooking oils), containers, fish, scrap metals, and automobiles. The Port of Boston is also visited by a small number of cruise ships, research and military vessels. Vessel activity does not appear to vary much seasonally. While fluctuations have occurred, and will probably continue to occur periodically, it is likely that shipping activity in and out of the Port of Boston will remain relatively stable, and be dominated by the movement of petroleum (Edward O'Leary, COE/NED, pers. comm., May 1990). Despite the proposed deepening of portions of the Harbor to be completed by the mid-1990's and the worldwide trend toward larger vessels, it is unlikely that significantly larger vessels will use Boston Harbor.

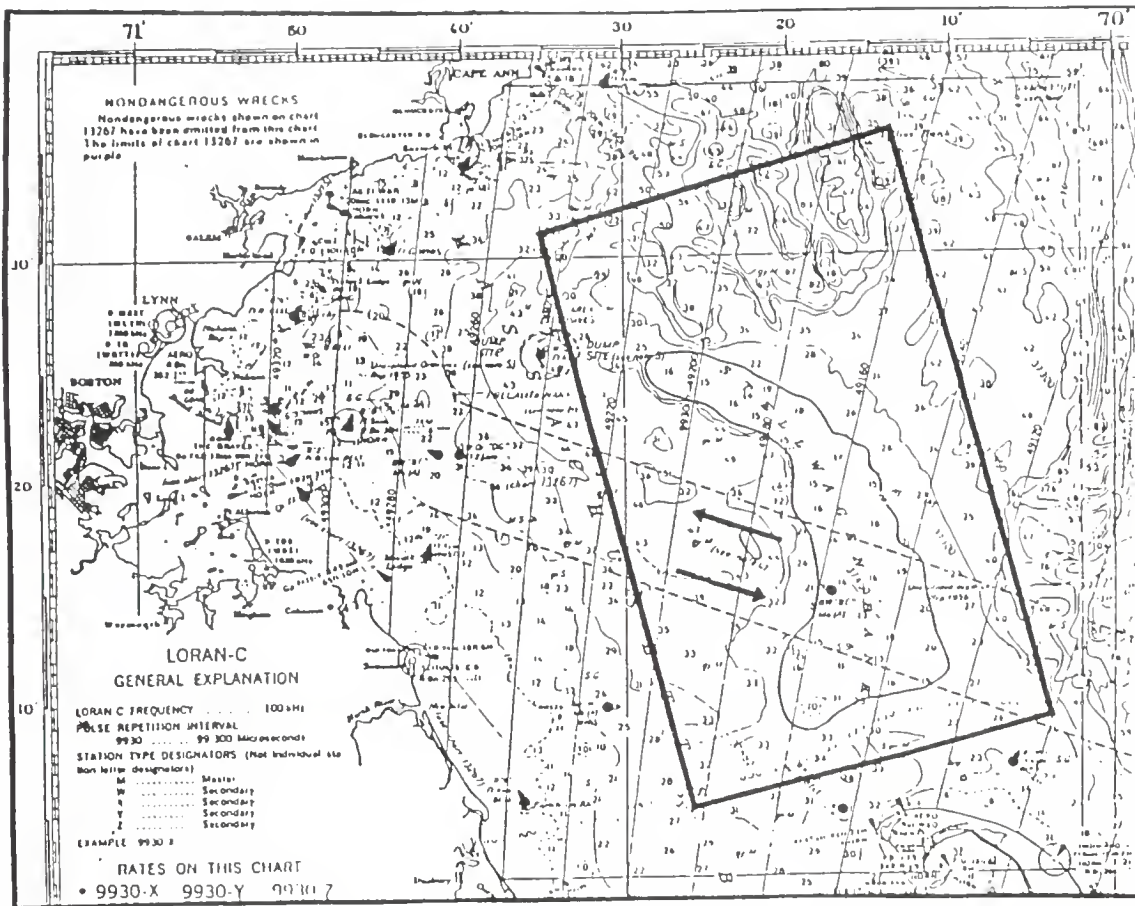


FIGURE 8: VESSEL TRAFFIC SEPARATION SCHEME

* Note: Marked boundary depicts NOAA study area for proposed Sanctuary

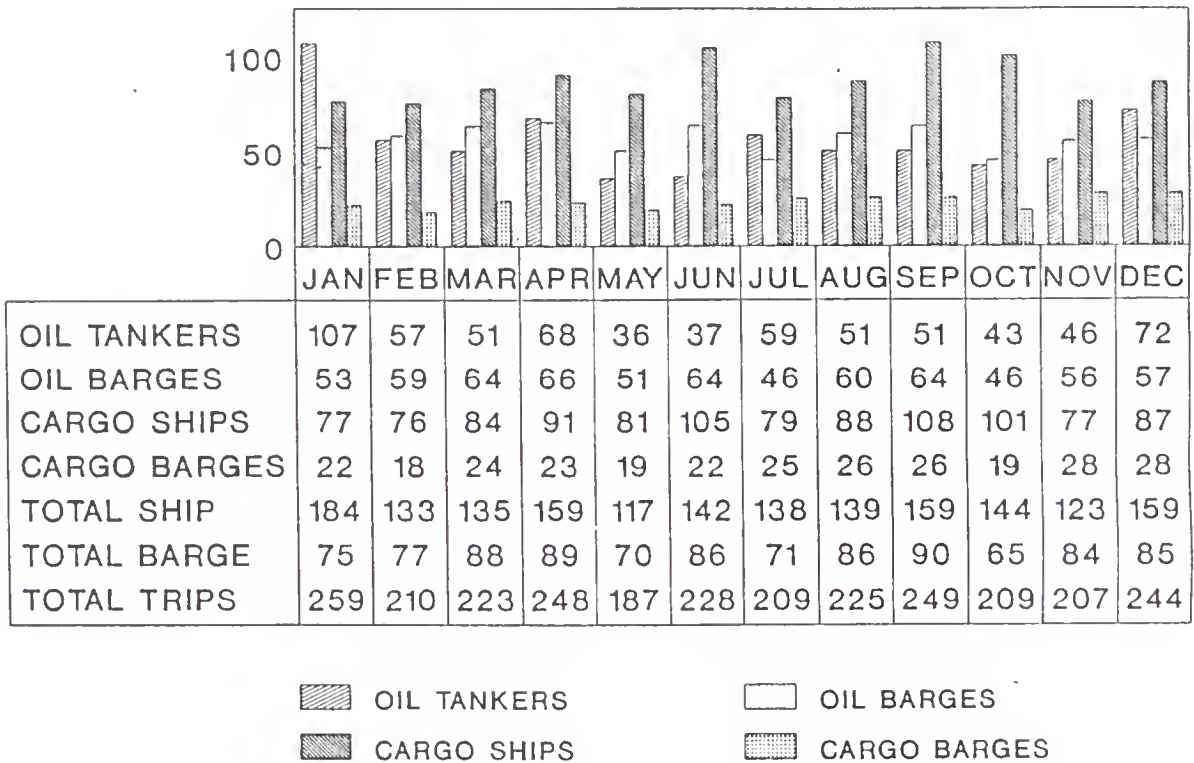


TABLE 7: SEASONAL TRENDS IN COMMERCIAL SHIP TRAFFIC ACROSS STELLWAGEN BANK (1989-90)
 (Source: Massachusetts Coastal Zone Management, 1990)

Cruise ships currently comprise only a small part of vessel traffic using the Port of Boston, averaging about 30 visits per year. However, given the presence of a new state-of-the-art terminal (Black Falcon Cruise Terminal on the Reserved Channel), the Port could support significant expansion in this area. The Massachusetts Port Authority (Massport), Maritime Department has suggested that the numbers of cruise ships visiting Boston could be increased considerably with appropriate promotion of the Port as a point of departure for cruises to other ports to the north, particularly maritime Canada; and as a base for "cruises to nowhere" (Anne Aylward, Maritime Division, Massport, pers. comm., May 1990). A possible seagoing ferry link to Halifax or some other Nova Scotia port has also been discussed.

Given the dominance of petroleum products as cargo of vessels passing over Stellwagen Bank, the principal threat, at least theoretically, is oil spills. Because the Bank, as a geologic feature, occurs at much greater depths than safe navigational depths for all vessels that might pass over it, spills caused by grounding are not an issue. With the Vessel Traffic Separation System having been in place and operational for a number of years, the possibility of oil spills resulting from vessel collisions is very minimal.

The Coast Guard maintains at least two different historical oil spill data bases. The Coast Guard Management Information Branch in Washington has identified, for an area which includes the shipping lanes across Stellwagen Bank (but not the entirety of the study area), seven oil discharge incidents for the years 1988 and 1989. All reports involved fishing vessels, and only two yielded observable discharges, totalling approximately 52 gallons. The USCG Marine Safety Office in Boston has identified six incidents in the past 10 years, within an area somewhat larger than the study area, involving no observable discharges.

To estimate the possibility of vessel collisions causing oil spills, vessel accident records, maintained by the Coast Guard Marine Safety Evaluation Branch in Washington, were consulted. For the period 1984-1988, there were a total of 105 so-called "vessel casualties" reported for the study area. Of

this total, nearly all reports (98) involved fishing vessels; five were pleasure or passenger vessels; and two involved commercial vessels (tugs). Only two incidents were reported as collisions, both involving fishing boats. Given the volume of ship traffic crossing the Bank, these historic data indicate that the chance of a vessel collision on the Bank appears to be quite remote. The prospects of a significant oil spill are even less.

Chronic discharges of oil from tank washing and ballast discharge is also a potential source of contamination. Grossling (1976) has suggested that, where large numbers of petroleum tankers and barges are present, such discharges can be a significant source of oil in the marine environment. However, it is not thought that tank washings or ballast discharges occur in the vicinity of Stellwagen Bank (Robert Calder, Executive Director, Boston Shipping Association, pers. comm., May 1990). Coast Guard Oil Regulations (33 CFR 157.37) prohibit the discharge of an "oily mixture" (i.e., mixture of oil and water from tank washing and/or ballasting) unless the vessel is at least 50 nautical miles from the nearest land.

"Lightering", described as the ship-to-ship transfer of petroleum products, is an additional potential source of contamination. This activity is regulated under the authority of the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. §§ 1251 *et seq.*). Relevant sections of the Act have recently been amended by the Oil Pollution Control Act of 1990 (33 CFR § 2701). Lightering is conducted to transfer petroleum products onto smaller, shallower draft vessels which are able to enter harbors not able to accommodate larger commercial vessels. This activity occurs within Boston Harbor, and in Broad Sound, immediately east of Deer Island, near the entrance to the Harbor. When lightering is scheduled to occur within the "anchorage" (the major deep draft area within Boston Harbor), ship operators are required to provide four hours' notice to the U.S. Coast Guard.

Lightering is not known to occur on a routine basis within the area of Stellwagen Bank. (LCDR George Matthews, Marine Safety Office USCG, Boston, MA, pers. comm., June 13, 1991).

Routine discharge of other materials (garbage, refuse, and other debris) could also present potential problems. Although the Coast Guard regulates such discharges under the Marine Plastic Pollution Research and Control Act, which implements Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL), these regulations would allow the dumping from vessels of most forms of refuse, with the exception of plastics and garbage that floats, on all or part of the Bank (depending on the type and character of the material involved). Certain vessels, such as those of the military, have exemptions from any prohibitions on dumping imposed by these regulations. While a vessel in transit from Boston to Portland was recently fined \$12,000 for discharging refuse (in this case, dunnage), in an area directly adjacent to the study area boundary, there is no estimate available as to how much material is currently being discharged from ships passing over Stellwagen Bank.

Another potential issue of concern involving the shipping industry is the potential for vessel collision with marine mammals. The Draft National Recovery Plan for the Northern Right Whale (NMFS, 1990) devotes significant attention to the problem of marine mammal collisions with vessels. The report states that over the last two decades, twenty five right whale mortalities have been documented, with five (20%) attributable to ship collisions. One such mortality was reported over Stellwagen Bank. Approximately 24, or 8% of the 300 North Atlantic Right Whales identified in the New England Aquarium's photographic catalog exhibit marking presumed to be indicative of vessel collisions, although the size and characteristics of vessels likely to have been involved in these collisions are not definitively known. (Kraus, Crone and Knowlton, 1988).

The potential for possible collisions arises because right whales exhibit behaviors such as resting at the surface, surface skim feeding, and surface courtship, which increase exposure to possible vessel collisions. In addition, because right whales are a relatively slow swimmers, avoiding an approaching vessel is sometimes impossible, particularly at night when visibility is reduced.

The Plan identifies the reduction of vessel collision-related mortalities as one of its implementation priorities. Two principal recommendations are made to deal with this problem. The first is to identify responsibilities related to reducing ship collisions with northern right whales. This is to be accomplished by: 1) collecting additional information regarding areas and seasons of potential conflict, and characterization of the types of vessel typically involved in ship collisions; and 2) analyzing known kills and scarring patterns on living northern right whales to identify vessel activities which put whales at risk of collision. The second priority is to investigate strategies for reducing ship collisions with right whales. To implement these objectives the Recovery Plan proposes to: 1) educate mariners about right whales through publishing special warnings, identifying seasonal high-use areas in Coast Guard and Defense Mapping Agency Notices to Mariners and VHF radio Marine Information Broadcasts; identifying those areas on nautical charts; and 2) implement appropriate controls on ship operation and design.

This final objective involves activities such as: a) restricting vessel speeds in "high risk" areas during "high risk" periods; b) requiring lookouts on ships during these "high risk" periods; c) shifting shipping lanes where feasible; d) placing acoustical warning devices on ships, if feasible; e) using appropriate technologies to detect whales in the path of vessels (e.g., side-scan sonar, low light intensity television); f) investigating alternative vessel designs to reduce probability of collisions; and g) investigating satellite capabilities for the detection of transmitter-tagged whales in shipping lanes. The implementation of the "ship collision" objectives of the Recovery Plan are identified by its authors as a top priority.

5. Military Activity

The U.S. Department of Defense (DOD) designates areas of water and air space as "operating areas" (water) and "warning areas" (air), in support of military operations involving training, readiness, and support of national defense and security interests. Stellwagen Bank lies within the Boston Operating Area, which extends from

offshore Nantucket Island north to offshore Washington County, Maine. Military exercises in the Boston Operating Area include such activities as submarine operations, gunnery practice, anti-submarine warfare tactics, sea trials, radar tracking, warship maneuvers, and general operations. The designated warning areas closest to Stellwagen Bank are Air Force Warning Areas W-103 and W-104A, located northwest and east of the Bank, respectively. (Figure 9). These areas are used as training areas for high-speed aircraft operating out of several New England bases.

Military operations or exercises are not routinely conducted on Stellwagen Bank. From August 17 through 31, 1985, however, the U.S. Navy conducted vessel operations known as "Ocean Safari '85" in Massachusetts Bay and in the approaches to Boston Harbor. In connection with this activity, local notices to mariners were issued by the U.S. Coast Guard that certain waters over Stellwagen Bank and the Massachusetts Bay Precautionary Area were closed to fixed gear fishing activities between August 22 and 31, 1985. Navy exercises involved streaming strings of equipment aft of vessels that could cause damage to, or loss of fishing gear. Within the Boston Operating Area, safety zones were established around each vessel, and fishermen, recreational boaters, and other mariners were advised to maintain distances of at least 1,000 yards from Navy vessels. These restrictions were enforced by U.S. Coast Guard units. This military operation was prefaced by an environmental assessment, a request for consistency determination from the Commonwealth of Massachusetts, and consultation with the National Marine Fisheries Service.

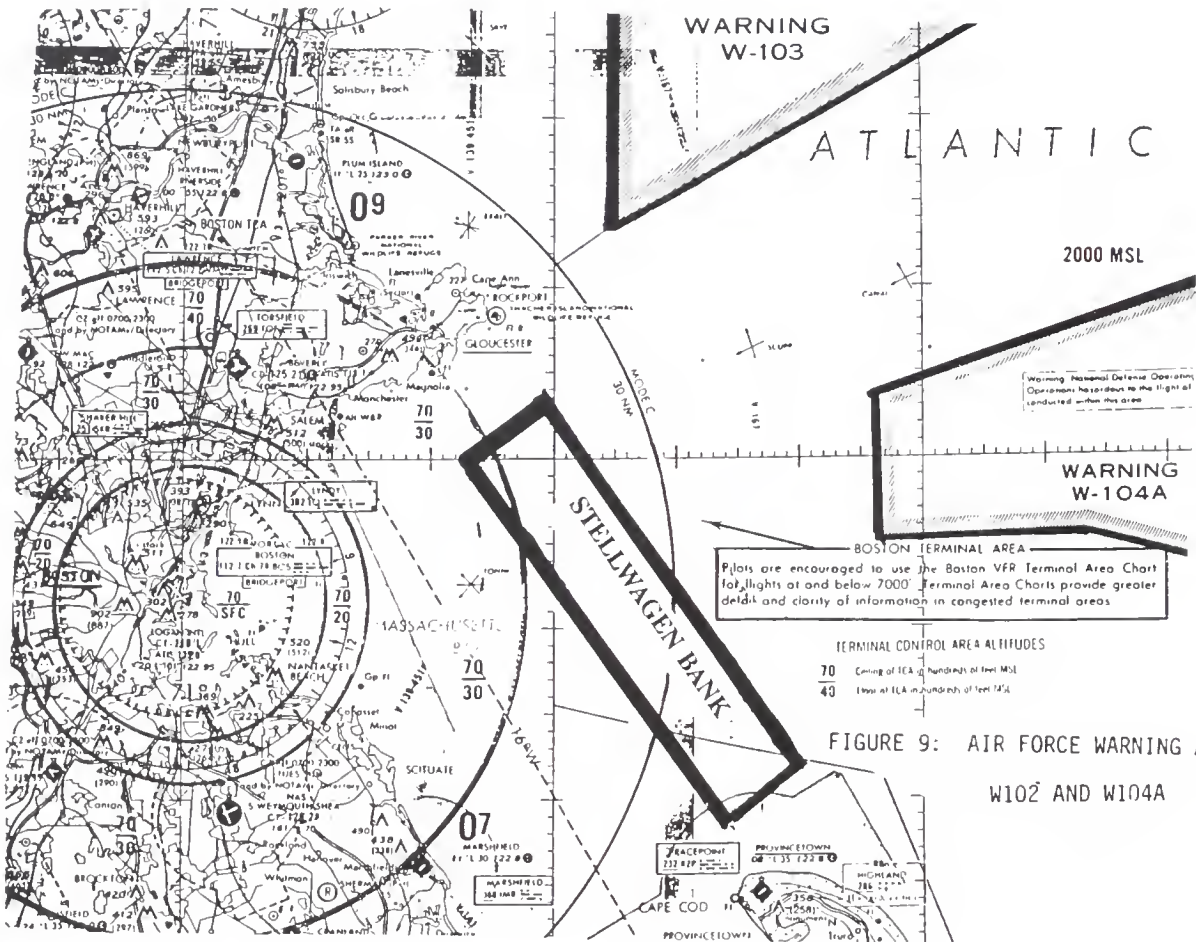
Sanctuary regulation of human activities does not prohibit any Department of Defense activity necessary for national defense in an emergency. In the event of future planned military activities, coordination and consultation between the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics; the office with overall responsibility for DOD's Offshore Military Activities Program) and the Sanctuary Manager and NOAA will be required.

6. Offshore Oil and Gas Activity

The Secretary of the Interior has the statutory authority and responsibility to plan for and to conduct the offering of leases of OCS acreage, as directed in the Outer Continental Shelf Lands Act, as amended (OCSLA) (43 U.S.C. § 1331 *et seq.*). Within the Department of the Interior (DOI), the Minerals Management Service (MMS) has primary responsibility for management of OCS minerals operations.

Pursuant to Section 18 of the OCSLA, the Secretary of the Interior, through the MMS, prepares, periodically revises, and maintains an oil and gas leasing program to carry out OCSLA policies. (43 U.S.C. § 1344). This leasing program consists of a schedule of proposed offshore lease sales indicating as precisely as possible the size, timing, and location of leasing activity determined to best meet national energy requirements for the five-year period following approval or re-approval of the schedule. Previous to 1978, OCS leasing programs were issued via discretionary act of the Secretary of DOI. In June 1980, the first five-year OCS oil and gas leasing program was approved, covering the period September 1980 through June 1985. To date, a total of three five-year programs have been approved, the last of which covers the period between mid-1987 and mid-1992.

For purposes of OCS oil and gas leasing activities, the Atlantic OCS Region (extending from offshore Maine to the Florida Keys) is subdivided into four planning areas. Stellwagen Bank occurs within the northwest portion of the North Atlantic Planning Area of the Atlantic OCS Region (Figure 10). Within this Planning Area, three areas of hydrocarbon potential have been identified: 1) the Gulf of Maine; 2) the Georges Bank Basin, and 3) the deep-water area seaward of the continental slope. Limited geological and geophysical data exist related to the Gulf of Maine area; and the petroleum potential of this area is not well known. (U.S. DOI, MMS, 1989). The first of two COST (Continental Offshore Stratigraphic Test) wells was drilled in the Georges Bank Basin in April 1976. Eight additional wells were drilled in the Georges Bank Basin in 1981-1982. Drilling sites ranged from 110 to 150 miles southeast of Nantucket Island. The results of these drillings were negative, and the wells were subsequently plugged. No OCS oil and



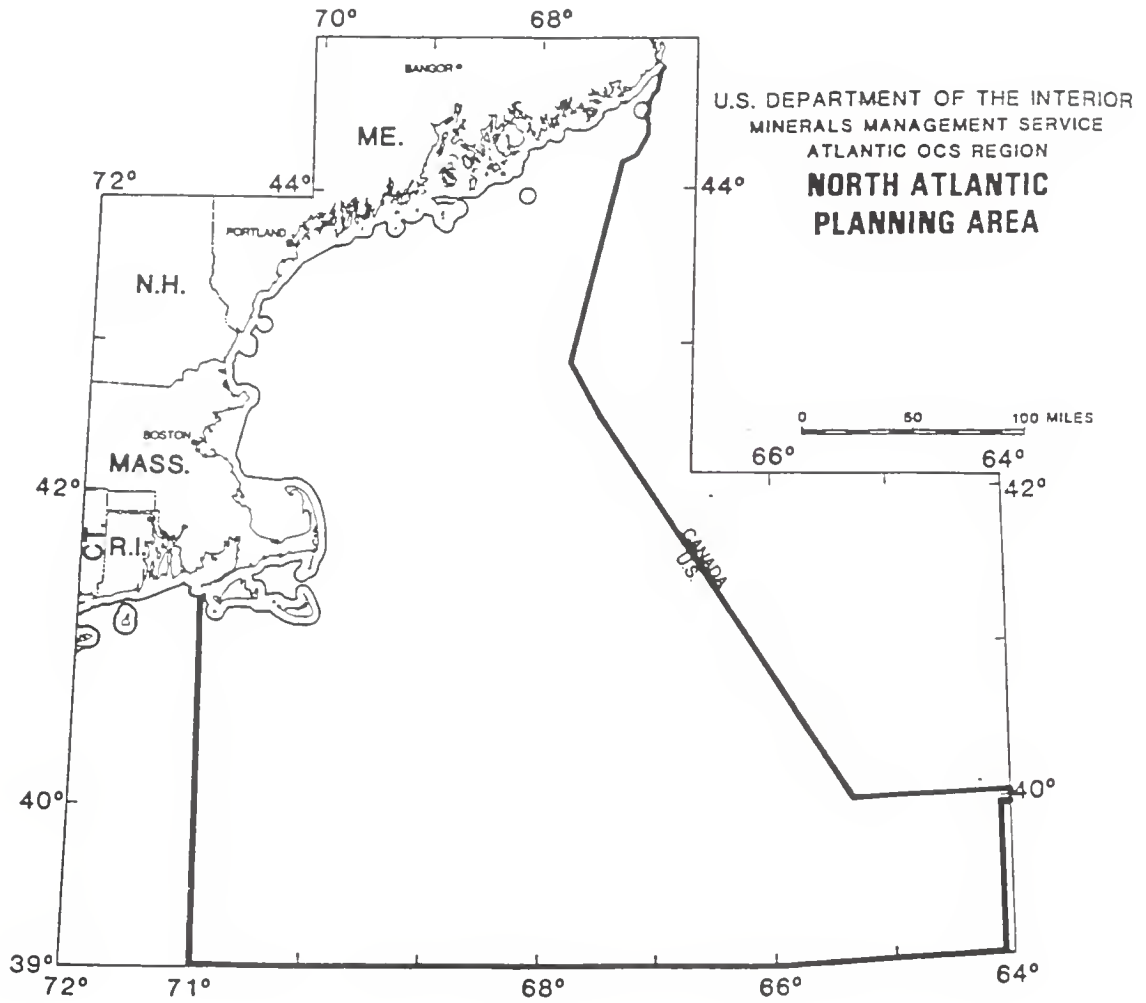


FIGURE 10: NORTH ATLANTIC OCS PLANNING AREA

gas lease sale activities have been conducted within the area of the proposed Sanctuary. No exploratory wells have been drilled anywhere on the Atlantic OCS since 1984.

Initial industry interest in the overall Atlantic OCS region focused on an ancient buried reef trend, believed to extend intermittently from Massachusetts to Florida. However, industry interest in the Atlantic OCS has decreased since 1984 for two reasons: 1) leasing moratoria and numerous OCS subarea deferrals; and 2) failure to locate commercially viable quantities of oil or natural gas. (U.S. DOI, MMS, 1989).

The current 5-Year Leasing Program Mid-1987 to Mid-1992 proposes two lease sales for the North Atlantic Region: Sale #96 (scheduled for February 1989), and Sale #134, (scheduled for February 1992). Both Sales are currently cancelled due to a Presidential Order, signed on June 26, 1990. Under that Order, no OCS leasing and development activity may occur in the Georges Bank area of the North Atlantic Planning Area until after the year 2000. Stellwagen Bank is included within the area covered by this Order. Therefore, no leases will be offered within the vicinity of the proposed Sanctuary in the foreseeable future. However, based upon the September 25, 1990 recommendation of the Director of MMS, the North Atlantic Planning Area would be considered for MMS geologic and environmental studies during the currently proposed mid-1992 to mid-1997 five-year oil and gas leasing program.

Marine transportation issues related to the transport of oil and gas resources have also been examined for the North Atlantic Planning Area. The Massachusetts Coastal Zone Management Office has conducted a preliminary pipeline siting study for natural gas originating from the OCS. The study focused on the types of data necessary for identification of natural gas pipeline corridors, including physical, geological, and biological features and existing land-use patterns. Transportation scenarios are developed based on the proximity of potential hydrocarbon discoveries to existing refineries or processing facilities. Preliminary identification also was made of potential pipeline corridors. However, since no commercially

producibile quantities of oil and gas have been discovered, no pipeline or tanker routes have been designated.

7. Sand and Gravel Mining

Within the past decade, the Boston metropolitan area has experienced significant and rapid economic growth, which has in turn encouraged substantial industrial, commercial, and residential development. Pressures on both the housing industry and transportation systems to meet the demands of this growth have resulted in increased consumption of and demand for sand and gravel resources, for use as aggregate in construction activities.

Recently, three large-scale public works projects have been initiated in this area: the construction of a new secondary wastewater treatment facility by the Massachusetts Water Resources Authority (MWRA); reconstruction of the Central Artery, the major highway through Boston, by the Massachusetts Department of Public Works (MDPW); and construction of the Third Harbor Tunnel, also being undertaken by MDPW. These projects will create additional demand for construction aggregate.

Stubblefield and Duane (1988) identify two principal areas in Massachusetts Bay and surrounding waters where sand and mixed aggregate are known to occur in significant quantities. The first is in the inshore waters off Boston Harbor between Hull and Plymouth. Fitzgerald, *et al.* (1990) in characterizing these deposits, provide a very speculative estimate of the total volume of material in three potential deposits within this area as approximately 4.8 million cubic yards (3.7 million cubic meters). The second area is Stellwagen Bank. Setlow (1973) estimated that the volume of material (predominantly sand) on or adjacent to the Bank was 114.7 million cubic yards (87.7 million cubic meters). Sands account for over 90% of the Bank feature's composition (BOM 1987).

More recently, Stellwagen Bank has been identified by the Minerals Management Service (MMS) as a potentially favorable area for possible mining activities, primarily for sand deposits (MMS, 1987). Environmental considerations were not,

however, factored into the MMS analysis of site suitability. The Bureau of Mines made particular reference to the possibility that concerns over environmental protection "could have significant adverse effects on any dredging and processing operations". (BOM, 1987). Several small deposits of gravel and coarse sand occur on top of the Bank, which could be individually exploited.

The distribution of gravel and sand on Stellwagen Bank is provided in Figures 11 and 12, respectively.

Most of the sand and gravel resources on the Bank occur in less than 130 feet, indicating the feasibility of recovery using currently available mining technology. While a number of small gravel deposits have been identified immediately east of the Bank, and in waters off of Cape Ann, these areas are considered too deep to make the deposits economically recoverable (MMS, 1987). Other factors which make Stellwagen Bank a desirable source for sand and gravel are its proximity to Boston (approximately 30 miles east of Boston Harbor), and its occurrence in Federal waters, making the area potentially available for leasing (Hassol, 1987).

Sand and gravel resources are unconsolidated deposits classified as "industrial materials" by MMS (Cruickshank, *et al.*, 1987). These deposits may be collected directly either at or under the seafloor. While numerous methods have been developed to exploit offshore sources of mineral aggregate, current mining technologies applicable to sand and gravel deposits on Stellwagen Bank would likely include individual variations of two basic methods: scraping the surface and excavation of pits and tunnels into the surface. Variations in methodology could include both trailing suction dredges (scraping), or anchored suction dredges (excavation). It is likely that the latter method would be used at Stellwagen Bank, depending on water depths at operating locations. Similar methods are routinely used for mining of sand and gravel at depths of less than 100 feet (30.48 meters).

In general, the environmental effects of offshore sand and gravel mining include: destruction of the existing benthic biota; resuspension of fine

sediments; and alteration of the surface profile (Hurme and Pullen, 1988). To date, however, there have been few studies thoroughly assessing the effects of offshore mining activities. During the late 1970's, the New England Offshore Mining Environmental Study (NOMES) addressed the impacts of commercial-scale mining, although the study was terminated prior to actual test mining. The NOMES project identified several possible results of offshore hydraulic mining for sand and gravel, including: formation of stagnant water-filled excavation pits, causing in turn coastal erosion or penetration of freshwater aquifers; harm (or benefit) to fisheries, depending on the physical nature of the bottom surface following excavation; introduction, via discharge plumes, of pollutants and undesirable nutrients, causing interference with filtering, feeding, and respiratory functions of marine organisms; direct smothering of benthic species; loss of food sources and habitat; lowered photosynthesis and oxygen levels; and degraded appearance of the water itself. Unavoidable changes in bathymetry and bottom type may also cause alterations in population and migration patterns (Hurme and Pullen, 1988).

Of particular concern at Stellwagen Bank are impacts to fish, invertebrates, and marine mammals resulting from mining operations. The sandy substratum is especially important to sand lance, the primary forage fish for cetaceans. Sand lance burrow into the Bank's sandy substratum during the day, and may also burrow for longer periods of inactivity during the late summer. (S. Katona, 1991).

In terms of finfish, there is general agreement among the sources consulted (DeGroot, 1979; ICES, 1981; MMS, 1987; Hurme and Pullen, 1988; Oulasvirta and Lehtonen, 1988) that individual adult fish are unlikely to be affected by mining operations, as they are likely to avoid the disturbed site. Early fish life stages are less mobile, however, than adults and more sensitive to elevated suspended sediment concentrations. DeGroot (1979) has determined that dredging and construction of a sand island would cause damage to fisheries of the area, as well as a sizeable permanent economic loss to commercial fisheries (Dfl. 10,000,000, or approximately \$ 5.3 million in 1990 dollars). In a study of the effects of sand

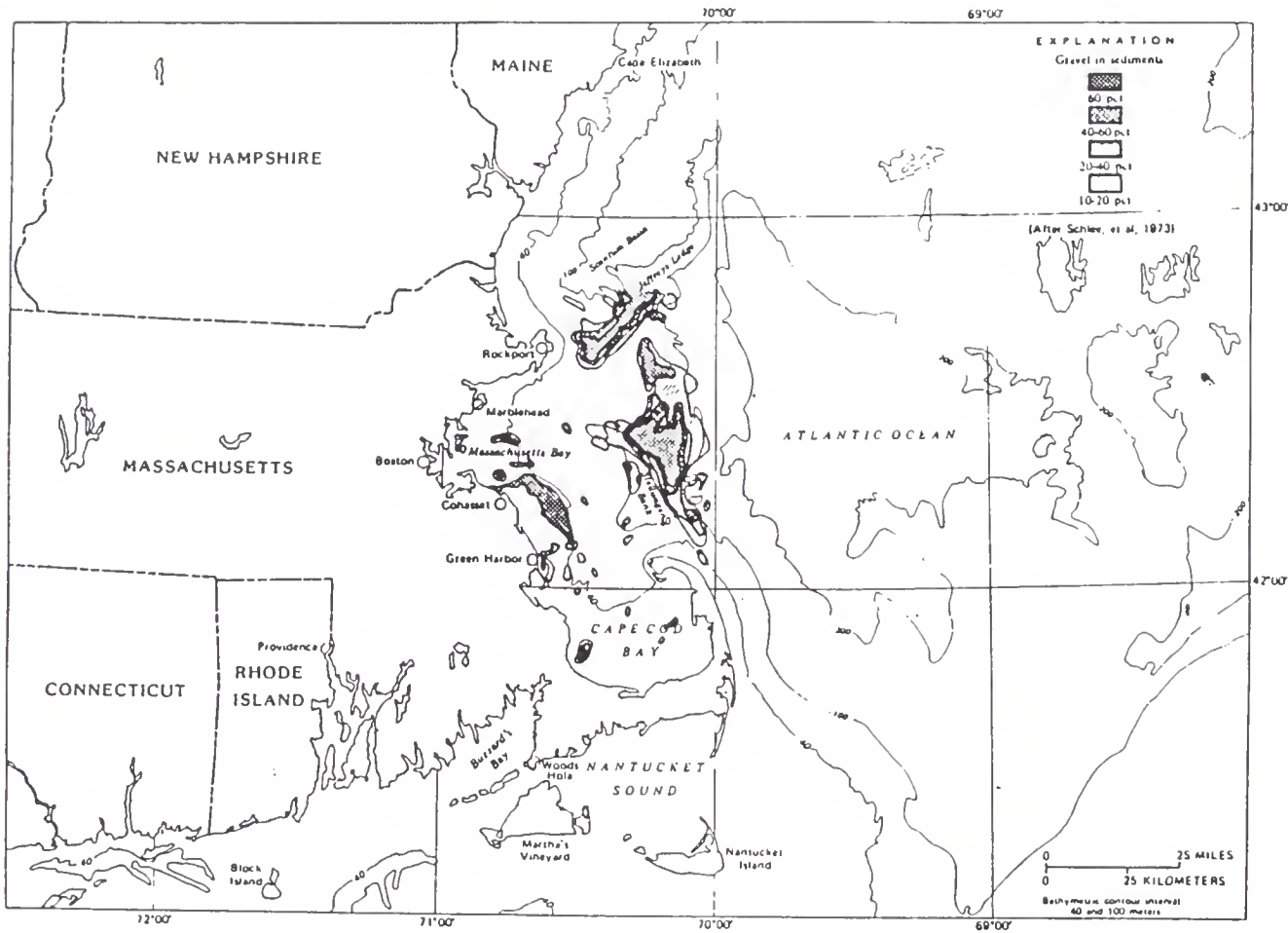


FIGURE 11: GRAVEL DISTRIBUTION OFFSHORE BOSTON METROPOLITAN AREA

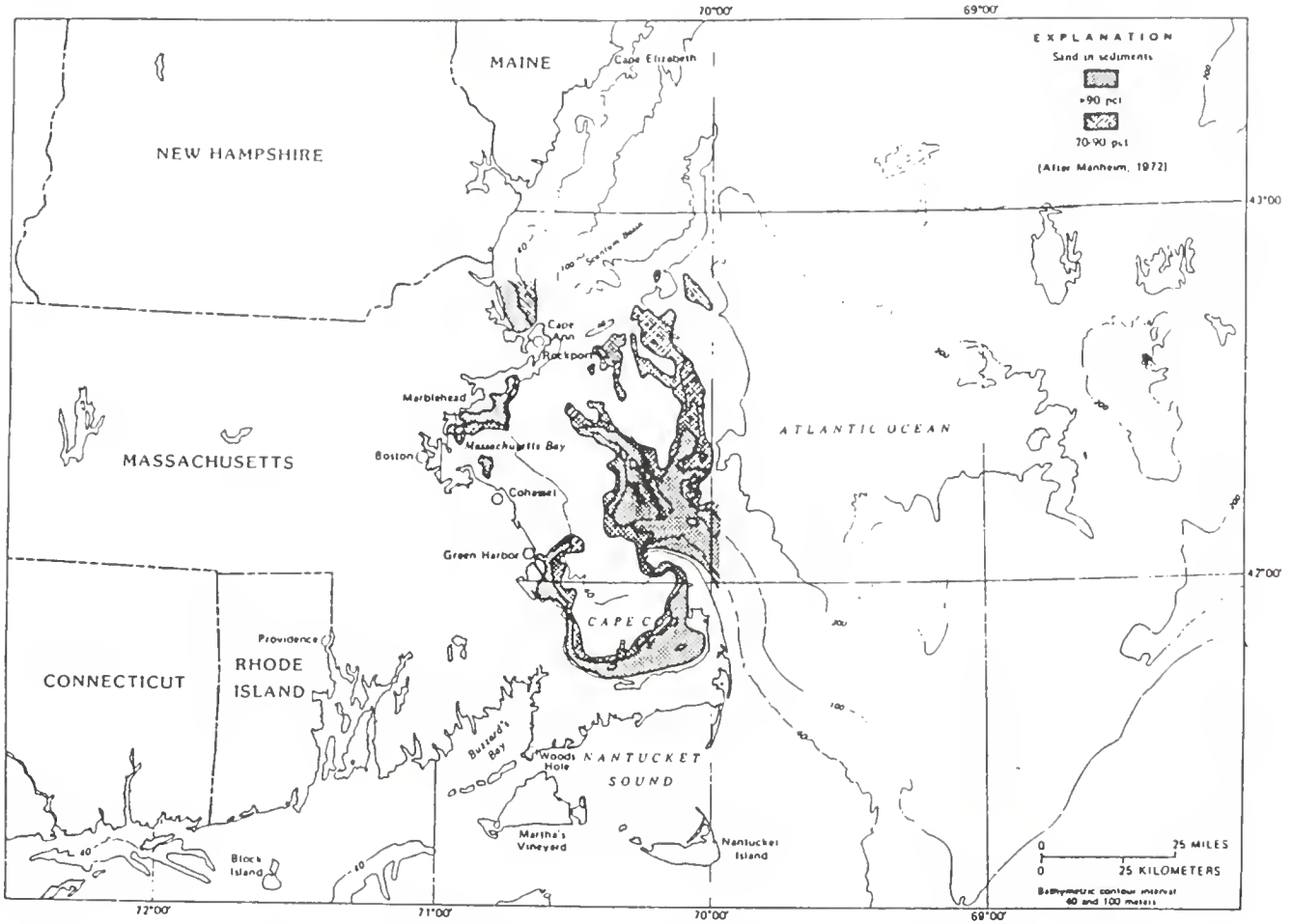


FIGURE 12: SAND DISTRIBUTION OFFSHORE BOSTON METROPOLITAN AREA

extraction on herring in the Gulf of Finland (Oulasvirta and Lehtonen, 1988), while results did not indicate that Baltic herring were affected by the mining operation, the catch in a trapnet set nearby was significantly reduced over that of years previous to the operation.

Some of the direct impacts to organisms that live on or in the sediment can be mitigated through various operational practices, such as avoiding overlap of dredging paths. However, as there are increased costs generally associated with such practices, and compliance can be difficult to ensure, reliance upon operational practices as a mitigating factor can be of limited value.

Data on potential effects of offshore mining on marine mammals are almost nonexistent. A recent study associated with locating a dredged material disposal site in Cape Cod Bay (Battelle, 1987) stated that evidence available on suspended sediments indicated that elevated levels would have no effect on whales. This conclusion was based on the speculation that whales often live in turbid environments (inshore waters during winter months, or offshore of glaciers); and certain species are known to feed on organisms in or on the surface of the sediment. However, secondary effects may be significantly more important than direct impacts. Bowhead and beluga whales have been observed altering their swimming patterns within 2.4 miles of a dredging operation, a change in behavior thought to be associated with the noise generated by the dredging operation (DOI, 1983b, reported in MMS, 1987). Similar effects also have been observed in grey whales off the California coast (MMS, 1987).

Impacts to principal prey species of marine mammals also may be important. Both zooplankton and phytoplankton can be affected by exposure to elevated suspended sediment (MMS, 1987), possibly causing some secondary impacts to marine mammal predators. If fish actively avoid dredging plumes, whales in the area may have to exert more effort in feeding or other behavioral changes. The available information presently is inadequate to allow any conclusions to be drawn about this issue, beyond suggesting that a potential for adverse impacts exists.

There is additionally some concern about physical effects on the Bank feature resulting from a substantial mining operation. Stellwagen Bank is biologically productive because the Bank feature causes upwelling to occur, bringing nutrient-rich waters to the surface. Any change in the physical characteristics of the Bank could alter the pattern of upwelling. Even small alterations in the characteristics of the circulation and upwelling could have profound effects on the biology of the Bank. In addition, there is some indication that the Bank feature is very important in propagating internal waves in Massachusetts Bay (Gardner 1990). Internal waves seem to be important in affecting both the Bay's general circulation, and its primary and secondary production in surface waters. Any change in the Bank feature caused by a mining operation could affect the wave propagation properties of the Bank. However, further investigation and analysis are necessary to develop a better understanding of the relationship between the Bank and Massachusetts Bay.

8. Ocean Disposal Activities

a. General Disposal Activities

Between the 1940's and the 1970's, numerous offshore areas throughout Massachusetts Bay were used for the disposal of a variety of industrial waste products (including canisters, construction debris, derelict vessels, and radioactive waste). These activities were largely unregulated and unrecorded.

Disposal of low-level radioactive waste material was permitted at four areas within Massachusetts Bay between 1953 and 1959, the most frequently-used site being centered at 42°26.8'N and 70°35.0'W. Such low-level wastes were normally generated by academic, commercial, and medical institution sources (EPA 1980). Some radioactive wastes were also disposed at this site during the period between 1946 and 1953; however, previous to 1952 disposal records were not kept. Thus, specific description of disposed materials has not as yet been possible (EPA, 1984).

In 1963, the U.S. Coast Guard deployed disposal marker "A" buoy in the vicinity of the present Massachusetts Bay Disposal Site (42°26.8'N X

70°35.0'W). At this time the area became known as the Industrial Waste Site (IWS). Between 1963 and 1975, this area was also authorized for disposal of toxic and hazardous wastes. In 1975, at the request of the Commonwealth of Massachusetts and the Corps of Engineers, the IWS buoy marker was moved one nautical mile east, to its present location (42°25.7'N X 70°35.0'W).

b. Dredged Material

In 1977, EPA promulgated its Ocean Dumping Regulations, and subsequently granted "interim site designation" status to ocean disposal sites which had been historically used (40 CFR 228). The disposal area, now known as the Massachusetts Bay Disposal Site (MBDS), was established over a two-nautical-mile-diameter circle (Figure 13) centered at 42°25.7'N X 70°35.0'W, and overlapped the old IWS. The MBDS has alternatively been called the "Marblehead Site" and the "Foul Area Disposal Site" (FADS). The name "Foul Area" was used because disposed materials on the bottom would tend to tear or "foul" fishermen's nets. Since 1977, the MBDS has been used only for the disposal of dredged materials. Approximately 3,160,000 cubic yards of dredged material have been placed at MBDS since 1975. Nearly all of these materials are generated from dredging coastal harbors and waterways ranging from Rockport, Massachusetts to Plymouth, Massachusetts.

In 1988, the COE prepared a site evaluation report using the criteria for selection of ocean disposal sites (40 CFR §§ 228.5 and 228.6), and summarizing 15 years of site monitoring. In September 1989, EPA published a Draft Environmental Impact Statement on the continued use of the MBDS under a permanent ocean disposal site designation. In response to public review comments, a Supplemental EIS was prepared in July 1990 which more fully evaluates alternative sites for dredged material disposal activities. The alternatives analysis is being prepared using the guidelines prepared by EPA and COE for dredged material site designation (EPA, 1986). A zone of siting feasibility (ZSF) has been established to develop a reasonable range of alternative sites. The following factors are taken into consideration in establishing the ZSF: cost of dredging, transport,

and disposal; navigation restrictions; distance to the edge of the continental shelf; existing political boundaries; environmentally sensitive areas; and areas of incompatible uses. The suitability of these alternative sites are evaluated using the five general and eleven specific criteria for disposal site designation (40 CFR §§ 228.5 and 228.6).

Prior to the preparation of the COE's MBDS Site Evaluation Report, a review of the Disposal Area Monitoring Program (DAMOS) program reports and pertinent scientific literature was conducted to identify data gaps in the oceanographic knowledge of site specific conditions at MBDS. Extensive site evaluation studies were contracted during the preparation of the site designation document to fulfill the criteria of Title I of the Marine Protection, Research and Sanctuaries Act of 1972 (40 CFR §§ 228.5 and 228.6). Physical oceanographic data were collected using bathymetric surveys, current meters, and side scan sonar. Water column chemistry was measured and chemical analyses were also performed on sediments and organisms (worms, shellfish, and sandlance), both inside and outside of the MBDS boundary. Benthic analyses were made using conventional grab samples (soft sediments), and manned submersible dives (hard and soft sediments). Additional fish were sampled using trawls and gill nets. These data along with NMFS fish catch statistics were used to evaluate fish resources in the area. Specific programs and results are found in the MBDS site evaluation study (COE, 1987) and in supporting documents (SAIC, 1987).

A major effort was also made to determine the use of the area by cetaceans, marine reptiles, and seabirds. Data were collected from the following sources:

- 1) Cetacean and Turtle Assessment Program, Bureau of Land Management (1978-1980);
- 2) National Marine Fisheries Service, Northeast Fisheries Center-sponsored marine mammal surveys, Manomet Bird Observatory, Manomet, Massachusetts (1980-1985);
- 3) Right Whale Surveys of Cape Cod Bay, Center for Coastal Studies, Provincetown, Massachusetts (1983-1986);

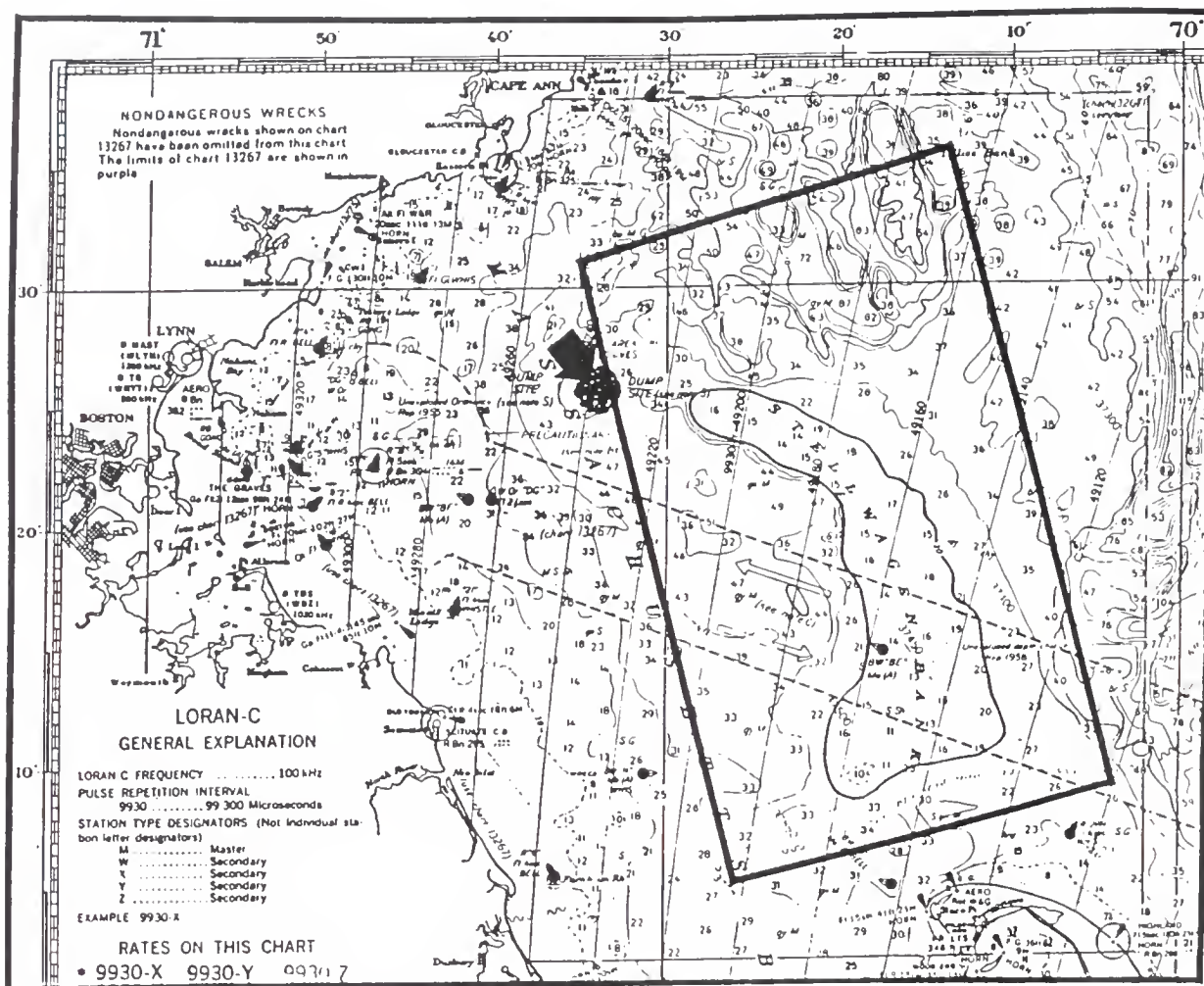


FIGURE 13: MASSACHUSETTS BAY DISPOSAL SITE

* Note: Marked boundary depicts NOAA study area for proposed Sanctuary

- 4) Cetacean Research Unit of the Gloucester Fisherman's Museum, Gloucester, Massachusetts (1980-1985);
- 5) Gulf of Maine Cetacean Sighting Network College of the Atlantic, Bar Harbor, Maine (1975-1981);
- 6) Aerial surveys at MBDS (monthly, January-June, 1986); and
- 7) Onboard observers during site designation cruises.

These data, along with a synthesis of the primary literature, were used to map the distribution and abundance of cetaceans, turtles and seabirds in the area around Stellwagen Bank and the MBDS. Complete descriptions of these studies can be found in MBO (1987), and results are summarized in the MBDS Site Evaluation Report (Hubbard *et al.*, 1988).

The Army Corps of Engineers (Hubbard *et al.*, 1988) estimates that if the MBDS is ultimately designated by EPA, it is likely to receive an average of approximately three million cubic yards of dredged material per decade. The Boston Harbor Deepening Project, which involves the dredging of certain portions of the Harbor to allow safer passage for vessels entering and leaving the Harbor, or other proposed infrastructure improvement projects currently under review, could triple this estimate in any one decade.

c. Fish Processing Wastes

In 1985, and again in 1987, requests were made to the EPA to allow ocean dumping of fish processing wastes. Section 102(d) of the MPRSA, and the regulations at 40 CFR § 220.1(c), specify that "the transportation for the purpose of dumping or the dumping in ocean waters of fish wastes" does not require a permit, provided that the dumping does not occur in: 1) "harbors or other protected or enclosed coastal waters"; or 2) "any other location where the administrator finds such dumping may reasonably be anticipated to endanger health, the environment, or ecological systems." In response to those proposals in 1985 and 1987, EPA, in

consultation with NMFS and the fishing industry, provided suggested locations for such disposal and recommended a number of conditions which, if followed, would allow such dumping to meet criterion 2, as described above. Those conditions included criteria for the character of the material to be discharged (e.g., must be ground/no chunk greater than 1"; no shells from shellfish), and how the discharge should occur (e.g., laid down in rows; no revisiting the site of discharge for at least three days). Also, these sites were only to be used when fish processing plants either break down and are undergoing repairs, or are temporarily shut down for repairs. When recommendations for suitable sites were being developed, attempts were made to avoid active fishing areas, and to ensure that the wastes did not drift onshore. No post-disposal assessments were conducted. Dumping of fish processing wastes did take place, under the conditions described above, at a site off Gloucester.

Future activity involving the dumping of fish wastes within or adjacent to the proposed Sanctuary is highly uncertain. One of the principal reasons for this uncertainty is the unpredictable nature of the fisheries themselves.

The Northeast Region Office of NMFS has suggested that this disposal activity is not particularly problematic from an environmental standpoint, as most of the material appears to disappear quickly from the sea bottom. (C. Mantzaris, NMFS, pers. comm., June 1990). Results of an informal study conducted by EPA's Region I Office on dumping of dogfish wastes in Maine were consistent with the opinions expressed by NMFS.

It should be noted that this issue is confined to the disposal of fish wastes as defined at 40 CFR § 220.1(c). It does not include such activities as the discharge of fish or parts and chumming materials (bait) from fishing vessels. It is limited to large scale commercial fish processing operations wishing to transport and dump fish wastes within or adjacent to the Sanctuary.

d. Incineration of Trash

A proposal has been recently put forward to

construct vessels and facilities to allow the offshore incineration of trash from metropolitan Boston. While much of the proposal is preliminary, and therefore proprietary, the proposed activity would generally involve the construction of a shoreside facility from which to load trash into a special incineration vessel.

Offshore incineration of trash may be conducted via permits issued pursuant to regulations implementing Title I of the Marine Protection, Research and Sanctuaries Act of 1972 (16 U.S.C. § 1431 *et seq.*), at 40 CFR §§ 220.3(f), 228.4(b).

In general, § 220.3(f) states that permits for incineration of wastes at sea will be issued only as "interim" permits or "research" permits (defined at 40 CFR §§ 220.3(d) and 220.3(e), until specific criteria regulating this type of disposal are promulgated, except in instances where studies have been conducted on: the waste material; incineration method and vessel; and the site to be used.

Additionally, the site in question must have been designated for incineration at sea according to procedures set forth in § 228.4(b). These procedures must be conducted in accordance with the same site designation requirements for other types of ocean disposal activities, found at §§ 228.5 and 228.6. Among those requirements is the particular consideration to be given to avoidance of sensitive areas, such as beaches, shorelines, marine sanctuaries, or geographically limited fisheries or shellfisheries.

Currently, there is no site within the Stellwagen Bank area designated for ocean incineration. Because incineration activities have not occurred previously, it is unclear at this point what precise effects, if any, such an operation could have on the proposed Sanctuary's resources. In the event of a proposed incineration site designation, or the issuance of an interim (or research) permit under Title I regulations, future action by the Sanctuary Manager may be warranted to ensure that Sanctuary resources and qualities are protected from any harmful effects resulting from such an activity.

9. Ocean Discharges

Massachusetts Bay and Cape Cod Bay receive waste, in the form of effluent or sludge, from a number of pipes extending from municipal wastewater treatment plants (Figure 14) (MBP Management Committee, 1989). The total combined flow of this material is reported to be 566 million gallons per day (MGD), with approximately 500 MGD of that total discharged by the existing Massachusetts Water Resources Authority (MWRA) treatment works at Deer and Nut Islands, the plants that serve the greater Boston Area. Most industrial discharges enter Massachusetts Bay through the municipal wastewater treatment plants, principally the MWRA system.

The MWRA is currently involved in the construction, to be completed by 1999, of a new wastewater treatment facility on Deer Island. The new plant will provide more effective, secondary treatment of the wastewater, and eliminate the discharge of sludge into coastal waters (by 1991). The discharge point, an ocean outfall, is to be relocated from the entrance to Boston Harbor to an area between 7.9 and 9.4 statute miles (or 12.7 and 15.1 km) east-northeast of Deer Island (Figure 15). This location is approximately 12.5 nautical miles (23.12 km) from the Sanctuary study area.

An extensive environmental assessment of the potential environmental effects of the proposed outfall was undertaken by the MWRA, with the results published in Volume V, "Effluent Outfall", of the MWRA Secondary Treatment Facilities Plan (1988), and appendices. An Environmental Impact Statement (EIS) was also prepared by the EPA for this project. Each of these documents concluded that a diffuser-type outfall located in the area identified above would be environmentally acceptable.

Increases in discharge volume have also been proposed for the South Essex Sewer District and the Town of Plymouth, discharging into Massachusetts Bay and Cape Cod Bay, respectively. No point source discharges have been proposed directly within the Sanctuary.

The Massachusetts Ocean Sanctuaries Act prohibits any new discharge of wastewater into areas designated as ocean sanctuaries. (Such areas

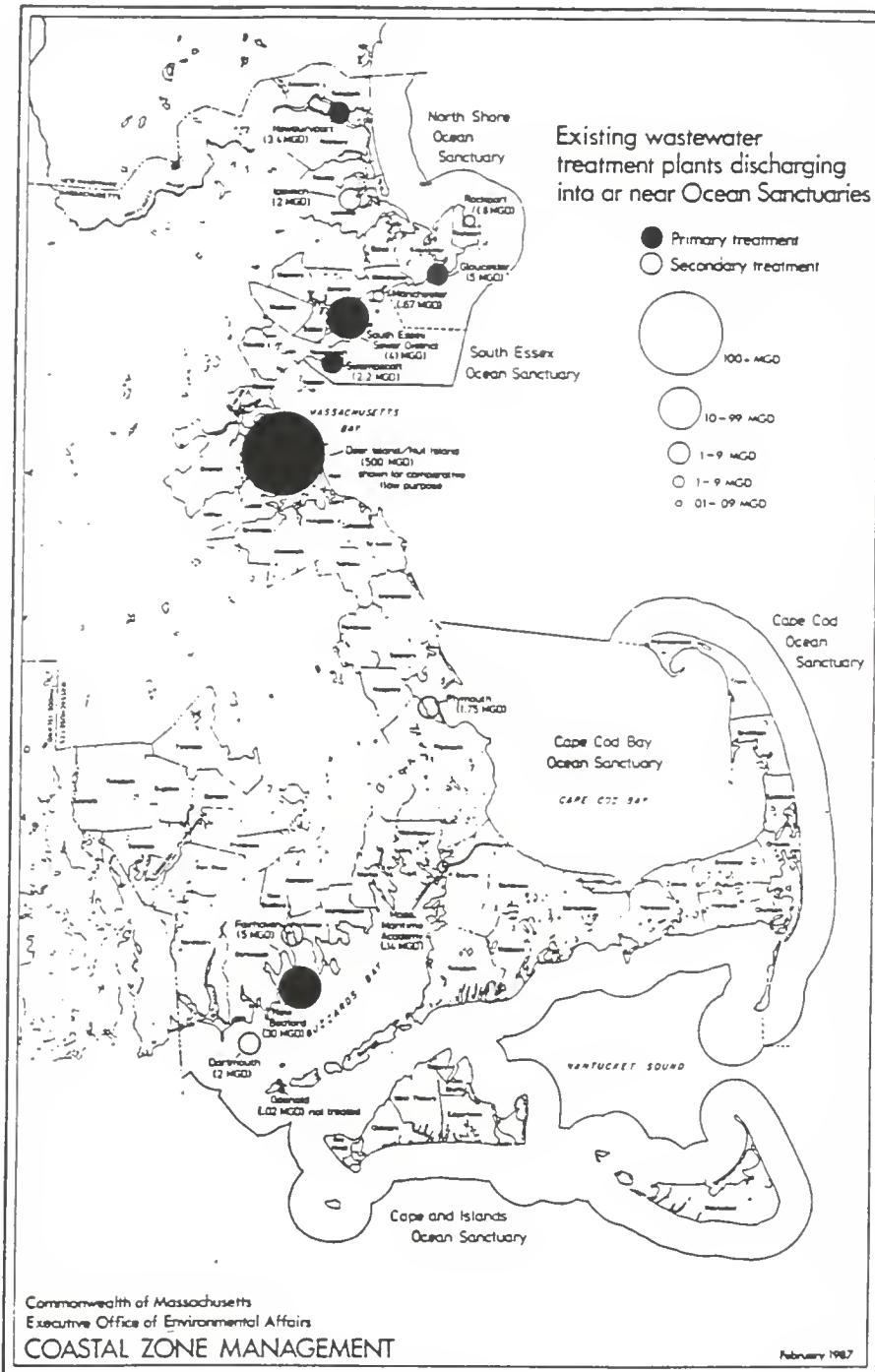


FIGURE 14: EXISTING WASTEWATER DISCHARGES INTO MASSACHUSETTS BAY AND CAPE COD AREA

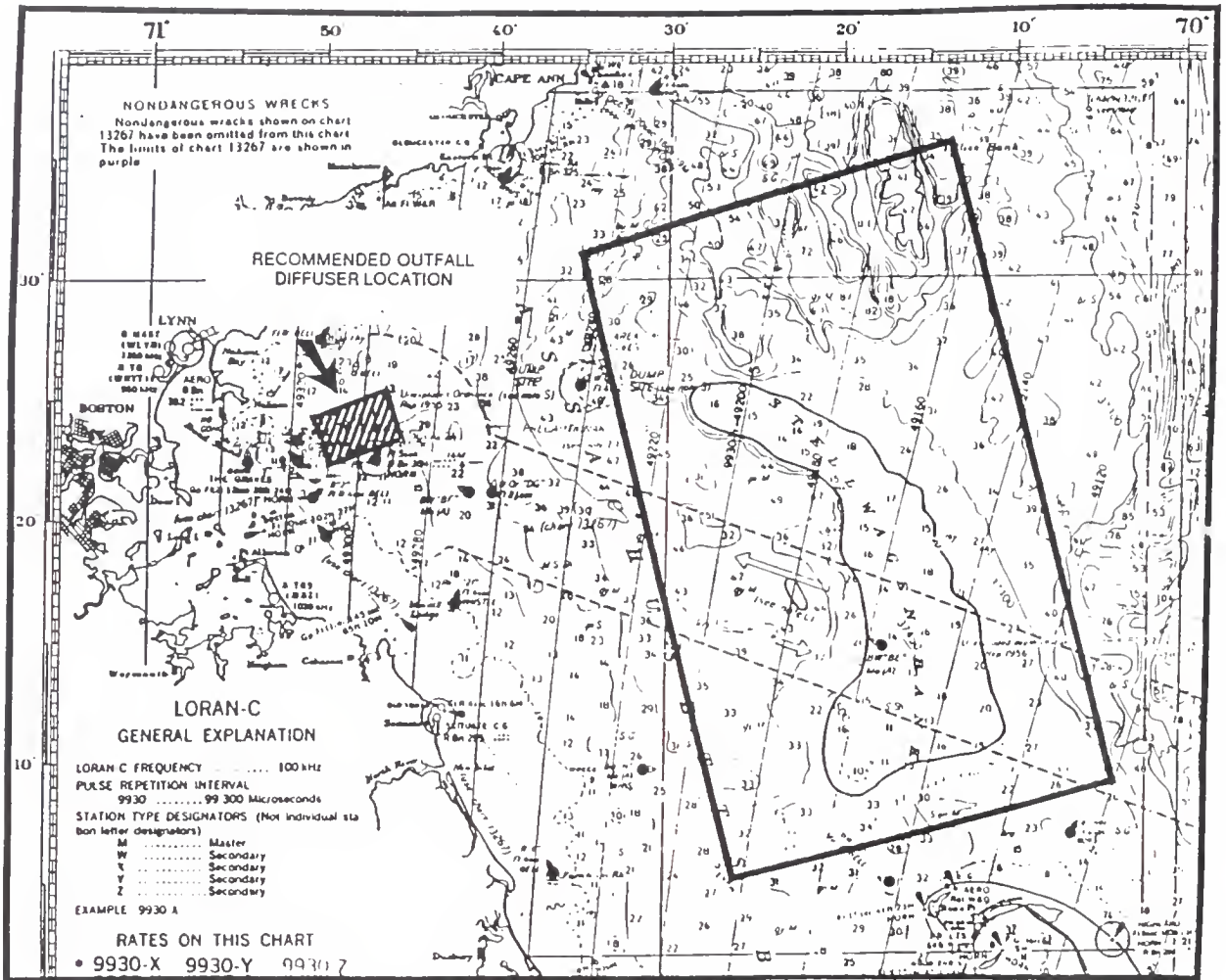


FIGURE 15: EPA RECOMMENDED OUTFALL LOCATION

* Note: Marked boundary depicts NOAA study area for proposed Sanctuary

encompass all of the Massachusetts coast except for the area between Marshfield and Lynn). A recent amendment to the Ocean Sanctuaries Act adds a variance procedure to allow increases in discharge volumes from existing wastewater treatment plants if a strict set of criteria are successfully met.

10. Submerged Pipelines and Cables

No submerged electrical cables or pipelines are known to exist on or adjacent to Stellwagen Bank. Additionally, no international telephone cables exist or are contemplated for the Stellwagen Bank area (Jeff Ewald, AT&T, pers. comm., May 1990). NOAA nautical charts indicate the presence of a "submerged cable" passing immediately to the south of the Bank, which has been identified as an inactive telegraph cable (Jeff Ewald, pers. comm., May 1990).

Very speculative and preliminary information is available regarding proposals for the construction of pipelines or the installation of submarine cables on or adjacent to Stellwagen Bank. Only one instance has been found where the possibility of constructing a pipeline across the Bank was discussed. Discussions surrounded an OCS lease sale for the northern portions of Georges Bank (P.Hughes, MCZM OCS Coordinator, personal communication, May 1990). If the volume of oil discovered had been of sufficient quantity, a direct pipeline to the Boston area would have been proposed, most likely along an alignment which could traverse the Bank.

In terms of submarine cables, the MCZM Office was contacted two to three years ago regarding the possibility of installing an electrical transmission cable from Nova Scotia to the Boston area, presumably as a part of planning for the Fundy tidal power project (Jan Smith, MCZM Water Quality Planner, pers. comm., May 1990). Additionally, in response to the DEIS/MP on this Sanctuary, reference has been made to a tentatively proposed submarine cable, known as the Bluenose Project, which would transmit "significant amounts of power and energy between Nova Scotia and the Pilgrim Nuclear Station in Plymouth, Massachusetts." (R. Gillis, Esq., April 1991). Nova Scotia Power also has indicated that preliminary discussions have been conducted with "a number of interests in

Massachusetts" regarding the installation of a submarine cable across Stellwagen Bank for the purpose of electricity transmission." (R. Smith, Nova Scotia Power, April 1991). Almost all possible alignments for submarine cables would intersect with the Stellwagen Bank feature.

Although the laying of submarine cables is thought to be reasonably benign environmentally, the presence of a cable in an active fishing area could cause problems with damage to both the cable and fishing gear. Some have speculated that cables on the sea bottom could create obstacles to the movement of bottom-dwelling organisms (Darnell, 1976). The trench and fill required for burying cables and pipelines could disturb sensitive fish spawning areas; and the activity of the installation equipment could disturb marine mammals and seabirds. Excavation activity can also disturb or destroy marine archaeological sites.

The most significant problem with pipelines, and with electrical transmission cables which use circulating oil for cooling, is the possibility of leaks causing contamination of the surrounding waters.

11. Mariculture

Given the open-ocean environment of Stellwagen Bank, the only form of commercial fish culture (or mariculture) operation likely to be sited on or adjacent to the Bank would be a finfish pen or cage-culture operation. ("Aquaculture" operations involve freshwater areas.) These are generally "grow-out" operations, where fish smolts are held in pens, usually fed from the surface and medicated with antibiotics to control diseases, and harvested when they reach marketable size.

Most existing operations at other locations involve the culture of salmonids (principally Atlantic salmon); however, a number of experimental attempts are being proposed to expand the effort to species such as cod, haddock, striped bass and halibut (C. Mantzaris, NMFS, pers. comm., August 1991). As of 1989, there were 37 commercial mariculture leases in New England (18 in operation), with most located on the coast of Maine (Bettencourt and Anderson, 1990).

NMFS has identified, in the NMFS Strategic Plan, aquaculture as one of ten agency-wide priorities. However, the NMFS Northeast Regional Office does not anticipate embarking on any new policy initiatives or major projects related to aquaculture (C. Mantzaris, NMFS, pers. comm., August 1991). NMFS has nonetheless issued joint State/Federal guidelines (prepared by NMFS, the Army Corps of Engineers, the Environmental Protection Agency, and the State of Maine) for net pen finfish aquaculture projects. In this joint guidance, finfish leases are prohibited in, or within 1/4 mile of, any area "named in acts of Congress or Presidential proclamations such as national parks, national wilderness areas, national recreation areas, national lakeshores, national natural landmarks, national wildlife refuges, and such areas as may be established under federal law for similar and related purposes." Similar guidance has been developed by the New England Division of the COE, for information required in applying for floating fish pen project permits.

Mantzaris (1990) identifies five key factors related to siting issues and environmental impacts associated with finfish pen culture: 1) distance between the bottom of the net and the sea floor - minimum has been 30 feet, but recently reduced to 10 feet; 2) currents - should be sufficient to insure the dispersal of organic matter generated by the operation; 3) tidal range - as with factor #1, this factor is a consideration only with the siting of inshore operations; 4) location with respect to rare, threatened, endangered, or otherwise protected species (particularly seal nursing sites); and 5) commercial and recreational conflicts - operations should not be located or interfere with significant commercial fishing or recreational areas.

Wildish (1990) generally identified five basic ecological issues of interest concerning aquaculture: 1) organic site-specific pollution or waste-related pollution; 2) eutrophication or nutrient enrichment; 3) interaction of aquaculture with traditional fisheries; 4) toxic chemicals in cultured products (antibiotics, pesticides, hormones, antifoulants); and 5) disease transmission (principally to native fish stocks). With the exception of conflicts with traditional fisheries and other human activities, the remainder of the issues are generally not

problematic with offshore operations.

While no mariculture facility is currently operating in the offshore waters of New England, in 1987 a proposal was developed by American Norwegian Fish Farm, Inc. (based in Gloucester, Massachusetts) to establish a floating mariculture facility offshore of Cape Ann, for commercial production of salmon. Application was made to the U.S. Army Corps of Engineers to obtain a permit under Section 10 of the Rivers and Harbors Act, for construction, installation, and maintenance of two facilities, one inshore for raising juvenile salmon (smolts), and a second offshore site for raising the smolts to market size.

The original application proposed an inshore facility to be moored to the seabed adjacent to the southwest side of the Federal breakwater in Sandy Bay, approximately 1-1/2 miles offshore of Rockport, Massachusetts. At this site, smolts were to be raised between April and October annually, to 5" in size, and then transferred to the offshore site, for growth to market size. The offshore site would encompass a 7-nautical-mile by 7-nautical-mile area, situated 27 miles east of Cape Ann.

In addition to the requirements of § 10 of the Rivers and Harbors Act, the applicant was required to comply with § 402 of the Clean Water Act (requiring a National Pollution Discharge Elimination System, or NPDES, permit), administered by the Environmental Protection Agency (EPA).

Following public hearings and consultation with Federal and state agencies on the structural, environmental, and economic feasibility of this proposal, the applicant withdrew entirely plans for the inshore facility and combined the proposed operation to a single site, located approximately 37 miles (59.5 km) offshore of Cape Ann. This location occurs slightly northeast of Sanctuary boundary alternative #3.

The modified configuration of the offshore facility would consist of nine anchored strings of 10 fish pens each, for a total of 90 pens. The conical-shaped pens would each measure 90' from top to bottom, and 90' in diameter at the top. At

optimum capacity, each pen would hold approximately 500,000 pounds of fish of market size (8" to 10"). Nets hanging beneath the water surface would be 1-1/2" mesh, and designed to exclude marine mammals, fish, and seabirds.

The total area required for the site would be approximately 55.6 square nautical miles. Water depths at the revised location are approximately 700 meters (2,296.5 ft.), deeper than the 300-400 foot depths at the original offshore location. The proposed site is located outside normal commercial vessel traffic lanes, and would be marked in conformance with U.S. Coast Guard guidelines.

Several aspects of the offshore facility have presented siting, structural, environmental, and economic concerns. In response to the original application, the COE required extensive additional information before processing of the application could proceed, covering structural, resource, operational, administrative and financial specifics of the proposed project. Additionally, a Section 7 consultation (pursuant to the Endangered Species Act) with the National Marine Fisheries Service (NMFS) was conducted, and resulted in a biological finding of "no jeopardy" to endangered marine species in the vicinity of the proposed aquaculture facility. (C. Mantzaris, NMFS, pers. comm., May 1990).

Although the fish farm operation would be "self-monitoring" to attain best management practices, both COE and EPA permits would carry with them several requirements, including an endangered species monitoring program requirement.

Under this "monitoring program" requirement, fish pen operators would conduct monitoring activities during four months of each year. During those periods, 360° surveys of the pens would be made to determine the presence of any endangered species, and to note any interaction between endangered species and the fish pens. These surveys would be made every 15 minutes, over an 8-hour period, on a total of six days during a two-week period (total of 48 observations of all pens over each two-week period). Secondly, boat surveys would be made during the same time periods to note (from the water's surface) any interactions

between endangered species and the fish pens.

If the results of these monitoring activities indicate interaction problems, the permits would be subject to additional NMFS and EPA review (and possible hearings) to determine whether the permits should be withdrawn.

A Section 10 permit was recently issued by the COE for this project. Subsequent to the issuance of this permit however, two actions have resulted in uncertainty regarding the future of the Norwegian Fish Farm proposal. The COE permit was challenged in court by the Conservation Law Foundation (CLF) which charged, among other claims, that the fish farm facility would unreasonably displace other human uses of the site.

Secondly, the Department of the Navy has recently raised strong objections to the permit on the grounds that the proposed location for the facility conflicts directly with certain Navy air and sea operations. On the basis of national security, the COE was requested to revoke the Section 10 permit for this project. The Norwegian Fish Farm proposal has currently been moved to a site further north, offshore of New Hampshire.

13. Offshore Fixed Artificial Platforms

A proposal and plans initiated by a private marine consultant in the mid-1980's for the construction of a fixed offshore artificial "island", or platform, were submitted to the U.S. Army Corps of Engineers (COE) for its review under § 10 of the Rivers and Harbors Act (as extended by § 4(f) of the Outer Continental Shelf Lands Act (OCSLA)). The offshore fixed platform, to be known as "Gugel's Arabian Nights", was proposed as a holiday resort facility, incorporating restaurants, shopping malls, hotels, casinos, apartments, a hospital, a heliport, and other amenities to accommodate 100,000 persons (Figure 16).

As originally proposed, the physical structure would consist of an octagonal-shaped steel platform supported by 16 steel piles, located approximately 30 miles (48.3 km) east of Boston, in water depths of 80 to 85 feet (24.4 to 25.9 meters), and directly over the Stellwagen Bank, at 42°23'N x 70°23'W

(Figure 16). Each of the 16 piles would support 850,000 tons, and would rest in pockets cut into bedrock (no additional anchoring would be required). The platform itself would be 1000 feet (304.8 meters) wide and 60 feet (18.3 meters) deep, and constructed of steel and reinforced concrete. The bottom of the platform would rest 60 feet (18.3 meters) above the mean high water level.

The interior of the platform would consist of two or more levels. The lower level (approximately 800,000 square feet) would be between 20 and 40 feet (6.1 to 12.2 meters) high, and contain support systems for the facility, including diesel electric powerhouse; garbage disposal; fire pumps; storage tanks for fuel, potable water, emergency water (fire); food storage; maintenance shops and warehouses. The upper level (approximately 800,000 square feet) would contain multiple stories, including eight towers rising above the main platform. Transportation to and from the facility would be aided by a helicopter landing pad, and three docking spaces for cruise liners.

During the summer and autumn of 1988, the COE received comments from the public and other Federal and state agencies in response to the proposed project. Significant concerns were raised regarding the effects of the project on the marine habitat and living resources of the Stellwagen Bank system. Also, the Massachusetts Coastal Zone Management Office (MCZM) determined the proposal was likely to affect the Massachusetts coastal zone, and was thus subject to a Federal consistency review and determination, pursuant to § 307 of the Coastal Zone Management Act (15 CFR Part 930.53(b)). In addition to raising questions concerning structural stability and integrity, the Commonwealth asserted the proposal's likely effects would include:

- Operation of necessary support facilities in one or more ports or harbors;
- Increased boat and barge traffic within State waters, and in trips to and from Stellwagen Bank;
- Interaction with commercial and recreational fisheries on Stellwagen Bank;

- Potential environmental harm to fishery resources and the Bank's ecology, resulting from construction activities; volume and composition of discharges; fuel and other spills occurring during transfer operations; accidental loss of debris and litter; noise and light-induced changes in fish behavior;
- Potential environmental harm to threatened and endangered species, especially the northern right whale and sea turtles, resulting from noise and vessel traffic; and
- Interaction with whalewatch vessels.

The National Marine Fisheries Service (NMFS) also stated that a NEPA environmental impact statement (including consultation pursuant to § 7 of the Endangered Species Act), would be necessary to address these concerns. In 1990, the applicant proposed the relocation of the artificial platform to a site further north (42°30'N x 70°06'W); and the expansion of the project to include two identical platforms, or "twin towers", each 1,000 feet wide and connected by a gangway. The COE has indicated numerous uncertainties still require resolution before the proposal may move forward, including the financial support for this project (T. Bruha, COE, pers. comm., June 1990). Additional inquiries to the COE have indicated there has been no further progress on this proposal (T. Bruha, ACOE, pers. comm., June, 1991).

14. Research and Education

Several research and educational institutions or agencies conduct activities in the vicinity of Stellwagen Bank. These activities are largely focused on living resources of the Bank, and involve both on-site and off-site programs. In addition to living resources, scientific inquiry has also been directed at physical processes of the overall Gulf of Maine. The public's interest in understanding living and non-living resources of the Gulf of Maine has more recently fostered the expansion of educational/interpretive activities by several organizations.

Among agencies, institutions, or organizations which have conducted research and educational

projects related to or in the area of Stellwagen Bank are: U.S. Department of the Army (Corps of Engineers), U.S. Department of Commerce, U.S. Department of the Interior, U.S. Environmental Protection Agency, University of Massachusetts, University of Rhode Island, New England Aquarium, Atlantic Cetacean Research Center, Center for Coastal Studies, Center for Marine Conservation, Cetacean Research Unit, Conservation Law Foundation, International Wildlife Coalition, Manomet Bird Observatory, Massachusetts Audubon Society, Marine Biological Laboratory, and Woods Hole Oceanographic Institution.

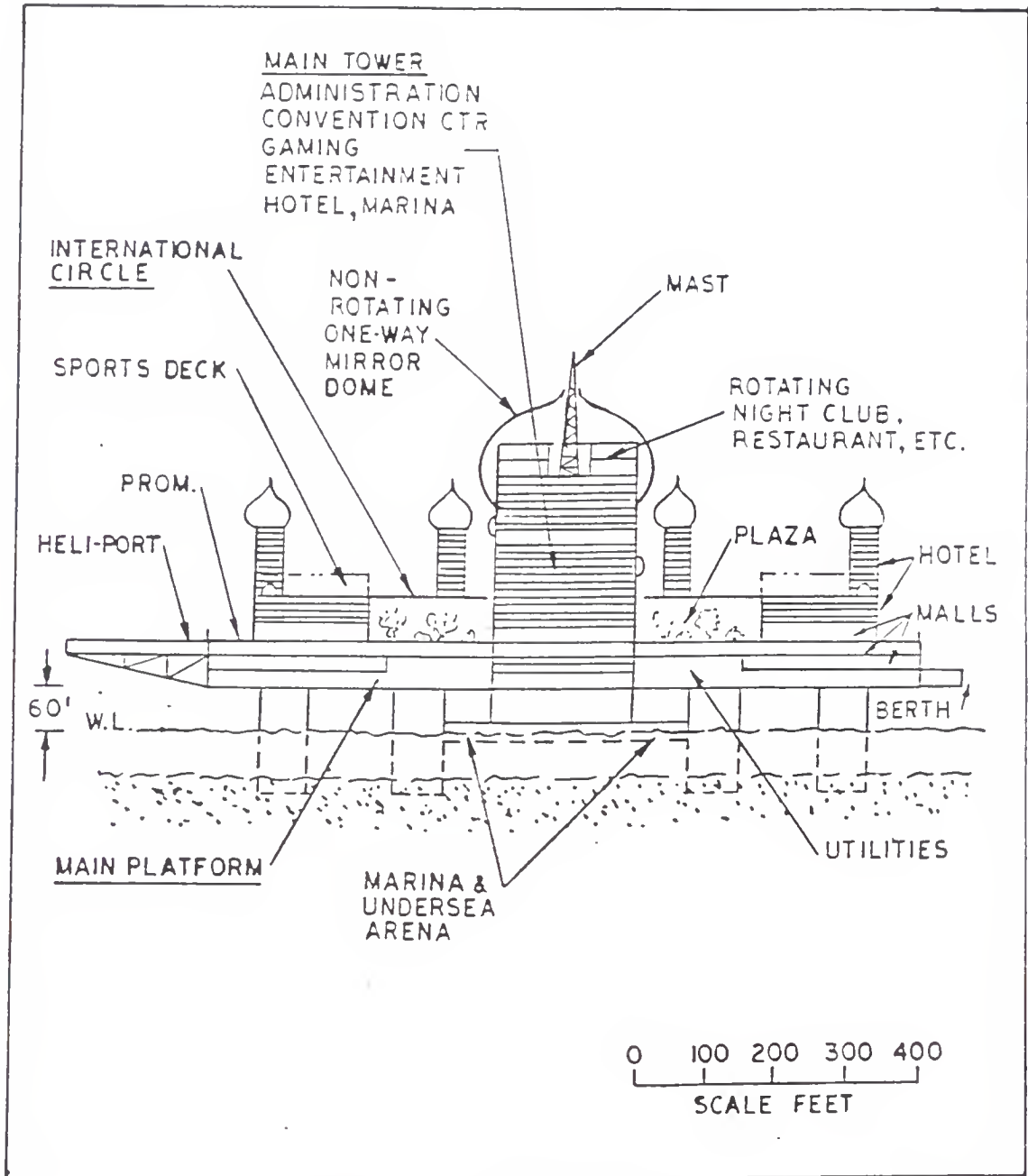


FIGURE 16: OFFSHORE FIXED ARTIFICIAL PLATFORM

Section III: Sanctuary Management Plan

A. Overall Management and Development Concept

1. General Context

The highest management priority for the Sanctuary is long-term protection of the living and non-living resources of the Stellwagen Bank system. Effective protection of Sanctuary is dependent on several factors affecting the feasibility of Sanctuary programs and actions. Factors affecting management of the Sanctuary include: its size; its depth and location; its accessibility; and coordination of responsibilities for comprehensive management of the site with other authorities.

As discussed in previous sections, the Stellwagen Bank area receives moderate-to-high levels of human use, with particularly high levels of visitation on a seasonal basis. The proximity to shore and accessibility of the site indicate the need for a Sanctuary management structure which provides for coordination of resource protection, research, and interpretation/education activities.

Understanding the ecological relationships among the diverse and abundant species of benthic organisms, invertebrates, fishes, mammals, and seabirds dependent on the Stellwagen Bank environment is of primary importance in providing system protection. The Sanctuary management plan proposes a research program which will characterize and monitor environmental conditions. This continuing program will provide the basis for detecting significant changes in the status of populations and their habitats. These data bases and predictive studies will in turn provide the basis for formulation of contingency plans and response mechanisms to unforeseen threats to the Sanctuary environment and surrounding waters.

Interested individuals and organizations throughout Massachusetts and New England will play an important role in attaining resource protection goals in the Sanctuary. Inherent to this management plan, and critical to its success, are effective interpretive programs enhancing public understanding, and hence, support for management

objectives. Establishment of the Stellwagen Bank National Marine Sanctuary will provide a unique opportunity to inform the public about both the value of resource protection and the need for long-term management of the overall Bank system. Communicating these messages effectively to the public will depend on publications, exhibits, and special events tailored to a varied public audience.

This management plan outlines actions tailored to specific issues affecting Sanctuary resources. The plan recognizes the basic need for a balanced approach to system management, reflecting both protection priorities and the multiple-use character of the Bank system. Implementation of this plan will involve cooperation and coordination among several agencies with specified regulatory responsibilities for the Stellwagen Bank area. In addition to NOAA's National Marine Fisheries Service (NMFS), other agencies include the U.S. Coast Guard (USCG), the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (COE), and the Commonwealth of Massachusetts (MA). Regular information exchanges and coordination of policies and procedures for resource protection will be integral to all Sanctuary programs, including research and interpretation. The management plan is designed to guide the management of the Sanctuary for the first five years following designation. During this period, management initiatives will occur in three basic programs: resource protection, research, and interpretation. Guidelines and specific initiatives for each program are discussed in the remainder of this section.

2. Existing Management Programs

The ocean areas within and surrounding the Sanctuary are currently subject to a number of management plans, either existing or in preparation. While none of these efforts focus particularly on the resources of the Stellwagen Bank Sanctuary, all affect, or will be affected by, designation of the Sanctuary.

a. Regional Management (Within Massachusetts)

Management of the Massachusetts Bay and

Cape Cod Bay coastlines falls under the jurisdiction of regional planning entities. While the interest of these organizations in planning for coastal waters is highly variable, some of the management initiatives arising from these groups could have secondary or indirect effects on the Sanctuary. For instance, management objectives established for the region regarding waterfront development may have an effect on the relative difficulty of gaining access to the Sanctuary from adjacent harbors, or on the availability of shoreside services for fishermen.

The regional planning agency likely to have the greatest interest in waterfront planning (and thus possible effects on access to the Sanctuary), is the Cape Cod Commission. Created in 1989 by the Massachusetts Legislature, the Commission has direct regulatory authority, which can in certain instances supersede local by-laws. As one of its first acts, the Commission is charged with producing a comprehensive management plan for areas within its jurisdiction. Given the importance of water quality protection issues, it is likely that the Commission will give significant attention to coastal waters in its comprehensive regional management plan.

In addition to this agency, the New England Fishery Management Council (NEFMC) also has regional management responsibilities related to the continued viability of fishery resources throughout the New England region. Within this context, the NEFMC prepares fishery management plans, which are periodically amended to ensure conservation and management measures (including regulation) necessary to attain maximum sustainable yields.

b. Commonwealth of Massachusetts

Two state management programs will have some direct impact on the Sanctuary: the Massachusetts Coastal Zone Management Program (MCZM), and the Massachusetts Ocean Sanctuaries Program. The MCZM is established under the Coastal Zone Management Act of 1972, as amended, and is the principal planning and policy agency of the Commonwealth for coastal issues. MCZM jurisdiction includes all State territorial waters, and any activity seaward of State territorial waters that will likely have an effect on the coastal zone. The MCZM Plan encompasses 27 program

policies directing activities proposed for the coastal waters and adjacent areas. The policies cover a broad range of issues, from protection of critical areas, to port and harbor operations, to offshore oil and gas development. MCZM program policies are currently being rewritten to update the coastal zone management plan. Ocean policy is an area within that effort which will likely receive significant attention in the updated management plan.

The Massachusetts Ocean Sanctuaries Program is administered by the Department of Environmental Management. Ocean Sanctuaries are designated to provide protection "from any exploitation, development, or activity that would seriously alter or otherwise endanger the ecology or the appearance of the ocean, the seabed, or the subsoil thereof, or the Cape Cod National Seashore" (Figure 17). To this end, specific activities are either prohibited or special performance standards are established for regulated activities, to insure that the activity does not violate the provisions of the Act. Implementation of these provisions is accomplished through state regulatory authorities. With the exception of an area off Boston (generally described as waters from Brant Rock north to Nahant, seaward to the boundary of state territorial waters), the remaining areas of state waters, including the entirety of Cape Cod Bay, are designated as Ocean Sanctuaries.

c. Joint State/Federal Programs

In 1987, Boston Harbor, and Massachusetts and Cape Cod Bays were nominated to EPA for designation as an "Estuary of National Significance" under the National Estuary Program (NEP), pursuant to § 320 of the Clean Water Act. Designation was ultimately made by EPA in April 1990.

As an Estuary of National Significance encompassing Massachusetts Bay, Cape Cod Bay, Ipswich Bay, and Boston Harbor, EPA and the Commonwealth of Massachusetts are in the process of developing a single Comprehensive Conservation and Management Plan (CCMP) for this area. While the EPA designation was only recently made, the Massachusetts Bays Program has been in place

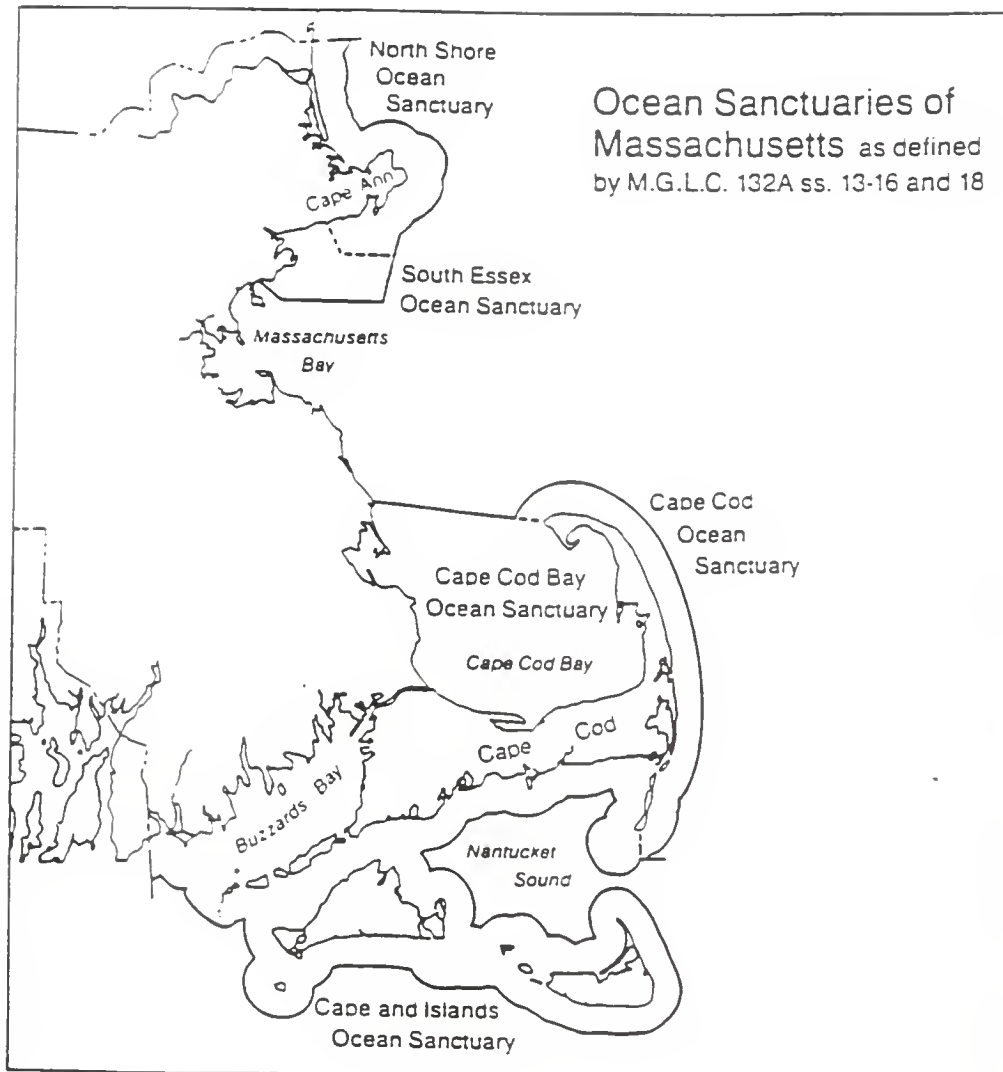


FIGURE 17: MASSACHUSETTS OCEAN SANCTUARIES

for well over a year, funded through an environmental trust fund with monies derived from the settlement of a lawsuit over pollution in Boston Harbor. The initial work of the Bays Program has been to set up the infrastructure for the NEP, and initiate the research which will provide the strong technical basis for the Comprehensive Plan.

The timing of the NEP designation provides a unique opportunity for the NEP and the National Marine Sanctuary Program to explore various ways these two programs can be linked for their mutual benefit. Given the high degree of coordination existing between these Programs and the MCZM, further opportunities are presented for Coastal Programs to add to, and benefit from this relationship.

d. International Management: The Gulf of Maine Initiative

Initiated a few years ago as a joint program funded under Section 309 of the Coastal Zone Management Act, the Gulf of Maine Initiative involves the States of Maine, New Hampshire, and Massachusetts, and now includes the Provinces of New Brunswick and Nova Scotia. A Gulf of Maine Council, made up of representatives from each of the States and Provinces bordering the Gulf of Maine, was recently empaneled with the charge of protecting the resources of the Gulf through coordinated action on critical issues. While the goals and objectives of the Council are quite broad, the international coordination and cooperation provided by the Council are a vehicle to facilitate future efforts on specific issues.

One of the first Council tasks was to provide the framework for a coordinated monitoring program for the Gulf of Maine. This task has been completed, and pilot monitoring studies are being implemented.

B. Resource Protection

1. General Context for Management

Designation of the Stellwagen Bank National Marine Sanctuary will focus public attention on the value of the area's resources. To ensure enhanced,

long-term protection for these resources, the Sanctuary resource protection program will include: 1) coordination of policies and procedures among agencies currently possessing resource protection responsibilities; 2) participation by other agencies in the development of new procedures to address specific management concerns (e.g., long-term monitoring and emergency-response programs); and 3) enforcement of Sanctuary regulations, in addition to enhancement of enforcement of regulations already in place.

2. Designation Document and Sanctuary Regulations

A summary of existing regulatory mechanisms applicable in the area of the Stellwagen Bank National Marine Sanctuary is presented in Part Three, Section I (Status Quo Alternative). Sanctuary designation will have no direct effect on these existing regulations. The Designation Document (Appendix A) describes the relationship between the Sanctuary's regulatory program and other regulatory programs. The Designation Document also includes:

- a list of activities subject to regulation immediately upon the Sanctuary's designation, or in the future;
- regulations for specified activities; and
- provisions for establishment of additional regulations, as necessary.

To ensure protection of Sanctuary resources and conservation of the Stellwagen Bank ecosystem, NOAA proposes additional regulations governing generally discharges and disposals, alterations of the seabed, development of industrial materials, placement of submerged cables or pipelines, incineration of trash, lightering, taking of historic/cultural resources, and disturbance of marine mammals, sea turtles, and seabirds.

a. Discharges and Deposits

Discharges and deposits of materials within the Sanctuary are prohibited. Discharge or deposit from beyond Sanctuary boundaries is also

prohibited if the substance or material discharged enters the Sanctuary and injures any Sanctuary resource or quality. Excluded from these prohibitions are discharge or deposit of fish wastes and bait; marine sanitation device effluents; water generated by routine vessel operations (such as deckwashings); and engine exhaust.

b. Alteration of the Seabed

Dredging, excavation, or any other alteration of, or construction on, the seabed within the Sanctuary is prohibited. Excluded from this prohibition are temporary alterations to the seabed which may result from traditional fishing operations.

c. Development of Industrial Materials

All phases of developmental activities connected with the extraction of industrial materials (e.g., sand and gravel resources) are prohibited throughout the Sanctuary.

d. Submerged Pipelines and Cables

The installation or placement of pipelines and cables within the Sanctuary is prohibited to ensure protection against possible adverse environment effects on resources, qualities, or habitat areas of the Sanctuary.

e. Incineration of Trash

The incineration of trash and waste from onboard vessels is prohibited throughout the Sanctuary to ensure prevention of any adverse environmental effect to resources or qualities of the Sanctuary.

f. Lightering Activities

The transfer of petroleum-based products from one vessel to another is prohibited anywhere within the Sanctuary, to prevent the possibility of accidental spillage and thus better protect Sanctuary resources and qualities.

g. Historical and Cultural Resources

It is necessary and desirable to protect and manage, for the long-term, any historical or cultural resources located in the Sanctuary. It is the responsibility of NOAA, as a Federal agency, under Section 110 of the National Historic Preservation Act, to "locate, inventory and nominate to the Secretary (of the Interior) all properties under the agency's ownership or control..." The intentional removal, taking, or injuring, or the attempt to remove, take or injure any historical or cultural resource in the Sanctuary is prohibited. Any activities resulting in the discovery or finding of such resources will be carefully investigated to determine their historical or cultural significance. This prohibition will be applied to any such resource determined to be historically or culturally significant.

h. Taking of Marine Mammals, Marine Reptiles, and Seabirds

The taking of any marine mammal, marine reptile (sea turtle), or seabird in or above the Sanctuary is prohibited. Exempted from this prohibition are takings of marine mammals which occur incidentally to commercial fishing operations, covered by §114 of the Marine Mammal Protection Act (MMPA), as amended in 1988 (P.L. 100-711). Also exempted from this prohibition are takings permitted under the MMPA, Endangered Species Act (ESA), or Migratory Bird Treaty Act (MBTA).

3. Contingency Plans for Major Emergencies

Resources of the Sanctuary are susceptible to both natural and human-related changes. Because many of these changes are gradual in nature, they may only be detected or forecasted through long-term monitoring of environmental indicators. Certain changes in conditions, however, may result from specific, dramatic events (e.g., oil or other toxins introduced into the environment through an accidental vessel collision), and pose serious threats to resources and public health and safety.

Under the National Contingency Plan, removal of oil and other hazardous substances from the

marine environment is the responsibility of Regional Response Teams, directed by the U.S. Coast Guard Marine Safety Office. The Teams will receive scientific support from NOAA, and assistance from other appropriate Federal and State agencies.

The Oil Pollution Control Act of 1990 (33 U.S.C. § 2701) requires the preparation of contingency plans for individual vessels. These plans are reviewed by the U.S. Coast Guard.

Added protection for Stellwagen Bank resources will be provided through ongoing Sanctuaries and Reserves Division monitoring and assessment of Sanctuary preparedness for emergency situations. SRD's actions will incorporate continuing dialogue and information exchange with government, industry and private response teams, in order to enhance support in detection, assessment and clean-up capabilities applicable to the Stellwagen Bank system.

SRD is developing a National Marine Sanctuary Program contingency and emergency-response plan, with a specific prototype being developed for the Channel Islands National Marine Sanctuary. Sanctuary-specific contingency and emergency-response plans will be prepared for each site in the National system, including Stellwagen Bank. The plan developed for Stellwagen Bank will:

- outline and describe emergency-response procedures and coordination requirements for SRD and Sanctuary staff;
- provide a geographic information system (GIS) depicting resources at risk;
- outline procedures for emergency research;
- provide guidelines for damage assessment.

In conjunction with the SRD contingency/emergency-response plan, cooperative agreements may be formulated to improve spill detection programs and to enhance containment capabilities (i.e., through additional deployment plans, equipment, and staff). Such additional efforts will be closely coordinated through the Sanctuary.

4. Encouraging Compatible Uses of the Sanctuary

An important element of resource protection for the Sanctuary is the encouragement of public uses of the site that are compatible with the overall objective of long-term resource and system protection. SRD will foster such compatible public uses by initiating the following actions:

- monitor commercial and recreational activities within the Sanctuary; and encourage other agencies to undertake similar actions and to improve overall detection of areas for particular management concern;
- exchange information on commercial and recreational activities occurring within the Sanctuary;
- consult with other agencies on proposals and policies for management of activities which may affect Sanctuary resources; and
- develop materials designed to enhance public awareness and appreciation of Sanctuary resources and show the need for their protection.

Anticipated monitoring and information exchange activities are discussed below under Research (Subsection C); and development of public materials is also discussed below under Interpretation (Subsection D).

5. Surveillance and Enforcement

Essential to the resource protection program is surveillance of Sanctuary waters and enforcement of Sanctuary and other applicable regulations. The U.S. Coast Guard has broad responsibility for enforcement of Federal laws in navigable waters under U.S. jurisdiction. In the Sanctuary proposal area, enforcement of laws pertaining to fishing harvests are cooperatively the responsibility of the U.S. Coast Guard, the National Marine Fisheries Service (NMFS), and the Commonwealth of Massachusetts (through its Division of Environmental Law Enforcement, within the Massachusetts Department of Fisheries, Wildlife

and Environmental Law Enforcement). Within the exclusive economic zone, responsibility for enforcement of fishing regulations is shared among these agencies.

Designation of the Sanctuary broadens the enforcement responsibilities of the U.S. Coast Guard with respect to Sanctuary regulations. Should analysis of human use patterns indicate the need for additional surveillance of the Sanctuary, then NOAA will provide for increased enforcement to strengthen resource protection. An evaluation of Sanctuary enforcement effectiveness will be conducted within two years and annually thereafter.

a. Public Education and Information

The Sanctuary interpretive program will inform users of the need to use Sanctuary resources wisely. Means for accomplishing this objective will include brochures and other written materials concerning Sanctuary regulations and their purpose. These materials will be available to all Sanctuary users.

b. Planning and Coordination

The results of Sanctuary research and surveillance-enforcement activities concerning visitor use patterns, frequently-occurring violations, and potentially sensitive resources will be incorporated into the agendas of periodic meetings between the Sanctuary Manager and enforcement agency personnel, to assist in determining the adequacy of Sanctuary surveillance.

C. Research

1. General Context for Management

Effective management of the Sanctuary requires a research program which addresses management issues. Understanding the relationships and interactions among system components, and how the system functions as an ecological unit are critical to developing effective solutions to management problems. Research supported by SRD will primarily be directed toward improving understanding of the Sanctuary system, and how Sanctuary resources may be affected by human activities. The general framework for

research program activities and the process for preparation of an annual Sanctuary Research Plan are discussed below.

2. Framework for Research Program

The Sanctuary Research Program will consist of three primary project categories:

- baseline studies to determine: features and processes of the environment; abundance, distribution, and interactions among the living resources; and patterns of human activities;
- monitoring studies to document changes in ecology, environmental quality, and human activities in the Sanctuary; and
- predictive studies to assess causes and effects of ecological and environmental changes. and to anticipate management issues.

Initial baseline studies will focus on gaining enhanced knowledge and better understanding of Sanctuary ecology. Cyclic biological productivity levels of the Stellwagen Bank system are subject to changes due to a variety of factors. For example, in recent years, variations in the availability of food sources have contributed to periodic changes in the distribution of cetacean feeding patterns, and may also have contributed to the relative success of commercial fishing efforts. A better understanding of productivity cycles will provide a basis for better understanding of relationships among the Sanctuary's living resources, and the effects of variations in those cycles.

In addition to data bases documenting plant, animal, and non-living components of the Sanctuary, successful management requires knowledge and understanding of long-term changes occurring within the Stellwagen Bank system. Continuing monitoring programs could provide the means to such understanding. Ecological changes and trends may be detected through monitoring data which provide indicators of the relative health of Sanctuary resources.

The monitoring program should include pollution monitoring studies, and studies on species

population dynamics as indicators of species' response to natural or human-caused threats to the Bank's resources.

Additional monitoring studies should include fluctuations in cetacean and seabird abundance and relative effects of sport fishing, commercial fishing, and whalewatch activities.

As needed, the Sanctuary research program will also conduct focused predictive studies, analyze the causes and consequences of system changes, and predict the effects on the system of new or increased levels of human activity. For instance, possible areas of predictive study might include: the effects of increased boating traffic on marine mammals.

3. Selection and Management of Research Projects

Sanctuary research projects funded by SRD will address the resolution of management issues and concerns. The Sanctuary Manager and SRD staff will follow research selection procedures established by SRD to ensure that the Sanctuary's research program is consistent with the policies and directions of the National Marine Sanctuary Program. Research selection procedures include: preparing an annual Sanctuary Research Plan (SRP); and monitoring progress on research conducted in the Sanctuary.

a. Annual Sanctuary Research Plan (SRP)

A Sanctuary Research Plan (SRP) will be prepared each year. Annual Research Plans for individual National Marine Sanctuaries are incorporated into a National Research Plan for the overall National Marine Sanctuary Program. The annual research planning process involves the following steps:

- (1) Sanctuary management concerns are identified, with supporting evidence or rationales.
- (2) Research priorities are established, based upon the identification of management concerns. Research priorities are established by the Sanctuary Manager, in consultation with SRD.

Important factors to be considered in establishing research priorities include:

- immediate or evolving management issues which can be resolved through directed research;
- prospects of related research in progress; and
- availability of funding and equipment for research support.

- (3) Following the identification of management concerns, a research announcement and request for detailed research proposals is prepared. The announcement and request for proposals discusses the identified management concerns, and summarizes past and current related research. Occasionally research workshops are conducted to facilitate the identification of research problems.
- (4) A draft SRP is prepared based on suggestions generated by the announcement, workshops or other means. A list of proposed research projects is presented in the draft SRP, with supporting discussion and rationales.
- (5) The draft SRP is forwarded to SRD and circulated for peer review.
- (6) A final SRP is prepared, documenting how proposed research projects meet the national selection criteria.

The final SRP is forwarded to SRD; and it is incorporated into the National Marine Sanctuary Program Research Plan. The highest ranking proposed research projects are selected from the National Plan, and procurement schedules are then prepared.

In instances where a research proposal entails activities prohibited by Sanctuary regulations, a research permit may be issued by NOAA upon separate application by the researchers. Alternatively, SRD may determine that all or part of the research should be not conducted inside the Sanctuary's boundary. Research activities involving

threatened, endangered, or otherwise protected species may require additional permits from other agencies.

b. Research Project Monitoring Program

As a routine activity, the Sanctuary Manager will monitor the performance of researchers conducting research activities in the Sanctuary. The Sanctuary Manager will also maintain records of all current research, equipment being used on site, frequency of researchers' visits on site, and current progress on each project. Interim progress reports and final reports by the researcher to SRD and the Sanctuary Manager are required to ensure adherence to schedules outlined in the terms of the contract. Final research reports may be reviewed by scientists recognized in the particular field of research, as well as by resource managers before final approval of the report by SRD. Particularly outstanding research reports may be published by SRD in the NOS/SRD Technical Report Series.

4. Information Exchange

SRD encourages Sanctuary research funded by other sources to complement research directly funded by NOAA. To assist in this research exchange effort, SRD will make Sanctuary research data bases derived from past and ongoing research projects available to other agencies and private institutions.

D. Interpretation/Education

1. General Context for Management

Public awareness, understanding, and appreciation for the special values of the Stellwagen Bank ecosystem are essential for its protection and continued vitality. The Sanctuary interpretive program will focus on improving public understanding by providing information on the Bank's functions and resources, and on the Sanctuary regulations designed to ensure resource protection. To accomplish this objective, interpretive information will be targeted to a variety of audiences, including in particular, the user public.

2. Interpretive Opportunities

Interpretive opportunities for the Sanctuary will be targeted toward three basic audiences: visitors to the Sanctuary; visitors to the Sanctuary headquarters; and interested individuals or organizations not visiting either location (off-site). Numerous interpretive opportunities exist for all types of audiences.

The accessibility of Stellwagen Bank to numerous recreational and commercial boaters, to commercial fishermen, and to scientific researchers, provides a variety of ways in which to reach the visiting public with information about the Sanctuary's resources and programs. Among anticipated methods of reaching this on-site user public are brochures and other informational materials distributed aboard whalewatch vessels; through recreational charterboat captains; and through research and educational institutions sponsoring vessel trips to the site.

Establishment of a Sanctuary headquarters in Plymouth, MA will provide a focal point for interested members of the public who may or may not intend to actually visit Stellwagen Bank. The visitor center will make available interpretive materials on the Stellwagen Bank system, its resources, recreational activities, and protective and safety regulations in effect.

Some of these materials will be presented in audio-visual formats; others in printed form. The sanctuary headquarters will also provide a location for the public to learn about other private or governmental activities occurring within or near the Sanctuary. Information will also be provided on how the Sanctuary program coordinates with other public and private institutions or agencies to ensure the continued protection and viability of the Stellwagen Bank ecosystem. National Marine Sanctuary Program information will also be available at the Sanctuary headquarters.

Finally, Sanctuary interpretive staff will conduct outreach activities to make Sanctuary information available to individuals, schools, and organizations throughout the New England area. These materials will be directed at those who are

not likely to actually visit the Sanctuary, but who are nonetheless interested in learning about the SBNMS and the National Marine Sanctuary Program.

3. Interpretive Programs

Interpretation for the Sanctuary will consist of three distinct programs:

- On-site visitor programs for fishing and whalewatching vessels, and other recreational boating visitors to the Sanctuary;
- Visitor center programs for individuals visiting the Sanctuary headquarters, or other nearby information centers; and
- Outreach programs for interested individuals and groups not visiting the Sanctuary or its headquarters.

a. On-Site Visitor Programs

On-site interpretation for the Sanctuary will consist primarily of printed materials on the Sanctuary and its regulations made available on commercial fishing and/or whalewatching vessels. The program will rely heavily on the cooperation of excursion boat operators. Many of the commercial whalewatch vessels incorporate the onboard services of a naturalist, to identify and discuss various species of cetaceans. Verbal information on the Sanctuary will be included in such discussions, in addition to brochures or other printed materials which excursion participants may carry home with them. Local organizations, such as Manomet Bird Observatory, Cetacean Research Unit, Center for Coastal Studies, or the New England Aquarium, may also be interested in co-sponsoring special excursions to the Bank.

b. Visitor Center/Headquarters Programs

Exhibits, audio-visual information, and printed materials will be available to the public at the Sanctuary visitor center/headquarters. Additional potential distribution points for Sanctuary brochures and other materials include NOAA's National Marine Fisheries Service facility (Gloucester), and the Cape Cod National Seashore Visitor Centers at

Race Point and South Wellfleet.

c. Outreach Programs

Off-site interpretive programs will involve coordinated and cooperative efforts with local and regional environmental study organizations, e.g., Center for Coastal Studies, Cetacean Research Unit, Manomet Bird Observatory, International Wildlife Coalition, New England Aquarium, and Massachusetts Audubon Society. Additionally, Sanctuary staff will make interpretive materials available to local and regional schools and universities. Materials may include slide presentations and travelling exhibits, curriculum materials and other teacher aids. Opportunities will be assessed for Sanctuary outreach locations in areas of heavy public visitation, such as highway welcome centers and public docks.

Section IV. Administration

A. Administrative Framework

This section of the management plan describes the roles of various agencies that will be involved in Sanctuary management; proposes strategies to coordinate their activities; and provides for periodic evaluation of the overall effectiveness of the management plan. As previously discussed, sanctuary management consists of three basic functions: resource protection, research, and education/interpretation. Administration oversees all other functions and establishes who is responsible for implementing specific programs. The administrative framework ensures that all management activities are coordinated.

The Sanctuaries and Reserves Division (SRD) is responsible for the overall management of the Stellwagen Bank National Marine Sanctuary (SBNMS). SRD will coordinate its on-site activities through cooperative agreements with the Commonwealth, regional, local and other Federal agencies. The general administrative roles of each agency are described below.

1. Sanctuaries and Reserves Division

The National Marine Sanctuary Program is administered by SRD. A site-specific management plan is prepared for each individual Sanctuary to ensure that on-site activities involving resource protection, research, and education/interpretation are coordinated and are consistent with Sanctuary goals and objectives.

SRD develops a general budget, setting out expenditures for program development, operating costs, and staffing. Funding priorities will be reviewed and adjusted annually to reflect evolving conditions in the SBNMS and National Marine Sanctuary Program priorities and requirements. SRD also establishes policies and procedures in response to specific issues in each Sanctuary. Detailed SRD responsibilities are listed under the resource protection, research, education/interpretation, and general administration sections which follow.

The Sanctuary Manager for the SBNMS reports directly to the Atlantic and Great Lakes Regional Manager at SRD. In this capacity, the Manager represents SRD and is the primary spokesperson for the SBNMS. The Sanctuary's headquarters will be located at a site which provides access both to the visiting public and to the Sanctuary. The town of Plymouth has been selected for the location of the SBNMS headquarters office; additional "satellite" information centers will be established following the designation of the Sanctuary.

2. National Marine Fisheries Service, Northeast Region

The National Marine Fisheries Service (NMFS), within NOAA, has a variety of missions which are directly involved with Sanctuary resources. In general, these include implementation of the various Fishery Management Plans; and implementation of the provisions of the Marine Mammal Protection Act and Endangered Species Act. (Further discussion of NMFS roles is presented in Part Three, Section I: Status Quo Alternative.) NMFS offices are located in Gloucester and in Woods Hole.

3. U.S. Coast Guard

The U.S. Coast Guard is responsible for enforcement of Federal laws in waters under U.S. jurisdiction, including those related to vessel traffic and search and rescue activities. (See further discussion in Part Three, Section I: Status Quo Alternative.) The First Coast Guard District office is located in Boston; Coast Guard stations are located at Boston Harbor, Gloucester, Scituate, Sandwich, Merrimack River, Provincetown, Cape Cod Air Station (at Otis Air Force Base), and Woods Hole.

4. Sanctuary Advisory Committee

The National Marine Sanctuary Program differs from many other special area management programs, in that Sanctuaries are managed to enhance research and education/interpretation, as well as to ensure the primary goal of overall resource protection. Several agencies,

organizations, and interest groups are already involved with resources and qualities within the area of the Sanctuary. A mechanism will be established to facilitate the participation of interested and appropriate individuals and groups in providing to the Sanctuary Manager recommendations on policy related to management of the Sanctuary. In accordance with the provisions of Title III of the Marine Protection, Research and Sanctuaries Act (MPRSA), as amended, a Sanctuary Advisory Committee (SAC) will be established to provide this means of participation. Section 315 of Title III (as amended at P.L. 102-587, §2112) provides that the Secretary of Commerce may appoint up to 15 individuals who are: employed by Federal or State agencies with expertise in management of natural resources; members of relevant Regional Fishery Management Councils established under section 302 of the Magnuson Fishery Conservation and Management Act; or representatives of local user groups, conservation and other public interest organizations, scientific organizations, educational organizations, or others interested in the protection and multiple use management of Sanctuary resources.

Groups, individuals and agencies will be consulted to ensure that all interests are taken into account, and that the SAC is representative of a broad-based constituency. For example, interests represented on the SAC should include commercial and recreational fishing, commercial whalewatching, commercial and recreational boating, environmental, research, and education groups, and regional ocean/coastal management initiatives. Final selection of SAC members is the responsibility of the Secretary of Commerce, as parent agency to NOAA.

A SAC with a broad representation will help ensure that the Sanctuary Manager has an expanded information base upon which to make management decisions. The experience and expertise of the SAC will be available to the Manager on an ad hoc basis, as well as at regularly scheduled meetings. In order for the SAC to function efficiently, it may be beneficial to divide the SAC into subcommittees that deal directly with resource protection, research, education/interpretation, and general administration issues. Responsibilities of the SAC are detailed in

the resource protection, research, education/interpretation, and general administration sections which follow.

5. Other Federal Agencies

The Environmental Protection Agency, Region I office (EPA) in Boston, has regulatory responsibilities related to sewage outfalls and ocean disposal activities. Certain ocean disposal activities are also permitted and monitored by the U.S. Corps of Engineers, New England Division, located in Waltham, MA. The Corps is also responsible for certain activities in navigable waters.

The Minerals Management Service (MMS), within the U. S. Department of the Interior, is responsible for activities conducted pursuant to the Outer Continental Shelf Lands Act (OSCLA). (Further discussion of other Federal agency responsibilities is provided at Part Three, Section I: Status Quo Alternative.)

6. State, Regional and Local Agencies

NOAA will work closely within the existing administrative framework of Commonwealth agencies, such as the Massachusetts Coastal Zone Management Office and the Division of Marine Fisheries, to ensure a coordinated approach to the ocean and ocean resource management responsibilities of all agencies.

It is NOAA's intention to work to ensure full cooperation and coordination with other State and State/Federal programs, such as the Massachusetts Bays Program. This cooperation may involve formalization of Cooperative Agreements and/or Memoranda of Understanding.

To facilitate the administrative procedures regarding certification and notification of leases, licenses, permits, approvals, rights or other authorizations (as described above in Part Two, Section III, Designation Document and Regulations), NOAA intends to work closely with the owners or holders of, or applicants for, leases, licenses, permits, approvals, rights or other authorizations as well as with the appropriate issuing agencies.

Given the proximity of the Sanctuary to the Commonwealth of Massachusetts, and the close ties between resources of the Commonwealth and those of the Stellwagen Bank area, it is presumed that all activities proposed for Stellwagen Bank which are subject to direct Sanctuary management can be demonstrated to potentially affect land and water uses and natural resources of the Massachusetts coastal zone. Such activities will, therefore, be subject to the jurisdiction of the Massachusetts Coastal Zone Management Program (MCZM). Such activities -- whether they are direct Federal activities, require Federal permits, or are supported with Federal funds -- are subject to review by MCZM to determine whether they are consistent with applicable enforceable MCZM Program policies. The determination of consistency with the Commonwealth's enforceable policies, known as Federal Consistency Review, is conducted by the MCZM Program Office pursuant to § 307 of the Coastal Zone Management Act and its implementing regulations.

NOAA intends to seek the active participation of the MCZM Program Office in Sanctuary management issues; to draw upon the Commonwealth's experience and expertise in coastal ocean resource management; and to provide direct links with relevant Commonwealth environmental management and regulatory agencies. When it is feasible, reviews of proposed activities which are subject to both Sanctuary and MCZM jurisdiction will be conducted concurrently.

As a networking coastal program, MCZM implements its program policies through the regulatory authorities of several different Commonwealth agencies. NOAA believes, therefore, that close coordination with the MCZM Program will provide an effective means of developing appropriate and direct linkages between the Stellwagen Bank National Marine Sanctuary and the Commonwealth of Massachusetts.

B. Resource Protection: Roles and Responsibilities

1. Sanctuaries and Reserves Division

- a. Approves priorities for funding for resource protection;
- b. Monitors the effectiveness of interagency agreements for surveillance and enforcement and negotiates changes where required;
- c. Develops contingency and emergency-response plans and based on these plans, negotiates applicable interagency agreements;
- d. Monitors the effectiveness of existing Sanctuary regulations and promulgates changes where necessary;
- e. Coordinates efforts to protect and manage Sanctuary resources with other Federal, State, regional and local agencies, and with public and private organizations; and
- f. Ensures involvement of commercial and recreational fishery interests in Sanctuary resource protection issues, through participation in the Sanctuary Advisory Committee and by other appropriate means.

2. Sanctuary Manager

- a. Recommends to the SRD priorities for allocation of funds annually to resource protection, considering the advice of the SAC to ensure consistency with Sanctuary regulations and provide adequate resource protection;
- b. Assists in the coordination of surveillance and enforcement activities by providing liaison with the Federal, State, regional and local agencies;
- c. Coordinates regularly with commercial and recreational fishery representatives, primarily through the Sanctuary Advisory Committee, on resource protection issues affecting fisheries;

- d. Reports regularly to the SRD on surveillance and enforcement activities, and emergencies;
 - e. Provides information for use in training Sanctuary enforcement officials;
 - f. Monitors and evaluates the adequacy of emergency-response plans and procedures in the Sanctuary;
 - g. Maintains a record of emergency events (e.g., oil spills) in and around the Sanctuary; and
 - h. Evaluates overall progress toward the resource protection objectives of the Sanctuary program and prepares semi-annual and bi-monthly progress reports highlighting activities for the SRD.
3. Sanctuary Advisory Committee
- a. Advises the Sanctuary Manager on the effectiveness of interagency agreements for surveillance and enforcement;
 - b. Advises the Sanctuary Manager on the effectiveness of the Sanctuary regulations in providing adequate resource protection; and
 - c. Recommends improved methods of resource protection.
4. Federal Agencies
- a. NMFS works closely with Massachusetts Division of Marine Fisheries, under the Magnuson Fishery Conservation and Management Act (MFCMA), on approving and enforcing Fishery Management Plans (FMPs) prepared by regional fishery management councils to ensure protection of fishery resources;
 - b. NMFS implements the Marine Mammal Protection Act and provisions of the Endangered Species Act. Shares responsibility with the USFWS for provisions of the Endangered Species Act to prevent taking of any endangered species;
 - c. USCG holds broad responsibility for enforcing all Federal laws throughout the Sanctuary, including coordination with NMFS on enforcement of Fishery Management Plans.
 - d. USCG and NMFS ensure enforcement of Sanctuary regulations;
 - e. USCG provides on-scene coordination and Regional Response Center facilities under the National Contingency Plan for the removal of oil and hazardous substances in the event of a spill that threatens the Sanctuary;
 - f. EPA implements regulatory responsibilities regarding sewage outfalls (Clean Water Act, via the National Pollutant Discharge Elimination System (NPDES) permits); and ocean dumping (Title I of the Marine Protection, Research and Sanctuaries Act) to protect water quality;
 - g. The Corps of Engineers grants, based on EPA guidelines, permits for disposal of dredged materials at EPA-designated disposal site, and monitoring effects of disposal activities. Grants permits (under Rivers and Harbors Act) for marine construction, excavation or fill activities in any navigable waters of the U.S. (33 U.S.C. § 403). The COE may refuse to issue permits on the basis of threats to navigation or potential adverse effects on the environment;
 - h. MMS leases and permits (under Outer Continental Shelf Lands Act Amendments) marine mining activities for resources other than hydrocarbon resources, subject to safety and environmental regulations.

C. Research: Roles and Responsibilities

1. Sanctuaries and Reserves Division

- a. Prepares annual Sanctuary Research Plans (SRP's) for each Sanctuary;
- b. Prepares annual National Research Plan (NRP) and budget, based on the SRP's of individual Sanctuaries and in accordance with priorities determined at the National level;
- c. Sets dates for procurement based on the NRP;
- d. Administers interagency agreements and contracts for research;
- e. Reviews all interim and final research reports submitted by the Sanctuary Manager; and
- f. Issues permits, through the Office of Ocean and Coastal Resource Management, for research activities, considering the recommendations of the Sanctuary Manager, to ensure consistency with Sanctuary regulations and provide additional technical review where necessary.

2. Sanctuary Manager

- a. Recommends generic areas of research to resolve management issues;
- b. Develops the Sanctuary Research Plan (SRP);
- c. Reviews research documents and progress reports submitted by contractors;
- d. Prepares assessments of research needs and priorities based on management requirements and research continuity;
- e. Implements the Sanctuary Research Plan (SRP);

- f. Coordinates research and monitoring activities in the Sanctuary in cooperation with the SRD, Sanctuary Advisory Committee, and other interested agencies or parties;

- g. Coordinates an on-site process for reviewing and evaluating research proposals and permits requests, considering the views of the SRD, Sanctuary Advisory Committee, concerned individuals and interest groups;

- h. Submits recommendations to SRD on the issuance of Sanctuary research permits, considering the recommendations of the SAC; and

- i. Oversees permitted research activities.

3. Sanctuary Advisory Committee

- a. Advises the Sanctuary Manager on review of research proposals, interim, and final reports;

- b. Advises the Research Coordinator and the Sanctuary Manager on priority research needs; and

- c. Advises the Sanctuary Manager on the issuance of research permits.

D. Education/Interpretation: Roles and Responsibilities

1. Sanctuaries and Reserves Division

- a. Reviews and approves the list of annual priorities for education and the annual education budget prepared by the Sanctuary Manager;

- b. Reviews and approves design proposals for all educational facilities;

- c. Reviews all educational/ interpretive materials prepared for the Sanctuary;

- d. Evaluates progress toward accomplishing objectives for education/interpretation, and adjusts long-term priorities accordingly; and
- e. Issues Sanctuary education permits, through OCRM, considering the recommendations of the Sanctuary Manager, to ensure compliance with Sanctuary regulations and provide additional technical review where necessary.

2. Sanctuary Manager

- a. Recommends annually to SRD a list of priorities and an annual budget for education;
- b. Prepares and circulates as required Requests for Proposals (RFPs) for educational/ interpretive projects;
- c. Supervises the design and production of educational/ interpretive materials and facilities for the Sanctuary;
- d. Makes available training for educational staff assigned to the Sanctuary;
- e. Encourages local and regional organizations to participate in Sanctuary education;
- f. Disseminates information about the National Marine Sanctuary program and the Sanctuary;
- g. Oversees the development of any facilities constructed for the Sanctuary, reviews site analyses and design specifications, makes recommendations as to construction and maintenance contracts, and performs similar tasks;
- h. Submits recommendations to SRD on the issuance of Sanctuary education permits, considering the recommendations of the SAC; and
- i. Oversees permitted educational/

interpretive activities.

3. Sanctuary Advisory Committee

- a. Advises the Sanctuary Manager in raising public awareness of the Sanctuary and advises on the development of a local constituency by means of brochures, presentations, structured events, articles for publication, and other activities consistent with the management plan; and
- b. Advises the Sanctuary Manager on the issuance of education permits.

E. Site Administration: Roles and Responsibilities

1. Sanctuaries and Reserves Division

- a. Ensures that the Sanctuary is operated in a manner consistent with established National Program policies and with applicable National and international laws, and provides guidance to the Sanctuary Manager;
- b. Identifies, analyzes, and resolves major Sanctuary management problems and issues;
- c. Formulates comprehensive, long-term management plans for the Sanctuary and revises the Management Plan as necessary;
- d. Directs and assists the Sanctuary Manager in the implementation of the Management Plan;
- e. Coordinates Sanctuary management with other Federal and State agencies and private organizations;
- f. Evaluates the effectiveness of Sanctuary management and regulatory measures;
- g. Prepares a program budget for the Sanctuary;
- h. Provides funding for overall Sanctuary management and administration;

- i. Makes recommendations to the Director of the Office of Ocean and Coastal Resource Management as to the issuance of National Marine Sanctuary permits containing terms and conditions deemed appropriate (including research and education permits; see above), considering the recommendations of the Sanctuary Manager, to conduct an activity otherwise prohibited by the Sanctuary regulations, if the activity will: further the educational, natural or historical resource value of the Sanctuary; further salvage or recovery operations in or near the Sanctuary in connection with a recent air or marine casualty; assist in managing the Sanctuary; or have only negligible, short-term adverse effects on Sanctuary resources or Sanctuary qualities.
 - j. Issues certifications, through OCRM, with terms and conditions deemed necessary to protect Sanctuary resources and qualities, of leases, licenses, permits, approvals, or other authorizations, considering the recommendations of the Sanctuary Manager, to conduct a prohibited activity; and
 - k. Issues terms and conditions, through OCRM, deemed necessary to protect the Sanctuary resources and qualities on applications for leases, licenses, permits, approvals, or other authorizations, considering the recommendations of the Sanctuary Manager, to conduct a prohibited activity.
2. Sanctuary Manager
- a. Coordinates on-site efforts of all parties involved in Sanctuary activities, including State, Federal, local and regional agencies, and the public;
 - b. Reviews the management plan periodically and recommends changes to SRD as needed;
 - c. Assists the SRD in preparing the annual budget for the Sanctuary;
 - d. Oversees day-to-day operation of the Sanctuary, including administrative functions such as bookkeeping, purchasing, and keeping records of visitor activities;
 - e. Supervises Sanctuary staff and other personnel, including enforcement and interpretive employees assigned to the Sanctuary;
 - f. Represents the Sanctuary viewpoint on local issues and at public forums; and
 - g. Submits recommendations to SRD on criteria and terms and conditions for National Marine Sanctuary permits, certifications and applications for leases, licenses, permits, approvals, or other authorizations, or rights to conduct a prohibited activity.
3. Federal, State, Local and Regional Agencies
- a. Assists in the preparation and implementation of a comprehensive, long-term management plan for the Sanctuary;
 - b. Assists in the periodic review of the management plan; and
 - c. Appropriate issuing agency assists in the development of criteria and terms and conditions for certifications and applications for leases, licenses, permits, approvals, other authorizations, or rights to conduct a prohibited activity.
4. Sanctuary Advisory Committee
- a. Advises on the specific plans for Sanctuary development;
 - b. Advises on proposals for activities within the Sanctuary;
 - c. Advises on rules and conditions for all forms of public recreation;

- d. Advises on an overall plan for the use, development and maintenance of Sanctuary lands and facilities; and
- e. Advises the Sanctuary Manager on recommendations to SRD on criteria and terms and conditions for National Marine Sanctuary permits, certifications and applications of leases, licenses, permits, approvals, other authorizations, or rights to conduct a prohibited activity.

F. Sanctuary Staffing

Depending on the budget and personnel assigned to the Stellwagen Bank National Marine Sanctuary, staffing will include a NOAA Sanctuary Manager, an administrative assistant, a research coordinator, an education coordinator, and one or more enforcement/ interpreter positions. The Sanctuary staff will work closely with the USCG, the NMFS, the Commonwealth of Massachusetts and other Federal agencies in providing enforcement and surveillance in the area of the Sanctuary. The need for additional staffing will be determined during the first two years of Sanctuary operation.

G. Sanctuary Facilities

A Sanctuary headquarters, housing administrative offices and visitor center facilities, will be established at a suitable location convenient to the Sanctuary site. The town of Plymouth has been selected by NOAA as the location for the SBNMS headquarters office. Public Law 102-587, at §2202 (d), also directs the Secretary of Commerce to consider establishment of a satellite Sanctuary office in Provincetown, Gloucester, or Hull, MA.

PART THREE: ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

To evaluate the proposal for designating Stellwagen Bank as a National Marine Sanctuary, the National Oceanic and Atmospheric Administration (NOAA) has analyzed institutional, boundary, management, and regulatory options for achieving optimum protection for the overall Stellwagen Bank system; for increasing scientific knowledge of the area; and for promoting public understanding of the value and sensitivity of Stellwagen Bank resources. Part Three discusses the alternatives considered during this evaluation process. Part Four, following, describes the environmental consequences of the alternatives discussed in this Part.

Note to Reviewers: On October 7, 1992, Congress passed legislation reauthorizing and amending Title III of the MPRSA, and this legislation was signed into law on November 4, 1992 (P.L. 102-587). As amended, Title III designates the Stellwagen Bank National Marine Sanctuary (P.L. 102-587, §2202). Thus, the Status Quo (or No Action) alternative, as described in Section I, below, is precluded as an institutional alternative. P.L. 102-587 additionally mandates specific actions by the Secretary of Commerce affecting the Sanctuary boundary and human activities in the Sanctuary. These mandates are discussed in the sections following related to boundary alternatives and regulatory alternatives.

The institutional alternative of Sanctuary designation is general is discussed as a complementary measure to existing authorities and programs. Within this context, various individual management and regulatory alternatives are presented below.

Section I: Status Quo Alternative (No Action)

The status quo alternative proposes no action, and relies on existing State and Federal authorities and programs operating in the Stellwagen Bank area for long-term protection and management of the Stellwagen Bank system. The nature and extent of these existing authorities is summarized in Appendix B.

Several Federal and State government agencies

and programs are charged with responsibility for regulation and management of both individual resources and/or human activities in the Stellwagen Bank area. With regard to certain resources or activities, these responsibilities are shared via inter-agency agreements and programs. While these arrangements -- most often aimed at single resource management or at environmentally-safe conduct of human activities -- are generally satisfactory, there remain significant gaps in the protection of the overall Stellwagen Bank system. No existing authority or program has either the mandate or the ability to provide for long-term protection and management of this system, which attracts an increasing number and variety of human users to its resources. The gaps have become more apparent as real or potential results of human activities are identified. Faced with the realistic prospect of increased human uses in the Stellwagen Bank area, existing authorities are likely to lose their ability to function effectively or fully. Deficiencies in personnel, equipment, and enforcement funding have already been identified as serious problems in ensuring resource protection under existing mandates in the Bank area.

Additionally, in spite of good intentions, individual agency or program missions are often defined narrowly, without consideration of the larger ecosystem within which they operate. As the level of uses increases in this area, the potential also increases for confusing and overlapping jurisdictional authorities. At present, there is no single institutional entity with the ability to facilitate conflict resolution; and to provide a focal point to the public for understanding both the resources and the management of the Stellwagen Bank system. Given the variety and level of resources and uses, the presence of such an entity is critical to overall system protection. Appendix B identifies existing Federal and State management authorities related to resources and activities in the Stellwagen Bank area. Appendix C identifies the abbreviations used in this document.

Federal agencies with existing primary responsibilities in the area of Stellwagen Bank are: NOAA § National Marine Fisheries Service (NMFS), of the U.S. Department of Commerce; the Fish and Wildlife Service (FWS), of the U.S.

Department of the Interior; the U.S. Environmental Protection Agency (EPA); the U.S. Army Corps of Engineers (COE), of the U.S. Department of the Defense; the Minerals Management Service (MMS), of the U.S. Department of the Interior; and the Coast Guard (USCG), of the U.S. Department of Transportation.

Commonwealth of Massachusetts agencies with programs operating in the area of Stellwagen Bank include: the Coastal Zone Management Office; the Division of Marine Fisheries; and the Board of Underwater Archaeological Resources.

This section briefly reviews the responsibilities of these agencies in the Stellwagen Bank area. Appendix B provides additional information.

A. Federal Agencies

The National Marine Fisheries Service (NMFS) is responsible for the implementation and enforcement of Fishery Management Plans (FMP) developed by the New England Regional Fishery Management Council, pursuant to the Magnuson Fishery Conservation and Management Act. The Commonwealth's Division of Marine Fisheries also enforces FMP within three miles of the Commonwealth's coastal baseline jurisdiction.

NMFS is also responsible for implementation of the Marine Mammal Protection Act and the Endangered Species Act (ESA), as it is applicable to certain threatened or endangered marine species. Responsibilities under the ESA are shared with the U.S. Fish and Wildlife Service (FWS), of the U.S. Department of the Interior. In the Stellwagen Bank area, NMFS is responsible for the protection of cetaceans, pinnipeds, shortnose sturgeon, and sea turtles. The FWS is responsible for the protection of endangered or threatened bird species.

The Environmental Protection Agency (EPA) has regulatory responsibilities for ocean disposal activities, under the provisions of Title I of the Marine Protection, Research and Sanctuaries Act of 1972 (also referred to as the Ocean Dumping Act). Title I of MPRSA prohibits the transportation of any materials from the United States for the purpose of disposing them into the territorial sea,

the contiguous zone, or the ocean beyond, without a permit. EPA is responsible for the designation of ocean disposal sites, issuance of certain permits and oversight of COE permits for dumping dredged materials.

EPA is additionally mandated with implementation of the provisions of the Clean Water Act (CWA), notably the National Pollutant Discharge Elimination System (NPDES), which regulates, through permits, the discharge of pollutants from point sources into navigable waters of the United States, contiguous zone waters, and ocean waters beyond.

Finally, EPA is responsible for development of the National Estuary Program (NEP), pursuant to §320 of the Clean Water Act. The NEP recognizes and designates estuaries of national significance, and provides Federal monies for directed research activities, in cooperation with States. Massachusetts Bay was approved by EPA for inclusion in the NEP in 1990.

The Corps of Engineers (COE) issues permits, based on EPA guidelines, for the disposal of dredged materials at EPA approved and designated ocean disposal sites. The COE is also charged under Title I with the responsibility for ocean disposal site management, including the conduct of monitoring studies on the environmental effects of ocean disposal activities.

Under Section 10 of the Rivers and Harbors Act of 1899, the COE is charged with issuing permits for any marine construction, excavation, or fill activities in navigable waters of the United States. Interference with navigation and adverse effects on living marine resources are among the factors for which the Corps may deny issuance of Section 10 permits.

The Minerals Management Service (MMS) (of the U.S. Department of the Interior), under the Outer Continental Shelf Lands Act (OCSLA), has overall authority for the management of activities connected with exploration and development of offshore oil and gas resources. This authority includes enforcement of regulations implementing the OCSLA, and stipulations applied to individual

OCS leases. The MMS is also responsible for management of exploration and development activities connected with the extraction of submerged industrial materials, such as sand and gravel deposits. The conduct of those activities is also subject to the provisions of the OCSLA.

Coast Guard units operating in this region are responsible for regulation of vessel traffic, maintenance of boater safety, and coordination of search and rescue operations. Additionally, the Coast Guard is responsible for enforcement of fishing regulations; enforcement of regulations under the Clean Water Act and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which addresses the prevention of pollution caused by vessel discharge of oil, hazardous substances, or other pollutants. The First Coast Guard District Office is located in Boston, and Coast Guard stations are situated at Boston Harbor, Gloucester, Scituate, Sandwich, Merrimack River, Provincetown, Cape Cod Air Station (at Otis Air Force Base), and Woods Hole.

B. State Agencies

The Massachusetts Coastal Zone Management Act, (Ch. 21A; Reg. 310 CMR 20.00 et seq.), passed in 1978, established the Coastal Zone Management Office, housed within the Massachusetts Executive Office of Environmental Affairs (EOEA). The Massachusetts Coastal Zone Management Office exercises widespread authorities over activities conducted within the State's three-mile jurisdiction, as well as over activities occurring outside this jurisdiction that have an effect in the State's coastal zone.

The Commonwealth of Massachusetts asserts jurisdiction in State waters in Cape Cod Bay and Massachusetts Bay, within the southwestern Gulf of Maine. As part of an overall effort to provide a system-approach to ocean management, the Commonwealth has established a system of Ocean Sanctuaries in these waters (M.G.L.C. 132 A §§13-16 and 18). The boundaries of some of these State-designated Ocean Sanctuaries occur adjacent to waters presently being considered for National Marine Sanctuary designation. Additionally, the Massachusetts Coastal Zone Management Office

houses the Massachusetts Bays Program, which seeks to identify and conduct needed research and educational activities in designated bay areas to improve their environmental quality. As noted earlier, EPA has recently approved the inclusion of Massachusetts Bay into the National Estuary Program, thereby increasing the prospects of effective protection efforts through direct Federal support and coordination activities.

The Division of Marine Fisheries (DMF), within the EOEA, is responsible for the management of commercial and recreational fishing activities within State waters, in cooperation with the National Marine Fisheries Service (NMFS). The DMF also participates in the management of fisheries in Federal waters, and has authority to enforce fishery regulations as promulgated under Fishery Management Plans developed by the New England Fishery Management Council, and as approved by NMFS. The DMF sits on the New England Fishery Management Council.

The Board of Underwater Archaeological Resources is also housed within the EOEA, and is responsible for the preservation and management of underwater historical, cultural and archeological resources within Commonwealth waters.

The activities and regulatory controls under existing authorities and programs will continue as presently administered. In addition, a comprehensive, long-term management scheme for the Stellwagen Bank environment will be developed and implemented.

Section II: Designation of a National Marine Sanctuary (Preferred Alternative)

Note to Reviewers: As previously discussed, P.L. 102-587 (§2202) designates the Stellwagen Bank National Marine Sanctuary. Therefore, NOAA's preferred alternative to designate the Sanctuary has been Congressionally mandated and signed into law. Discussions following related to specific boundary and regulatory alternatives are consistent with this Congressional action, and have been edited accordingly.

NOAA's preferred alternative is

implementation of the Stellwagen Bank National Marine Sanctuary, in accordance with the provisions of Title III of the Marine Protection, Research and Sanctuaries Act of 1972, as amended, 16 U.S.C. 1431 *et seq.* This alternative is discussed in the Management Plan, presented in Part Two, Section III of this document. The preferred alternative will provide for improved protection of both Sanctuary resources and important habitat; offer opportunities for independent research and coordination with other research efforts; and provide an interpretive/educational program to enhance public awareness and appreciation for the Stellwagen Bank system through implementation of the management plan and the Sanctuary regulations (Appendix A). This comprehensive approach to system protection and management is not available through any existing institutional mechanism.

The preferred alternative would cost approximately \$600,000 for the first full year of operation, or approximately \$3,000,000 over five years. Estimated annual allocations of these funds would be for: personnel and administration, \$113,000; facilities and equipment, \$70,000; resource protection, \$250,000 (including one-time expense of \$100,00 for Sanctuary vessel); research and education, \$90,000; and manager's fund, \$50,000. The preferred boundary has been selected because it closely correlates with the typical areal distribution of living resources and encompasses important habitats for those resources, as well as human uses of these resources. The management alternatives were selected because of their conformance with goals of the National Marine Sanctuary Program, and because they are more cost-effective than alternative management structures. Sanctuary regulations were selected because they would provide comprehensive and long-term protection to the Stellwagen Bank system currently unavailable through other management or regulatory measures.

A. Boundary Alternatives

Five boundary alternatives were selected for review from the ideas offered during the evaluation process, and are discussed here. In response to comments on the DEIS/MP document, which presented three boundary alternatives, a fourth and

fifth boundary option were developed for discussion in this document. These boundary options were considered from the perspectives of: 1) distribution of living resources and occurrence of important habitat areas; 2) geological and physical oceanographic parameters; and 3) management logistics.

Note to Reviewers: As previously noted, P.L. 102-587 (§2202) designates the Stellwagen Bank National Marine Sanctuary. The legislation also mandates a Sanctuary boundary conforming with boundary alternative #5, as described below. Therefore, the adoption by NOAA of any boundary other than that identified as boundary alternative #5 is precluded.

Boundary alternatives depicted in Figures 18 through 22 are identified by both latitude/longitude coordinates, and by LORAN-C lines. The addition of LORAN-C lines provides an alternative method of locating boundary alternatives, particularly by commercial and recreational fishermen and other vessels operators who currently employ LORAN-C to locate their position.

1. Boundary Alternative #1

This boundary alternative (Figure 18) is the smallest area to be considered for Sanctuary designation, encompassing approximately 259 square nautical miles (342 square miles) of Federal waters. Its boundaries form an approximately rectangular area close around the Bank feature itself. Boundary coordinates would be marked at: 42°26'57.88"N x 70°32'03.01"W (northwest point); 42°30'00.25"N x 70°19'58.78"W (northeast point); 42°08'14.84"N x 70°06'11.35"W (southeast point); and 42°08'12.51"N x 70°27'03.48"W (southwest point).

The boundary is based on the importance of the physical structure of the Stellwagen Bank

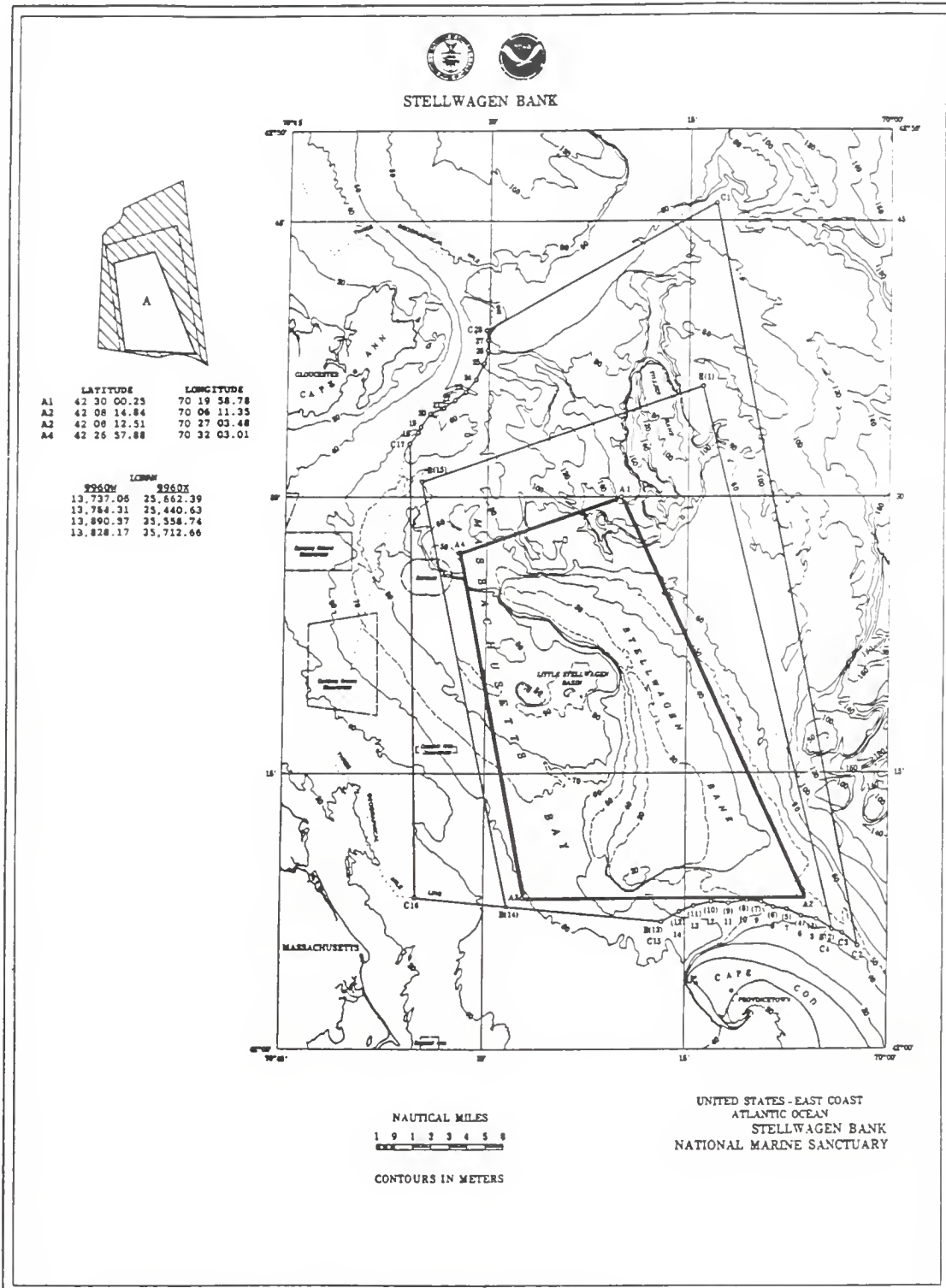


FIGURE 18: SANCTUARY BOUNDARY ALTERNATIVE #1

feature, as both habitat and as causal agent in the predictable occurrence of internal waves and upwelling phenomena, which contribute to the biological productivity of the overall larger system surrounding the Bank. Identified cetacean, pinniped, and seabird species occur within this alternative's boundaries, as do most of the fish species. These boundaries may not, however, incorporate all habitat areas important to shellfish and other invertebrate species of the overall Stellwagen Bank system. The boundaries also do not include all of those areas known to be primary cetacean feeding areas, and therefore do not encompass those marine areas most heavily used by commercial and recreational whalewatch vessels. The limitations of this boundary alternative would not permit the development of research or interpretive programs based on investigations into system-wide relationships.

Additionally, this boundary alternative does not coincide with any areas identified by the Commonwealth of Massachusetts as Ocean Sanctuaries, thereby precluding the opportunity for a direct connection between the Sanctuary and the Commonwealth's Ocean Sanctuaries Program. However, this boundary alternative would provide the opportunity for coordination with research efforts of the Massachusetts Bays/NEP.

Designation of boundary alternative #1 would also provide the opportunity for protection of the Bank feature under Title III from permanent alteration resulting from activities such as sand and gravel mining, and from other potentially adverse environmental impacts.

2. Boundary Alternative #2

This boundary alternative (Figure 19) encompasses approximately 453 square nautical miles (521 square miles) of Federal waters surrounding Stellwagen Bank. Like boundary alternative #1, the boundary forms an approximately rectangular area around the entirety of the Bank feature, except for the southern border, which coincides with the seaward limit of State jurisdictional waters, and follows the arc formed by that limit as it occurs along the northern end of Cape Cod. The boundary occurs in an approximate

southeast-to-northwest orientation, the northeast and northwest corners of which are marked by the following coordinates, respectively: 42°36 00.10'N x 70°13 56.46'W, and 42°30 49.14'N x 70°34 55.72'W. The Sanctuary's eastern and western borders extend in a south-southeast direction from these points to coincide with the northern limits of State jurisdiction waters off the northernmost land mass of Cape Cod. The Sanctuary's southern border follows an approximately west-to-east line, until the boundary reaches an offshore point three miles from the mean high tide line at Race Point, the northernmost point of land on Cape Cod. At that point, the Sanctuary's southern border curves in a line tangential to the three-mile jurisdictional boundary of Massachusetts around the northern Cape Cod land mass. The southeast and southwest corners are marked by the following coordinates, respectively: 42°06 29.53'N x 70°04 03.36'W; and 42°07 44.89'N x 70°28 15.44'W. (Figure 19). The area of boundary alternative #2 is roughly equidistant from the land points of Cape Cod, to the south, and Cape Ann, to the north.

Boundary alternative #2 encompasses identified important marine habitats resulting from the cyclic upwelling and mixing phenomena found at Stellwagen Bank. Several species of endangered and other cetaceans, pinnipeds, sea turtles, and numerous species of commercially-important fish and invertebrates depend on habitats over and surrounding the Bank feature. This boundary encompasses the entirety of the most frequently-utilized feeding and nursery habitats for the largest high-latitude population of humpback whales occurring in the contiguous United States. Also included in this boundary option are spawning areas for the primary prey of the humpback whales, the American sand lance. Additional endangered whale species utilizing the habitats enclosed by boundary alternative #2 are fin and northern right whales; other non-listed marine mammal species found within area include minke, orca, and pilot whales, as well as white-sided dolphins and harbor seals.

Boundary alternative #2 reflects closely the size and configuration of the site originally proposed to NOAA in 1982, during development of its Site

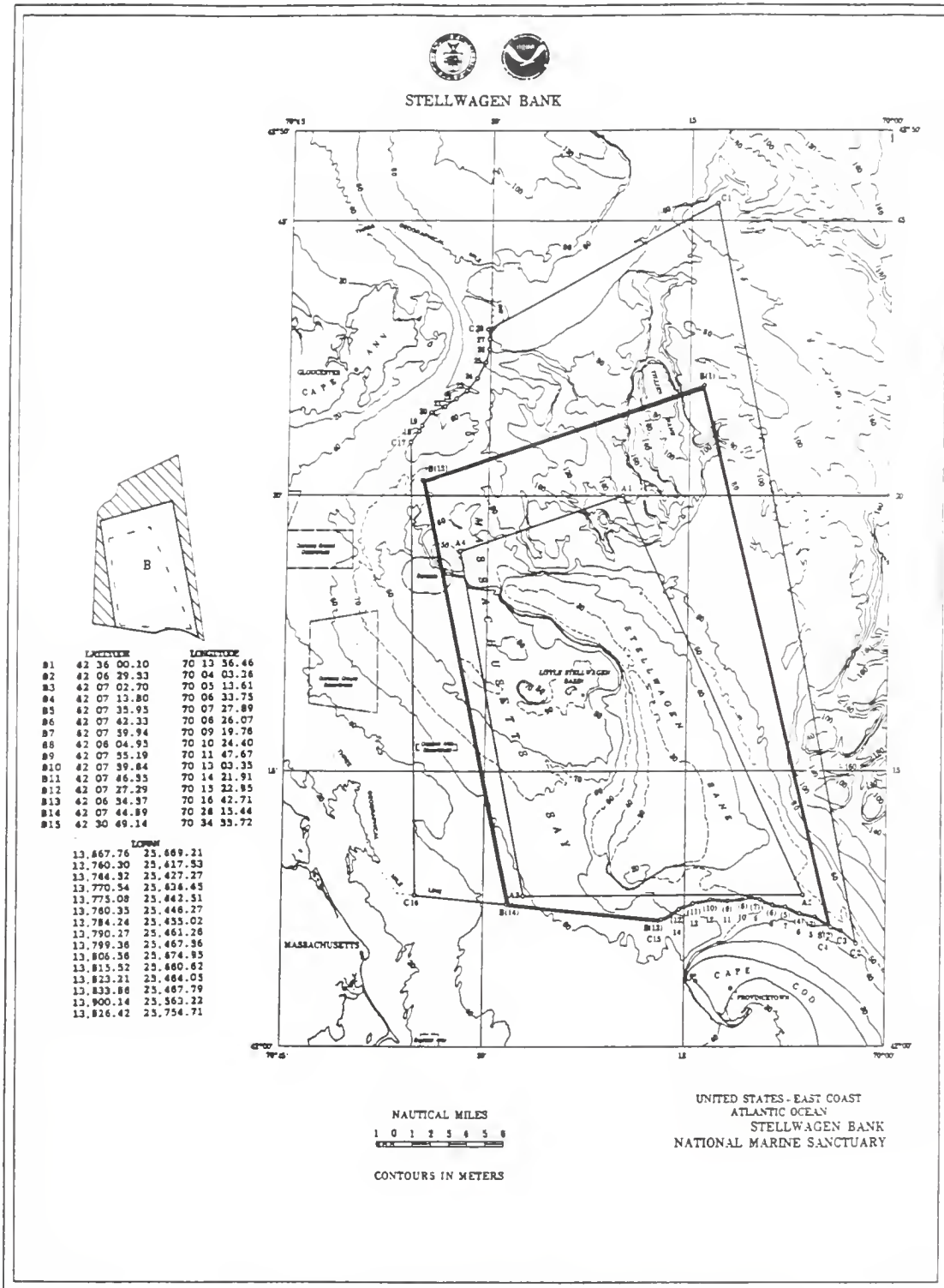


FIGURE 19: SANCTUARY BOUNDARY ALTERNATIVE #2

Evaluation List (SEL) of candidate sites qualified for possible future consideration as national marine sanctuaries. Placement of the Stellwagen Bank site onto the final SEL indicates that the proposed area has been determined by NOAA to meet four site identification criteria established to assess the value of any site proposed as a national marine sanctuary. Those criteria are categorized as: 1) natural resource values; 2) human-use values; 3) potential activity impacts; and 4) management concerns. Management concerns may include such concerns as relationship to other programs; management of a conservation unit; accessibility; surveillance and enforcement; and economic considerations.

As a result of its high natural resource values, this alternative includes most of the "focused" areas for commercial and recreational whalewatching activities. Much of the historical and current fishing activities are also focused on the areas encompassed by this boundary. The boundary therefore also encompasses a majority of those areas of highest interest to the research community, and of highest use by other commercial interests and the general public.

The southern border of boundary alternative #2 coincides with the seaward limit of Commonwealth of Massachusetts jurisdictional waters adjacent to the Commonwealth-designated Cape Cod Bay Ocean Sanctuary, and is also tangential to waters designated by the Commonwealth as the Cape Cod Ocean Sanctuary. The connection between boundary alternative #2 and these areas establishes the potential for NOAA/Commonwealth cooperative ocean management efforts, through the Massachusetts Ocean Sanctuary Program and the Massachusetts Bays Program/NEP.

Boundary alternative #2 does not encompass any of the Massachusetts Bay Disposal Site (MBDS), as currently proposed for permanent designation by EPA.

3. Boundary Alternative #3

Boundary alternative #3 (Figure 20) would establish a Sanctuary area of approximately 702 square nautical miles (927 square miles). The

western, northwestern, northern, and eastern borders of this boundary alternative are expanded from boundary alternative #2, so as to encompass all of the Stellwagen Bank feature, Tillies Bank, and southern portions of Jeffreys Ledge, located north of Stellwagen Bank. With the exception of that portion which extends further westward into Stellwagen Basin, the southern border is the same as boundary alternative #2. As with boundary alternative #2, the southern border of boundary alternative #3 coincides with the seaward limit of Commonwealth of Massachusetts jurisdictional waters adjacent to the Commonwealth-designated Cape Cod Bay Ocean Sanctuary, and is also tangential to waters designated by the Commonwealth as the Cape Cod Ocean Sanctuary. The northwestern border extension additionally expands the Sanctuary to coincide with coastal ocean waters designated by the Commonwealth of Massachusetts as the North Shore Ocean Sanctuary.

Boundary alternative #3 is marked by the following coordinates, which indicate the northeast, southeast, southwest, west-northwest, and north-northwest points: 42°45'59.83"N x 70°13'01.77"W (NE); 42°05'35.51"N x 70°02'08.14"W (SE); 42°08'13.90"N x 70°35'03.80"W (SW); 42°32'53.52"N x 70°35'52.38"W (WNW); and 42°39'04.08"N x 70°30'11.29"W (NNW). (Additional coordinates are noted at Figure 20.)

In addition to encompassing all of the "focused" areas for commercial and recreational whalewatching and fishing activities, this boundary alternative also includes additional habitat areas important to invertebrate, fish and cetacean species. Adoption of boundary alternative #3 would also strengthen the potential for increased cooperative ocean management planning between the National Marine Sanctuary Program and the Commonwealth through the Massachusetts Ocean Sanctuary Program and the Massachusetts Bays Program/NEP.

Boundary alternative #3 encompasses all of the "Interim" Massachusetts Bay Disposal Site (MBDS), which is used for the disposal of dredged materials. The EPA is currently proposing to

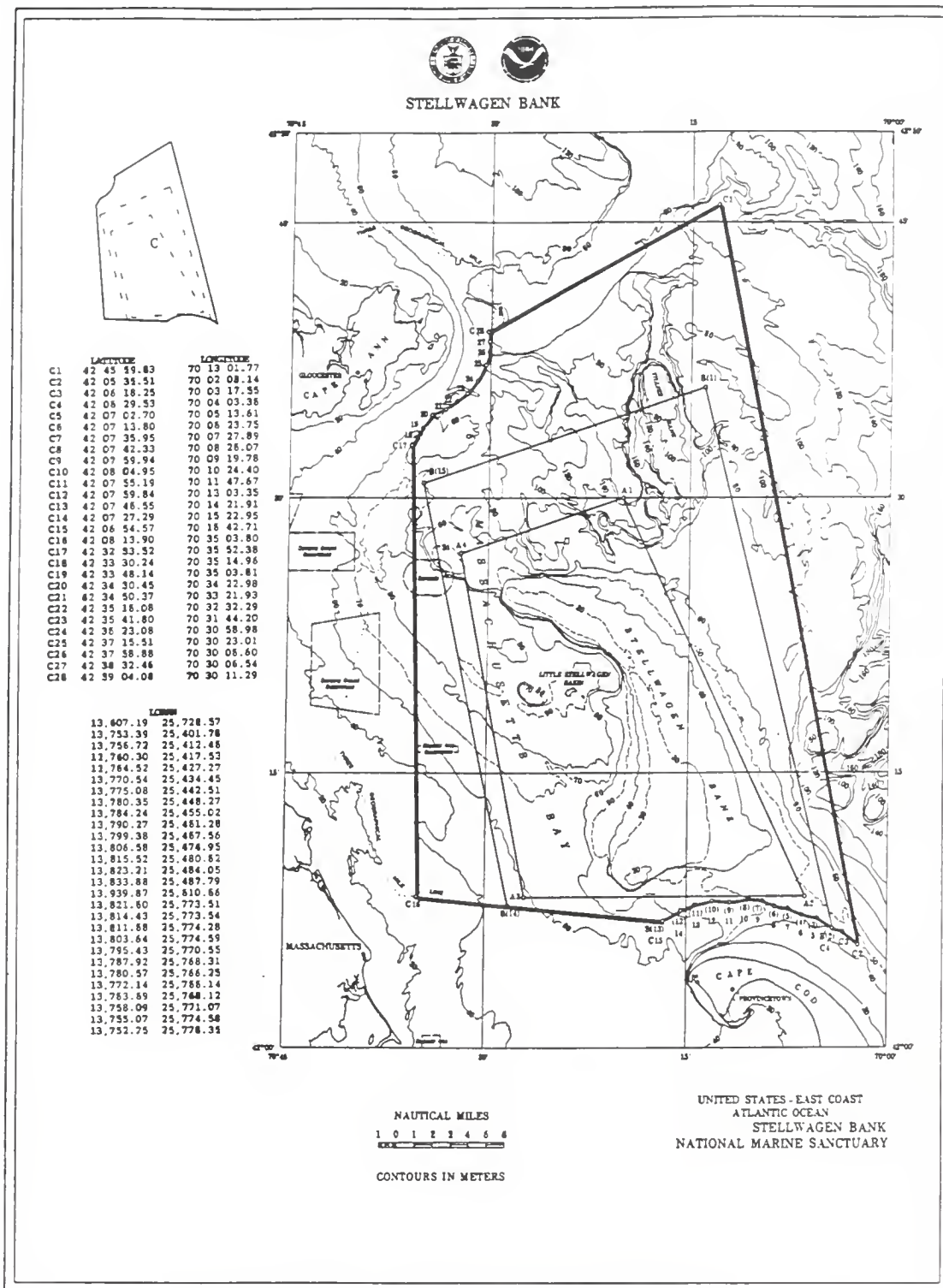


FIGURE 20: SANCTUARY BOUNDARY ALTERNATIVE #3

designate an area southwest of the existing MBDS, a two-nautical-mile diameter circle, centered at 42°25.1'N x 70°35.0'W (EPA 1992). Inclusion of all or part of the MBDS within the Sanctuary would conflict with the general NOAA policy against ocean disposal activities in marine sanctuaries. Encompassing the MBDS within the Sanctuary is not necessary to protect Sanctuary resources and qualities, because pursuant to their own programs, EPA and COE ocean disposal activities must avoid harm to Sanctuary resources. Moreover, Sanctuary regulations prohibit the disposal of materials outside the Sanctuary boundary which enter and injure resources or qualities.

4. Boundary Alternative #4

Boundary alternative #4 (Figure 21) was submitted for consideration by several reviewers, including the New England Fishery Management Council, in response to the DEIS/MP document. This alternative encompasses approximately 330 square nautical miles (436 square miles). This rectangular boundary configuration is similar to that of boundary alternative #1. As with boundary alternative #1, alternative #4 would essentially encompass the Stellwagen Bank feature itself; however, the western border extends well into Stellwagen Basin, so as to encompass entirely the interim MBDS, as well as the MBDS currently proposed for permanent designation.

Boundary alternative #4 is further described by the following latitude/longitude coordinates: 42°34'24.00"N x 70°25'06.00"W (northeast corner); 42°11'12.00"N x 70°06'18.00"W (southeast corner); 42°06'36.00"N x 70°22'30.00"W (southwest corner); and 42°28'24.00"N x 70°40'00.00"W (northwest corner). This boundary option is also described as being marked by the following LORAN-C lines: 13750, 13870, 44140, and 44295.

Boundary alternative #4, like all other boundary options, encompasses the entirety of Stellwagen Bank, thereby offering the opportunity for Sanctuary protection of the Bank feature. However, important habitat areas for invertebrate, fish and cetacean species are not included in this alternative. For instance, boundary alternative #4

would not encompass all of the important cetacean use areas north of the Bank, which are also heavily-frequented by whalewatch vessels. Thus, the opportunity for system protection and management would be somewhat diminished under boundary alternative #4.

This smaller configuration also limits the opportunity for coordination in ocean system management with the Commonwealth through its Ocean Sanctuaries Program, as it does not coincide with any coastal marine areas designated by the Commonwealth as Ocean Sanctuaries. However, the opportunity would be retained for coordination in research and educational activities with the Massachusetts Bays Program/NEP.

Boundary alternative #4, like boundary alternative #3, would encompass the "Interim" MBDS, and would also include the area currently proposed by EPA for permanent designation. As discussed in the description of boundary alternative #3, disposal of dredged materials is generally considered an incompatible use of sanctuaries.

5. Boundary Alternative #5

Note to Reviewer: Pursuant to P.L. 102-587 (§2202(b)), boundary alternative #5, the preferred alternative as described below, is established as the boundary for the Stellwagen Bank National Marine Sanctuary.

Boundary alternative #5 (Figure 22) is the preferred alternative, encompassing approximately 638 square nautical miles (842 square miles) of Federal waters surrounding Stellwagen Bank and additional habitat areas.

The configuration of this boundary alternative is the same as that of boundary alternative #3 (Figure 20), except for the western border, which extends in a straight line from the Sanctuary's southwestern corner, at 42°07'44.89"N x 70°28'15.44"W, to a west-northwestern point, at 42°32'53.52"N x 70°35'52.38"W. From that point, all boundary coordinates are otherwise the same as those of the northwestern, northern, eastern, and

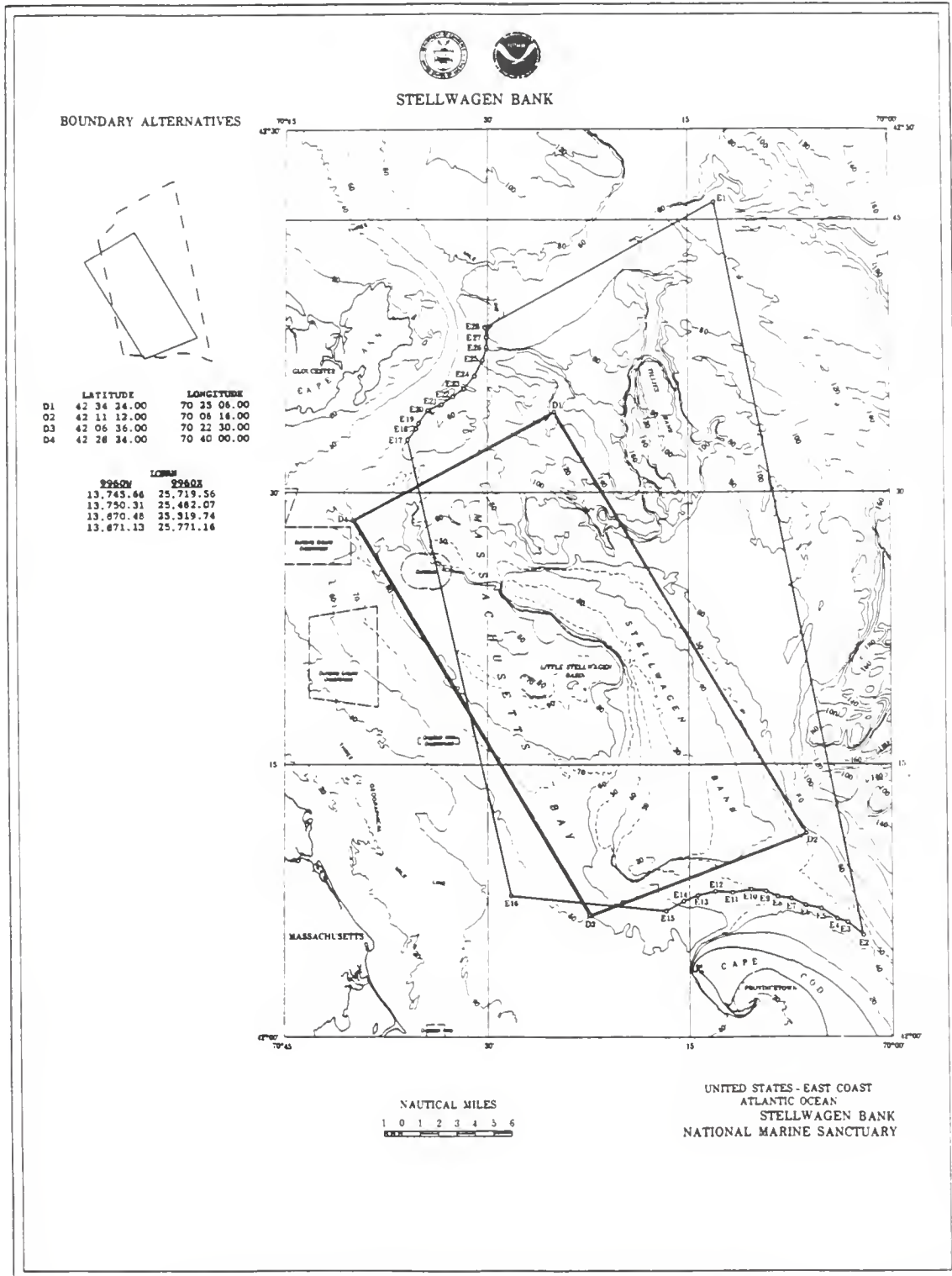


FIGURE 21: SANCTUARY BOUNDARY ALTERNATIVE #4

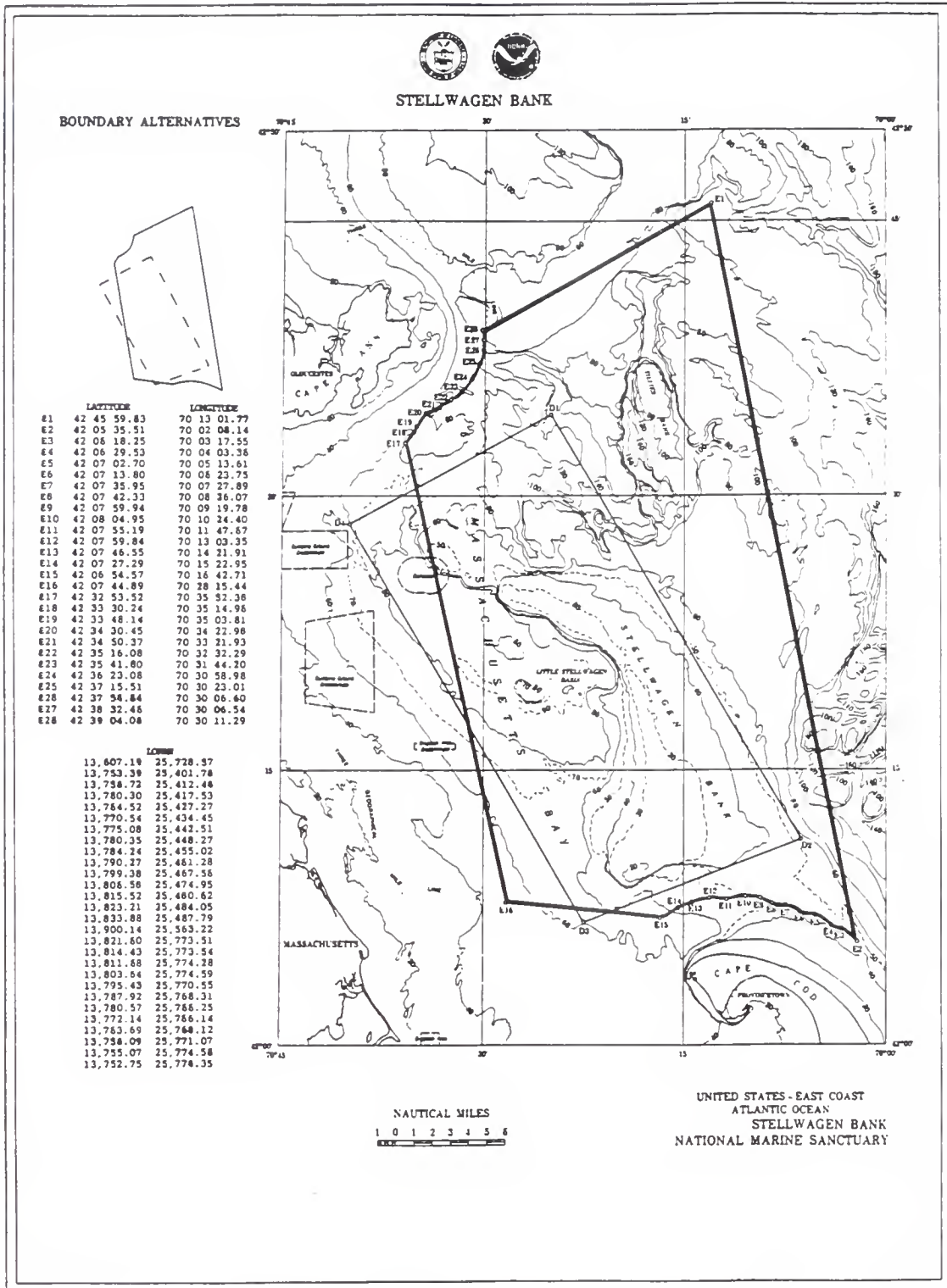


FIGURE 22: SANCTUARY BOUNDARY ALTERNATIVE #5

southern borders of boundary alternative #3. Borders of the Sanctuary are equidistant from the land points of Cape Cod, to the south, and Cape Ann, to the north.

The preferred boundary alternative #5 encompasses all of the Stellwagen Bank feature; Tillies Bank to the northeast of Stellwagen Bank; and southern portions of Jeffreys Ledge, to the north of Stellwagen Bank. Portions of the Sanctuary are adjacent to three ocean areas designated by the Commonwealth as Ocean Sanctuaries. The northwestern border coincides with the North Shore Ocean Sanctuary. The southern border coincides with the seaward limit of Commonwealth jurisdictional waters adjacent to the Cape Cod Bay Ocean Sanctuary; and is also tangential to the Cape Cod Ocean Sanctuary. As with boundary alternative #3, therefore, the potential for coordination efforts with the Commonwealth of Massachusetts related to ocean system management is optimal; as is the potential for cooperative educational and/or research efforts with the Massachusetts Bays Program/NEP.

The preferred boundary alternative #5 encompasses identified important marine habitats resulting from the predictable cyclic seasonal upwelling and mixing phenomena caused by the presence of the Stellwagen Bank feature. Several species of endangered and other cetaceans, pinnipeds, sea turtles, and numerous species of commercially-important fish and invertebrates depend on the habitats over and surrounding the Bank feature. The boundary includes the entirety of the most frequently-utilized feeding and nursery habitats for the largest high-latitude population of humpback whales occurring in the contiguous United States. Additional endangered cetacean species utilizing the habitats enclosed by boundary alternative #5 are fin and northern right whales. Other non-listed marine mammal species found within this boundary area include minke, orca, and pilot whales, as well as white-sided dolphins, harbor porpoises, and harbor seals.

The expanded area of boundary alternative #5 encompasses additional habitat areas around Tillies Bank and southern portions Jeffreys Ledge which are also important to fish, invertebrate, and

cetacean species. Jeffreys Ledge, to the north of Stellwagen Bank, provides feeding grounds for harbor porpoise and fish spawning areas. Tillies Bank, situated to the northeast of Stellwagen Bank, is an additional important feeding area for humpback and fin whales. Sand lance, primary prey for humpback and fin whales, as well as for some fish species, spawn within habitats included in boundary alternative #5.

The natural resource values of boundary alternative #5 also result in high levels of both commercial and recreational fishing and whalewatching activities. Again owing to its resource values, the majority of areas of particular interest to the research community are enclosed within boundary alternative #5.

The preferred boundary alternative #5 encompasses a portion of the "Interim" MBDS; however, the disposal site proposed by EPA for permanent designation is located entirely outside the Sanctuary boundary. Adoption of this expanded boundary alternative would not invalidate NOAA § authority under Title III to prohibit disposal activities at the MBDS which enter the Sanctuary and harm Sanctuary resources or qualities; nor would adoption of the expanded boundary option alter NOAA § prohibition on disposal and discharge activities inside the Sanctuary. Inclusion of all or part of the MBDS would conflict with the general NOAA policy against ocean disposal activities in marine sanctuaries. Encompassing the MBDS within the Sanctuary is not necessary to protect Sanctuary resources or qualities, because, pursuant to their own programs, EPA and COE ocean disposal activities must avoid harm to Sanctuary resources.

B. Management Alternatives

1. Management Alternative #1

Under this alternative, management of the Sanctuary would be conducted from SRD headquarters in Washington, D.C. Sanctuary Manager responsibilities would be assumed by an SRD Project Manager, who would coordinate, through cooperative agreements, with other Federal and State agencies located in the area of the

Sanctuary, to achieve implementation of Sanctuary regulations and programs. Working in coordination with the SRD National Programs Branch (formerly the Technical Projects Branch), the Sanctuary Manager would also initiate and coordinate research and interpretive projects for the Sanctuary, including investigations into possible historical/cultural resources within the Sanctuary. Interpretive outreach projects would be coordinated through other on-site agencies or institutions.

This management alternative would result in reduced administrative costs, because of limited staff requirements, and the absence of any separate, on-site Sanctuary facilities or equipment. Disadvantages of this alternative, however, include the lack of any on-site Sanctuary presence and minimal Sanctuary identity; and thus a lack of public awareness of the Sanctuary Program. Meeting any of the Sanctuary objectives (resource protection, research, education, multiple use) would be difficult under this alternative.

2. Management Alternative #2

The preferred management alternative is to identify a Sanctuary Manager and establish a Sanctuary headquarters facility in Plymouth, MA within a very short period of time following designation. In addition to the Manager, Sanctuary staff would consist of an administrative assistant, a research coordinator or an educational/interpretation coordinator, and at least one enforcement officer.

Under this alternative, an independent management and administrative system for the Sanctuary, housed in a NOAA-operated headquarters facility, would be established. Sanctuary headquarters would be located in the North Shore, South Shore, or Outer Cape area, depending in part on the size and configuration of the final Sanctuary boundary.

A variety of Sanctuary program activities would be phased in, with initial focus on research and education/interpretation. The Sanctuary headquarters would coordinate directly and actively with other Federal and State agencies in the implementation of Sanctuary regulations. The

Sanctuary Manager and staff, and the Sanctuary Advisory Committee would begin the processes of informing the public as well as regional officials of the Sanctuary's mandate, regulations, and research and education programs.

Although more expensive than management alternative #1, management alternative #2 is cost-effective overall because it phases in necessary management structures and measures commensurate with the growing presence of the Sanctuary and the needs of Sanctuary users. Identification of a Sanctuary Manager immediately upon designation would assist in establishing Sanctuary visibility at an early phase; although public awareness initially may be low.

Due to the numerous points of access to the Sanctuary available to the commercial and other user public, one centralized Sanctuary headquarters/information center may not provide optimum access to the variety of commercial and recreational Sanctuary users. The need for and timing of "satellite" information centers would be determined over a relatively short period of time, as development of the Sanctuary programs increases.

3. Management Alternative #3

Under this management alternative, a Sanctuary headquarters would be established soon after designation (within six months or earlier), and would be fully staffed with a Sanctuary Manager, an administrative assistant, a research coordinator, an education coordinator, and one or more enforcement officials. Additionally, "satellite" information centers as well as the Sanctuary headquarters facility, would be established quickly, so that the user and other interested public may easily gain access to, and information about, the Sanctuary's mandate, regulations, and research and education programs.

This alternative would provide rapid implementation of the Sanctuary program, which would enhance the potential for early cultivation and coordination of public support. Because of the wide variety of opportunities for research and interpretation, full-time Sanctuary research and education coordinators will allow the Sanctuary

Manager to focus on coordination among existing management authorities and resource protection efforts.

The start-up costs of this alternative would be greater than those of Alternatives #1 or #2, and may put Sanctuary staff into place prematurely. Over the longer-term, however, these staff and facilities are likely to be necessary to a successful Sanctuary program.

C. Regulatory Alternatives

Regulatory alternatives related to individual resources or to types of human activities have been evaluated in terms of three principal criteria found in the language of Title III: 1) whether the activity is generally consistent with the purposes of Sanctuary designation; 2) whether existing authorities regulating that activity provide appropriate and sufficient protection for Sanctuary resources; and 3) whether the additional Sanctuary regulation being proposed will be effective in protecting Sanctuary resources.

Areas of evaluation included the following human activities: discharges and deposits, including dredged materials, wastewater effluents, fish wastes, trash and other debris; incineration; development of mariculture operations; industrial materials extraction (i.e., sand and gravel mining); oil and gas extraction; historical/cultural resources exploitation; placement of fixed or tethered platforms; submerged pipeline and cable installation; commercial shipping; lightering; commercial charterboating (whalewatching and sportfishing vessels); recreational vessel operation; and taking of marine mammals, marine reptiles, and seabirds; and fishing.

1. Discharge or Deposits of Materials

Discharge or deposits of materials or substances into the ocean encompass a variety of individual activities. Following is a discussion of regulatory alternatives for discharge and deposit activities in general, followed by discussions of individually-identified discharge or deposit activities.

a. No Regulation: Under this regulatory

alternative, protection of Sanctuary resources from the potentially harmful effects of discharges and deposits from land and sea sources would rely on the existing provisions of the Clean Water Act (CWA); Title I of the Marine Protection, Research and Sanctuaries Act (MPRSA); Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); and the National Oil Spill Contingency Plan.

Discharges from ships are regulated in the U.S. under the provisions of the Act to Prevent Pollution from Ships of 1980 (APPS), as amended in 1982 and 1987 (33 U.S.C. § 1901 *et seq.*). APPS is the implementing legislation for the 1973 International Convention for the Prevention of Pollution from Ships, as modified by the Protocol of 1978 (MARPOL 73/78), as amended. Within MARPOL, there are currently five Annexes addressing: prevention and control of pollution by oil (Annex I); noxious liquid substances in bulk (Annex II); packaged or containerized harmful substances (Annex III); sewage (Annex IV); and garbage (Annex V). Annexes I, II, and IV are presently in force in the United States, and the U.S. Coast Guard has promulgated implementing regulations.

In addition to Title I of MPRSA, disposal of dredged materials at the Massachusetts Bay Disposal Site (MBDS) would also remain subject to the Federal consistency requirements of § 307 of the Coastal Zone Management Act (CZMA), as asserted by the Commonwealth of Massachusetts.

b. Regulation of the Activity: **The preferred regulatory alternative** is to prohibit all discharges or deposits from any location within the boundary of the Sanctuary, of materials or substances of any kind (except for those listed in Appendix A, at § 940.5(a)(1)). This prohibition would also be applicable to the discharge or deposit, from beyond the boundary of the Sanctuary, of materials or substances of any kind, except for the exclusions noted above, that subsequently enter the Sanctuary and injure a Sanctuary resource or quality. This regulation would apply to discharges or deposits of solid wastes as well as effluents.

Existing discharge or deposit activities being conducted pursuant to valid permits executed prior to the effective date of these Sanctuary regulations would be excluded from this prohibition. Such discharges or deposits would be allowed, subject to all prohibitions, restrictions, and conditions imposed by any other valid authority, as well as to all prohibitions, restrictions, or conditions imposed by applicable regulations, permits, licenses or other authorizations and consistency reviews issued by the appropriate authority. However, pursuant to the provisions of Title III of MPRSA, NOAA also may regulate the exercise of these existing permits consistent with the purposes for which the Sanctuary is designated.

NOAA may certify permits issued by other authorities for activities which are otherwise prohibited by Sanctuary regulations, such as discharges occurring outside Sanctuary boundaries which enter and harm a Sanctuary resource or quality. NOAA may deny certification or require additional conditions necessary to protect Sanctuary resources, or to achieve other Sanctuary management objectives. In all cases, NOAA will consult with the relevant authority over the activity and provide scientific information concerning Sanctuary resources to the existing regulatory authority. NOAA will cooperate with the existing authorities to formalize the consultative and management roles of the Sanctuary. To facilitate such coordination, memoranda of understanding and/or protocol agreements may be developed.

Individual Discharge or Disposal Activities

a. Dredged Materials Disposal

Alternatives dealing with the regulation of dredged materials disposal within the Sanctuary are discussed below. These alternatives have been developed under the premise that permitted disposal of dredged materials will occur at an MBDS designated by EPA at a location outside, but in close proximity to, the Sanctuary boundary.

1) No Sanctuary Regulation: Under this alternative, disposal of dredged materials would not be an activity regulated by the Sanctuary. Disposal activities could continue, pursuant to the jurisdiction

of existing applicable Federal (Title I of the MPRSA) and State authorities. The selection of this alternative would be made under the presumption that those existing authorities are entirely adequate to protect Sanctuary resources.

2) Disposal is Prohibited Throughout the Sanctuary: Under this alternative, disposal of dredged materials would be prohibited in all areas of the Sanctuary. The selection of this alternative is made under the presumption that dredged materials disposal activity within the Sanctuary may destroy, cause the loss of, and/or injure Sanctuary resources or qualities, and is generally inconsistent with the purposes for which the Sanctuary is designated.

3) Disposal Allowed at MBDS but Prohibited Throughout Sanctuary: **This is the preferred alternative.** Under this alternative, disposal of dredged materials would continue at the MBDS pursuant to Titles I and III of the MPRSA and their implementing regulations. Current studies indicate that no dredged materials have entered and injured resources within the Sanctuary. However, NOAA would review disposal permit applications involving the uses of the MBDS to confirm that such use does not conflict with the purposes for which the Sanctuary was designated. Disposal of dredged materials anywhere within the Sanctuary boundary would be prohibited.

Selection of the Preferred Alternative: Principal reasons for the selection of the preferred alternative (disposal allowed at MBDS but prohibited throughout the Sanctuary) are discussed below.

Regulations at 40 CFR § 228.10 provide special consideration of the effects of disposal activities on nearby National Marine Sanctuaries. Listed as "sensitive areas" in the Ocean Dumping Regulations, National Marine Sanctuaries are identified as areas "where natural resources are likely to be adversely affected by ocean disposal" (EPA, 1986).

However, if the disposal activity is outside the Sanctuary boundary, regulation of the activity by NOAA may only occur when it is determined by NOAA that this material has entered the Sanctuary and injured a Sanctuary resource or quality.

One of the central tenets of the National Marine Sanctuary Program is that any regulation promulgated by the Sanctuary should "complement existing regulatory authorities". Existing regulatory authority, principally the Ocean Dumping Act (Title I of the MPRSA) and regulations promulgated thereunder, provide a rigorous framework for assuring that each disposal event will not endanger "human health, welfare, and amenities, and the marine environment, ecological systems, and economic potentialities" (Section 2(a) of the MPRSA). However, a consideration central to this discussion is whether the regulation and management of ocean disposal under Title I is adequate for the protection of the resources and qualities of a National Marine Sanctuary. To determine whether additional Sanctuary management is necessary, it is important to fully understand how ocean disposal of dredged materials is currently regulated, in particular at the MBDS.

Ocean disposal is regulated under Title I of the Marine Protection, Research and Sanctuaries Act (MPRSA). Disposal of dredged materials at the MBDS is regulated by the Secretary of the Army under Section 103 (Title I) of the MPRSA. All other disposal activities are regulated by EPA under Section 102 (Title I) of the MPRSA. Dredged materials disposal is permitted when it is determined "the dumping will not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities". In making its permitting determinations, the Corps is mandated to use the criteria established by EPA under Section 102 (promulgated as regulation at 40 CFR § 227).

An implementation manual describing tests and procedures to be used in determining the suitability of dredged materials for ocean disposal was developed jointly by EPA and the COE in 1977. This testing manual, "Evaluation of Dredged Material Proposed for Ocean Disposal", was updated in 1991 (EPA 1991). The techniques described therein are considered state-of-the-art, and reflect years of research on disposal activities conducted jointly by EPA and COE since 1977. The COE's New England Division worked with EPA's Region I (Boston), in coordination with regional offices of the U.S. Fish and Wildlife Service

(FWS) and the National Marine Fisheries Service (NMFS) to develop a draft regional protocol (15 May 1989), in accordance with the draft National Protocol and forthcoming revisions to the Ocean Dumping Regulations.

Many factors are considered in characterizing the nature of the materials to be disposed, including but not limited to: the physical characteristics of the sediments; hydrography of the dredging area in relation to known or anticipated sources of contaminants; results from previous testing in the area; and historical records. In most cases, grain-size analyses and bulk chemistry analyses are performed. Among the parameters routinely checked are total organic carbon, water content, metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Where necessary, biological tests such as bioassay and bioaccumulation may also be employed to evaluate acute toxicity and the potential for biological uptake.

Each project is announced via a public notice and comment period (typically 30 days). All projects are closely coordinated with EPA, FWS and NMFS. The determination of suitability of dredged materials for open water disposal is made at the regional level by the COE. EPA has regulatory oversight of these determinations.

Disposal activities at the MBDS are generally inspected by an onboard COE observer. Buoys are maintained at the MBDS and precise coordinates are stipulated for the approved disposal point within the site. Violations are subject to substantial fines.

Monitoring activities at MBDS are conducted by EPA and COE. EPA is responsible for managing and maintaining effective ambient monitoring programs for the site. The COE (New England Division) monitors the disposal site through its Disposal Area Monitoring System (DAMOS). Although DAMOS was not formally in place until 1977, the COE has conducted oceanographic sampling at the MBDS since 1973, via contract with various scientific organizations and environmental consulting firms. DAMOS investigates all aspects of dredged materials disposal in New England, and monitors physical, chemical and biological conditions at nine disposal sites

throughout the New England area. DAMOS program activities include bathymetric surveys, side-scan sonar, underwater photography, divers, submersible vessels, sediment analyses and biological analyses.

The DAMOS program currently continues to monitor and manage the MBDS, and to conduct scientific investigations of the site. Since the 1988 Site Evaluation Report issued by the COE, monitoring activities have included: bathymetric surveys (DAMOS, October 1988); side-scan sonar (DAMOS, January 1989); sampling for sediment chemistry and tissue analyses (EPA/COE June 1989); and sampling for tissue analyses in fish and benthic organisms (EPA/COE, June 1990).

The regulatory framework surrounding the permitting of ocean disposal of dredged materials at MBDS therefore fully complies with Title I requirements. Notwithstanding the careful management described above, however, a National Marine Sanctuary is by definition an area recognized and designated for its "special national significance", encompassing resources and qualities deserving of special protection to ensure their long-term preservation and management. Title III states in part that, "while the need to control the effects of particular activities has led to the enactment of resource-specific legislation, these laws cannot, in all cases provide a coordinated and comprehensive approach to the conservation and management of special areas of the marine environment". A central purpose of National Marine Sanctuary designation is to provide the authority to allow this comprehensive and coordinated conservation and management.

While Title I provides for the regulation and management of the disposal of dredged materials into the marine environment, as a regulatory authority directed solely at a single activity, it cannot be expected to ensure that even the most rigorous application of this statute will provide the level of protection appropriate to an area of "special national significance" designated as a National Marine Sanctuary. "Comprehensive and coordinated conservation and management" of the Sanctuary require a broader context for regulatory decisionmaking than that which is possible under

Title I.

A large part of providing this broader view is the establishment of appropriate thresholds of significance for the analysis of impacts from disposal activities. Direct reference is made to National Marine Sanctuaries in Title I regulations (40 CFR §§ 228.5(b) and 228.10(b)(1)), which require the analysis of impacts of disposed materials on national marine sanctuaries. The designation of Stellwagen Bank National Marine Sanctuary will result in a higher level of scrutiny of impacts from dredged material disposal, under both Titles I and III of MPRSA. Standards and criteria established in Title I regulations for the evaluation of environmental impacts associated with ocean disposal encompass a comprehensive array of issues, from human health to the health of the entire marine ecosystem. These criteria have been established to provide a framework for identifying "unacceptable adverse effects." However, there are no specific references provided in the statute or regulations for determining the threshold for "unacceptable" impacts from disposal activities within an area recognized and set apart from other ocean areas as possessing resources and qualities of "special national significance".

Another facet of considering ocean disposal from the broader perspective of impacts on National Marine Sanctuaries is the assessment of cumulative effects. Title I regulations require the assessment of cumulative effects for site designations (40 CFR § 228.6(a)(7)), but restrict the discussion to long-term, chronic impacts of continued disposal at a disposal site. While the inclusion of any discussion of cumulative impacts is both necessary and beneficial, the limited scope of that discussion does not permit meaningful analysis of how cumulative impacts associated with disposal activities may be exacerbated by adverse impacts associated with other, unrelated activities.

This type of comprehensive impact analysis is difficult when attempted solely within the context of a regulatory analysis, primarily because individual projects are reviewed independently. A far more effective approach would be one based on comprehensive planning, facilitating the a priori development of scientifically and technically

supportable thresholds of significance. Such planning ideally should be addressed jointly by EPA, COE, and NOAA.

Impacts of continued disposal activities were evaluated in the MBDS site evaluation study (COE, 1988) and in the DEIS (EPA, 1989). No effects on Sanctuary resources or qualities from disposal activities at MBDS have been identified as a result of these evaluations. This conclusion is based on a number of studies including: surveys to determine the extent of the disposed sediments on the bottom; biological colonization on and around the disposed sediments; sediment chemistry surveys; and surveys of contaminant levels in organisms living on and near the site. Many of these studies have focused on near-field samples, where impacts could be expected to be most evident. Disposed sediments have been found to exist in well-defined deposits within either the present or the historical disposal sites. Bottom-dwelling organisms have recolonized these deposits, and are similar to the communities present at undisturbed reference sites. Sediment chemistry in these deposits has been generally consistent with that of sediments originally tested at the dredged materials disposal site. Contaminant levels found in the marine worm Nephtys, the clam Astarte, the shrimp Pandalus, and the scallop Placopectin indicate minimal bioaccumulation levels at and around the disposal site at the time of those studies.

At present, the MBDS site is considered an "Impact Category II" site, as defined in Title I regulations and criteria (40 CFR § 228.10(c), indicating that no detectable changes in species composition or population has occurred in habitats immediately outside the deposition area (EPA, 1990). It does not appear, therefore, that the previous use of the site has significantly degraded the resources of the area.

The preferred Sanctuary regulatory alternative is to prohibit disposal of dredged materials anywhere within the Sanctuary. Assuming that a permanent MBDS is designated outside the Sanctuary boundary, there should be no environmental impact on Sanctuary resources or any economic impact on users of the MBDS. NOAA plans to review disposal permit applications in order

to ensure that disposals do not enter the Sanctuary and harm Sanctuary resources or qualities. However, since there is no evidence of harm to Sanctuary resources or qualities from MBDS activities, no certification of these permits is necessary.

b. Disposal of Fish Processing Wastes

1) No Sanctuary Regulation: Under this regulatory alternative, the disposal of fish wastes, i.e., wastes from fish processing operations, would not require a permit under the Ocean Dumping Act (Title I of the MPRSA), provided that disposal not occur in "harbors or other protected or enclosed coastal waters", or any other location that may "reasonably be anticipated to endanger health, the environment, or ecological systems." (40 CFR § 220.1(c)). Proposals for disposal of fish wastes also may be required to meet EPA conditions related to location, character of the materials to be disposed, and methodology of the disposal activity. The terms of these conditions would be developed by EPA in consultation with NMFS and the fishing industry.

2) Disposal of Fish Processing Wastes Subject to Sanctuary Certification: Under the preferred regulatory alternative, proposals involving the disposal of fish processing wastes would have to be certified by the Assistant Administrator of NOAA to ensure that the activity is consistent with the purposes of the Sanctuary, and that it will have no significant effect on Sanctuary resources or qualities. This additional certification process will ensure that the Sanctuary, not specifically mentioned in the Ocean Dumping Act, is considered during any EPA decisionmaking process related to the disposal of fish processing wastes. Listing this as a regulated activity will also allow oversight of any fish processing wastes disposal activity occurring outside the Sanctuary boundary, to ensure that the effects of such activity do not enter the Sanctuary and cause harm to Sanctuary resources or qualities.

c. Discharge of Trash and Other Debris

As discussed in Part Two, Section II.C.4. (Commercial Shipping), existing regulatory authorities permit the discharge of several types of

solid wastes into ocean waters. Regulatory alternatives for discharge of trash or other debris into the Sanctuary are:

1. **No Sanctuary Regulation:** Under this regulatory alternative, existing authorities would continue to regulate the discharge of trash and other debris into Sanctuary waters. The following materials may presently be discharged: floating dunnage; lining and packing materials; paper; rags; glass; metal; bottles; crockery (ground, comminuted, or whole); and food waste (ground, comminuted, or whole). Plastics are prohibited from discharge anywhere in the ocean, and are therefore prohibited from overboard discharge.

2. **Discharge of all forms of solid waste would be prohibited in the Sanctuary:** This is the preferred alternative. With the exception of those items exempted by Sanctuary regulations, any discharge of solid waste would be prohibited in the Sanctuary. This alternative would ensure the prevention of environmental harm to Sanctuary resources. Additionally, the general scope of this prohibition would facilitate enforcement of the existing prohibition on discharge of plastics into the marine environment, by providing for a ban on the discharge of any solid materials. Because of the problems for marine wildlife resulting from the presence of such materials in the ocean (such as entanglement and ingestion), it is environmentally advantageous to apply this general prohibition to all solid waste materials.

d) Wastewater Discharges

Regulatory alternatives related to management of wastewater discharges from ocean outfalls into the Sanctuary are:

1. **No Sanctuary Regulation:** Under this alternative, point source discharges would not be subject to Sanctuary regulation. Existing management and regulation of ocean outfall discharge activities would continue under NPDES permits, and other Federal and State authorities, as applicable.

2. **Wastewater discharges subject to Sanctuary Certification:** This regulatory alternative would

allow the discharge of wastewater through ocean outfalls into the Sanctuary, provided that permits issued for such discharges are reviewed and certified by NOAA as being consistent with the purposes of Sanctuary designation, i.e., they would cause no injury to Sanctuary resources or qualities. Under this alternative, NOAA could approve discharge permits which clearly demonstrate no potential for harm to Sanctuary resources.

3. **Wastewater discharges into the Sanctuary would be prohibited:** This is the preferred regulatory alternative. Under this alternative, all outfall discharges of wastewater into the Sanctuary would be prohibited. Neither the NPDES sections of the Clean Water Act (CWA), nor its regulations make any specific reference to special standards or criteria for discharges into National Marine Sanctuaries. Existing authorities require no analysis of the cumulative effects of such discharges into coastal waters. It is therefore clear that existing authorities are inadequate to fully protect the resources of a National Marine Sanctuary.

Two factors contribute significantly to the conclusion that discharges of wastewater are generally not consistent with the designation of Stellwagen Bank as a National Marine Sanctuary. The first is that it is highly unlikely that any wastewater discharge could meet the resource protection standards appropriate for a National Marine Sanctuary. Generally, an increase in volume of wastewater discharged into waters of Massachusetts and Cape Cod Bays could lead to general degradation of water quality, particularly in terms of reductions in dissolved oxygen concentrations (notably during summer months when stratification of the water column is most likely); and elevation of nutrient concentrations in coastal waters. However, it is uncertain at what threshold such system-wide impacts would be observable. Most industrial discharges enter coastal waters through wastewater treatment plants; and there is the possibility that increased concentrations of contaminants could be introduced in these effluents. Combined with non-point sources of contamination, there is a potential for further water quality degradation. Within the area directly adjacent to a wastewater discharge outfall (the so-called "zone of initial dilution", or ZID), changes to

the biological community will almost certainly occur as a result of the discharge. There is some question as to whether EPA Water Quality Criteria would have to be met within the ZID. Further, considering the high cost of constructing ocean outfalls (the 9.5-mile outfall currently under construction by the MWRA will cost a minimum of \$278 million), any outfall would likely require a significant capacity large enough to justify its cost. Language in the existing regulatory authorities is somewhat broad, providing few performance standards. Given that this area contains a number of highly sensitive resources and is subject to intensive human use, even relatively small impacts can produce significant environmental changes.

With regard to the proposed MWRA outfall, the results of extensive analyses regarding the effects of its proposed discharge indicate the outfall would not be directly affected by this Sanctuary prohibition. Although the MWRA outfall will be the most significant single input of wastewater into waters adjacent to the Sanctuary, the MWRA has suggested that adverse impacts on Sanctuary resources are extremely unlikely (MWRA, 1990). This conclusion is based in part on physical oceanographic analysis of Massachusetts Bay, which generally appears to be well-mixed, allowing appropriate dilution of the effluent. In addition, the level of treatment of the effluent will be greatly improved; the concentrations of toxic contaminants in the waste stream are likely to be reduced by implementation of an industrial pretreatment program; sludge will no longer be discharged into coastal waters; and more effective grit screening will remove a larger portion of plastics and other floatable materials. Results of a far-field modeling study (MWRA, 1987- Volume V/Appendix H) appear to support these conclusions.

The EPA designation of Massachusetts Bay and Cape Cod Bay as an Estuary of National Significance, under the National Estuary Program (NEP), also plays an important role in this discussion. Many of the potential implications of point source and non-point source discharges will be carefully scrutinized in the Management Conference developed under this Program. The research and monitoring undertaken in the Massachusetts Bays Program (MBP), and the management plan

ultimately developed will focus attention on the quality of these waters and will contribute significantly to informed decisionmaking regarding wastewater discharges to coastal waters.

Under any regulatory alternative, establishing a high degree of coordination with the MBP/NEP is essential. The management framework established through the MBP/NEP will greatly enhance resource protection within the Sanctuary. Appropriate channels of communication and coordination should be established, and a priority placed on this coordination activity.

Of equal importance will be close coordination with the Massachusetts Ocean Sanctuaries Program (within the Massachusetts Department of Environmental Management), particularly in light of the prohibition against new or increased discharges in designated Ocean Sanctuaries, except as permitted through a very strict variance procedure.

2. Ocean Incineration

a. No Sanctuary Regulation: Under the regulatory status quo, existing authorities provided in Title I of the MPRSA would continue to apply to any proposed incineration activities. Under those authorities, ocean incineration of waste materials may occur (except as described below) until there has been designated an incineration site (pursuant to 40 CFR § 228.4(b)). Additionally, Title I regulations place requirements upon EPA to consider the effects of designating incineration sites near significant areas, such as marine sanctuaries (See 40 CFR §§ 228.5 and 228.6).

Pending the promulgation by EPA of specific criteria regulating ocean incineration activities, permits for this activity may only be granted as "Interim" or as "research" permits.

b. Identify the Activity as Subject to Regulation: Under this alternative, no regulation of ocean incineration activities would be proposed at this time. However, in the event of EPA § identification of a proposed incineration site which occurs within the boundaries of the designated Sanctuary, or in the event of applications for permission to conduct incineration operations under

interim Title I permits, NOAA may impose Sanctuary regulation of this activity, to ensure the protection of Sanctuary resources and qualities.

c. Regulation of the Activity: This is the preferred regulatory alternative. Under this alternative, both the designation of incineration sites and the permitting of any incineration activities within the boundaries of the designated Sanctuary would be prohibited. This alternative would prevent any environmental harm to Sanctuary resources which may result from incineration activities.

Moreover, the preferred regulatory alternative would conform to and reinforce existing regulatory guidance currently found in Title I regarding the designation of incineration sites. Those regulations recognize the sensitivity of certain marine areas and resources (such as those found within designated marine sanctuaries) by requiring that incineration sites be located in areas where the effects of incineration activities will not reach marine sanctuary boundaries. However, EPA has not previously designated an incineration site in the area of the Sanctuary; Title I § regulatory guidance has therefore yet to be applied with regard to this specific type of designation.

3. Offshore Industrial Materials Development

Note to Reviewers: Pursuant to P.L. 102-587 (§2202(d)), the exploration for and mining of sand and gravel and other minerals in the Sanctuary is prohibited. This legislative mandate is consistent the NOAA § preferred alternative, as described below.

a. No Sanctuary Regulation: There are no current proposals to initiate extraction activities for industrial materials (i.e., sand and gravel resources) pursuant to the provisions of the OCSLA. The Minerals Management Service, within DOI, has identified Stellwagen Bank as a potential source for these materials; however, substantial preliminary exploratory activities would be necessary prior to consideration of actual lease offerings by DOI. No overall leasing plan has yet been developed by DOI for development of industrial materials. Should DOI develop such a plan and offer offshore areas within the Sanctuary for sand and gravel extraction

operations, NOAA would exercise the same authorities for certification and conditioning of leases as described later in this section, with respect to offshore oil and gas leasing activities (see following item #8, 'Offshore Hydrocarbon Development').

Since only cursory assessment of offshore sand and gravel resources has been made to date, significant further exploration and delineation are necessary prior to actual mining activities on Stellwagen Bank. The MMS is developing an overall, case-by-case leasing program in cooperation with States, to match analysis and regulatory controls with the wide variety of environmental and operational issues associated with offshore mining. Following issuance of any leases, the MMS would require detailed exploratory and site-specific mining plans. Before commencement of operations, those plans would have to be assessed in terms of both long- and short-term environmental effects, particularly on living resources of the Bank, before actual mining could proceed.

b. Identify the Activity as Subject to Sanctuary Regulation: Under this alternative, no regulation of offshore sand and gravel mining would be proposed at this time. In the event of the development of actual proposals for sand and gravel extraction activities (following MMS § implementation of a leasing program for industrial materials under the OCSLA), NOAA will impose Sanctuary regulation of this activity, in order to make determinations of measures necessary for the protection of Sanctuary resources and qualities.

Such regulation would require, at a minimum, no initiation of activities to develop industrial materials until thorough investigation and assessment are made of the feasibility of conducting sand and gravel extraction (and related) activities in a manner which ensures the protection of Sanctuary resources and qualities.

It is possible that, based upon such investigations and assessments, Sanctuary regulation would result in a prohibition on all development activities associated with the extraction of sand and gravel (or other industrial materials) resources within the Sanctuary.

c. Regulation of the Activity: Sanctuary regulation of industrial materials development activities would result in one of two possible options: permit under certain conditions, or prohibit.

1) Permit Under Certain Conditions: Under the option of permitting industrial materials development activities under certain conditions, a Sanctuary regulation would be promulgated restricting sand and gravel extraction to certain levels and amounts; to certain areas of the Sanctuary; and/or to certain seasons of the year. These actions would be taken to avoid or to minimize adverse impacts on particularly sensitive areas of the Sanctuary, such as fish spawning areas. Development of specific Sanctuary regulations in coordination with MMS, however, would be necessary for protection of Sanctuary resources not already incorporated into the MMS leasing process to be imposed on lessees.

2) Prohibit: This is the preferred alternative. A prohibition on sand and gravel extraction activities would preserve the physical structure of the Bank feature, in addition to preventing the physical (and possible chemical) disturbances associated with extraction activities.

Physical disturbances resulting from extraction operations would include destruction of benthic biota; resuspension of fine sediments; and alteration of the Bank's surface profile. Additionally, extraction activities may result in the introduction of pollutants or undesirable nutrients, which in turn would result in: interference with filtering, feeding, and respiratory functions of marine organisms; direct smothering of benthic species; loss of food sources and habitat; lowered photosynthesis and oxygen levels; and (possibly) degraded appearance of the water itself.

Preservation of the Bank's physical structure and profile is important to the continuation of the cycle of seasonal upwellings, which generates the high biological productivity of the Bank system. Thus, the preferred regulatory alternative would prevent any such alteration of the physical character of the Sanctuary.

From the perspective of supply and demand for mineral aggregate within the New England region generally, it appears that the need to remove sand and gravel resources from Stellwagen Bank in order to supply regional demand is questionable. None of the large public works projects currently underway (i.e., the MWRA wastewater treatment facility in Boston Harbor, the MDPW Central Artery project, and the MDPW Third Harbor Tunnel project), has identified Stellwagen Bank as a possible source of construction materials. Although all of these projects are in early phases of construction, the time required for exploration, permitting, and facilities construction associated with a new marine mining operation at the previously-unexploited Stellwagen Bank make it highly unlikely that mineral aggregate materials necessary for these metropolitan Boston area projects could be supplied in time to be of direct assistance.

Additionally, a recent progress report to the New England Governors Conference on the construction aggregate demand study under development (Eastern Research Group, Inc., 1991), made the observation that industry representative survey respondents commented that while the Boston projects (such as the harbor tunnel) will return successful companies to better capacity rates (80-85%), the projects will not, of themselves, create a shortage of sand and gravel (or aggregate) resources. The industry opinion here expressed, therefore, is that sand and gravel resources from Stellwagen Bank are not necessary for the completion of the Boston area projects.

4. Alteration of, or Construction on, the Seabed

a. No Regulation: Under this alternative, the benthic resources and the seabed within the Sanctuary would continue to be protected by management measures available under existing Federal statutes. Federal regulations governing activities on the seabed would continue to apply within the Sanctuary. There would be no particular emphasis placed on the importance of either the Bank feature or of the seabed in providing the biologically rich area supporting fisheries, cetacean, and seabird populations.

Also under this alternative, NOAA would rely on the regulatory requirements of existing authorities to ensure the protection of the Bank during the construction and operation of man-made structures, such as artificial platform facilities. Assuming all such requirements are satisfactorily met, there would be no particular safeguards (unless permits issued for this activity incorporate specific conditions) against discharges from the facility entering the Sanctuary and possibly causing harm to a Sanctuary resource or quality. Additionally, the scope of consultations conducted under the Endangered Species Act pertain only to those species currently listed as threatened or endangered; full consideration of effects on all living marine resources is not addressed. Under the "no regulation" alternative, therefore, there remain gaps in protection against possible adverse effects of seabed alterations.

b. Regulation of Alteration of, or Construction on, the Seabed: The preferred alternative is to prohibit the alteration of, or construction on, the seabed, or the placement or abandonment of any structure or material on the seabed; or the attempt to do so for any purpose other than anchoring vessels; bottom trawling or dredging resulting from traditional commercial fishing operations; routine navigation operations; and ecological maintenance.

The intent of this regulation is to protect the resources of the Sanctuary from the harmful effects of activities such as, but not limited to: excavation of historical and/or cultural resources; drilling into the seabed; or ocean mineral extraction. This regulation is also intended to prohibit the placement of man-made objects or structures on the seabed, such as, but not limited to, pilings, supports or anchors for artificial platforms or islands; and submerged pipelines and cables. This regulation includes abandonment (which may include vessels that have run aground), and thereby ensures that vessel owners are responsible for the removal of such vessels.

5. Mariculture Activities

Beyond existing requirements related to construction and maintenance of offshore fish-raising facilities, there are no regulatory controls

currently imposed on the placement of large amounts of manufactured fish feed into the marine environment. Inasmuch as this type of activity is untested in an ocean location subject to strong storm events, it is unclear whether the proposed structure can withstand such events, and what the environmental and impacts would be if the structure broke apart during such an event.

a. No Sanctuary Regulation: Under this regulatory alternative, the initiation of mariculture operations would be subject to existing regulatory procedures at § 10 of the Rivers and Harbors Act of 1899, administered by the U.S. Army Corps of Engineers and coordinating Federal resource agencies. These regulations address the construction, installation and maintenance of any offshore tethered facility for raising fish as a commercial enterprise. Additionally, the activity would be subject to the requirements of § 402 of the Clean Water Act (National Pollutant Discharge Elimination System, or NPDES), administered by the U.S. EPA. Compliance with these existing regulations would also likely require that conditions be attached to the operation, including an endangered species "monitoring" program requirement, conducted regularly by on-site fish pen operators, to ascertain any interaction between endangered species and fish pens.

It is likely that existing guidance from the COE for the permitting of fish pen mariculture activities would preclude the permitting of any fish pen mariculture operation in a designated National Marine Sanctuary. In the COE guidance document, "Information Required for Department of the Army Permits: Aquaculture (Floating Fish Pen) Projects" (dated 25 November, 1988), fish farms are prohibited from areas "named in Acts of Congress or Presidential Proclamations as National Rivers, National Wilderness Areas, National Seashores, National Recreation Areas, National Lakeshores, National Parks, Monuments, or Wildlife Refuges, and such areas as may be established under federal law for similar or related purposes." [Emphasis added.] While National Marine Sanctuaries are not specifically listed in this guidance, this prohibition is applicable to National Marine Sanctuary areas.

b. Identify the Activity as Subject to Regulation: **This is the preferred regulatory alternative.** Currently, there is no proposal under consideration for the establishment of a mariculture facility and operation within, or nearby, the Sanctuary boundary. Given the concerns previously raised regarding structure stability, the proximity of vessel traffic lanes, the proximity to Department of Navy air and sea operations, possible entanglement or other harm to marine mammals and seabirds, water quality issues, and private commercial use of Federal waters, as well as current COE guidance related to the siting of fish pen operations, it is unlikely that any mariculture proposal directly involving Sanctuary waters will be proposed in the future. However, in the event of a future proposal for the establishment of a mariculture operation within the Sanctuary boundary, NOAA will determine, via a rule-making process, the necessity for a prohibition or other restriction on such activity.

c. Prohibit Mariculture Operations Within the Sanctuary. A prohibition on the placement and operation of a commercial fish-rearing facility within the boundaries of the Sanctuary would ensure the prevention of any marine mammal (endangered or otherwise), seabird, or other living resource conflict with fish pens. A prohibition would also prevent any possible adverse impacts on living or non-living resources which might result from the deposit of large amounts of fish feed into the marine environment. Finally, a prohibition on this activity within the Sanctuary affirms one of the Sanctuary's objectives, which is public use consistent with the overall Program goal of resource protection.

6. Removing, Taking or Injuring Historical or Cultural Resources

a. No Sanctuary Regulation: Under this alternative, all cultural and historical resources would remain protected under the existing management regime. Any historical or cultural resources within the Sanctuary, notably those eligible for listing on the National Register under the National Historic Preservation Act, would be carefully monitored by Sanctuary staff, once such designation is made. Additionally, any future

activity leading to the discovery or finding of cultural or historical resources would be carefully monitored and any regulations or management actions necessary for the protection of those resources would be decided on a case-by-case basis. The Sanctuary would ensure that information is made available regarding the national significance of such resources, and that appropriate management measures are implemented.

b. Prohibit the Removal, Taking, or Injuring of Historical or Cultural Resources: **This is the preferred regulatory alternative.** A prohibition provides the means necessary to protect and manage any historical and/or cultural resources that may be in the Sanctuary, particularly until an inventory can be performed to document the presence of such resources. Under this alternative, a prohibition on removing, taking, or injuring, or attempting to take, remove, or injure historical and/or cultural resources would apply throughout the Sanctuary. NOAA intends to conduct an inventory of historical/cultural resources, following Sanctuary designation, to determine whether any such resources are eligible for listing on the National Register.

7. Taking of Marine Reptiles, Marine Mammals, and Seabirds

a. No Regulation: Under this alternative, protection would continue to be provided to marine mammals generally, under the Marine Mammal Protection Act (MMPA); to certain species of marine mammals, seabirds, and marine reptiles protected under the Endangered Species Act (ESA); and to migratory seabirds generally under the Migratory Bird Treaty Act (MBTA). Marine reptiles, marine mammals, and seabirds would continue to be protected on a species-by-species and case-by-case basis, without particular consideration of the importance of their role within this ecosystem.

b. Prohibit Taking Marine Reptiles, Marine Mammals, and Seabirds: **This is the preferred regulatory alternative.** This provision would prohibit taking (including harassment) activities involving marine reptiles (sea turtles), marine mammals, and seabirds in the Sanctuary, unless

conducted pursuant to a Sanctuary permit, or otherwise permitted under the MMPA, ESA, or the MBTA.

Marine mammals taken incidentally to commercial fishing activities would continue to be exempted from this prohibition, pending any alteration of the current § 114 of the MMPA. NOAA enforcement personnel would continue to consider taking (or harassment) cases occurring in the Sanctuary within the same context they are now considered and reviewed under the Marine Mammal Protection Act and the Endangered Species Act. Taking of these species would only be authorized within the Sanctuary if the activities were conducted pursuant to valid permits issued by the National Marine Fisheries Service or the Fish and Wildlife Service, or other managing agencies, including special use permits issued by the Sanctuary. The preferred regulation would overlap to some extent with the MMPA, ESA, and the MBTA, but would also extend protection to species not covered by either of those statutes. The regulation demonstrates the intent of the MPRSA to protect Sanctuary resources on a holistic, or system-wide basis. The preferred regulatory alternative would provide such protection by effectively including all seabirds, marine reptiles, and marine mammals in the Sanctuary.

8. Offshore Hydrocarbon Development

a. **No Regulation:** Under the alternative of no regulation, the Sanctuary's resource protection regime would rely on provisions of the Outer Continental Shelf Lands Act (OCSLA), as administered by the Department of the Interior, through the Outer Continental Shelf (OCS) Oil and Gas Five-Year Leasing Program, and other DOI programs developed to implement the Act's provisions; the regulatory and management framework of the Sanctuary; and other existing Federal statutes to provide adequate protection for Sanctuary resources. Such other existing Federal statutes include, for instance, the provisions of the Marine Mammal Protection Act and the Endangered Species Act, which provide protection for certain marine species.

Although no leasing of OCS tracts is currently

permitted for areas within the Sanctuary until the year 2000, the Five-Year OCS Leasing Program may, following the expiration of the moratorium, offer tracts in the area of the Sanctuary for development of oil and gas resources. However, results of exploratory drilling in this general area have not indicated hydrocarbon reserves of sufficient quantities to warrant significant industry interest in exploitation of the Stellwagen Bank area.

Under the provisions of the Outer Continental Shelf Lands Act and the National Environmental Policy Act, thorough environmental review and the opportunity for public comment must occur prior to any hydrocarbon development activities. If in the future, areas within the Sanctuary are offered for lease for hydrocarbon development and production activities, NOAA has the authority to certify and condition, or to deny such certification as necessary, permits or other authorizations granted to operators (lessees or contractors) by other authorities for activities within the Sanctuary which are otherwise prohibited by Sanctuary regulation. Such conditions may include, but are not limited to, establishment of a monitoring program and scientific studies to assess and measure the effects of hydrocarbon activities, and of restrictions on discharges, on Sanctuary resources. Conditions imposed by NOAA or other authorities' permits will be made in consultation with those agencies and with the permittees.

Also, as with other activities, NOAA has the authority to impose emergency restrictions prohibiting any and all hydrocarbon activities (or any other activities) within the Sanctuary to prevent immediate, serious and irreversible damage to a Sanctuary resource or quality. In accordance with Title III regulations, such emergency regulations would remain in effect for not more than 120 days, during which time permanent regulations may be proposed by NOAA.

b. **Identify the Activity as Subject to Sanctuary Regulation:** This is the preferred regulatory alternative. No regulation of offshore hydrocarbon development activities is proposed at this time. However, in the event of increased industry interest in exploitation of the Stellwagen Bank area for oil

and gas resources (following the expiration of the current moratorium on leasing activities in the year 2000), NOAA will impose Sanctuary regulation of this activity, in order to make determinations of measures necessary for the protection of Sanctuary resources and qualities.

At a minimum, such regulation would require that no hydrocarbon development activities be permitted within the Sanctuary before the completion of thorough investigation into the feasibility of conducting such development activities in a manner which ensures no harm to Sanctuary resources or qualities.

At a maximum, such regulation would result in a Sanctuary prohibition on development of hydrocarbon resources within Sanctuary boundaries. NOAA regulation of this activity would be determined following a Sanctuary rulemaking process, which includes opportunity for public and agency comment.

c. Regulation of the Activity: Sanctuary regulation of hydrocarbon development activities would result in one of two possible options: permit under certain conditions, or prohibit.

1) Permit Under Certain Conditions: Under the option of permitting hydrocarbon development activities under certain conditions, a Sanctuary regulation would be promulgated prohibiting oil and gas activities within specified discrete areas within the Sanctuary. Such areas could include identified habitats over and around the Stellwagen Bank which are especially fragile and vulnerable to the effects of oil and gas development activities. If permitted under Sanctuary regulation, such hydrocarbon activities could be conducted only if executed with discharge and/or monitoring requirements. Monitoring requirements would be similar to the following:

Within specified areas of the Sanctuary, the operator (lessee) is required to submit a monitoring plan to assess the effects of oil and gas exploration, development and operations on the biotic communities of the Sanctuary. Monitoring investigations are to be conducted by qualified, independent scientific personnel.

These personnel and all required equipment must be available at the time of operations. The monitoring team must submit its findings to the Minerals Management Service Regional Manager (RM) (North Atlantic OCS Office) and to the SRD in accordance with a pre-established schedule. The findings must be submitted immediately in case of imminent danger to the biota of the Sanctuary resulting from drilling or other operations. If it is determined by the RM, in consultation with the SRD, that surface disposal of drilling fluids presents no danger to the Sanctuary, no further monitoring of that particular well or platform is required. If, however, the monitoring program indicates that the biota of the Sanctuary are being harmed, or if there is any likelihood that a particular well or platform may cause harm to the biota of the Sanctuary, the RM and SRD shall require implementation of mitigating measures such as: (1) the disposition of all drill cuttings and fluids by barging, or by shunting the material through a down pipe that terminates an appropriate distance, but no more than 10 meters, from the bottom, or (2) other appropriate operational restrictions.

2. Prohibit: The biological resources of the Stellwagen Bank system, especially endangered northern right whales, humpback whales, fin whales, and other cetaceans, pinnipeds, seabirds, marine turtles, and commercially-important fisheries and other fishes and invertebrates, are vulnerable to the effects of oil and gas development activities. A prohibition on oil and gas activities within the Sanctuary's boundaries would provide permanent protection to these and other resources. However, because of the current moratorium on hydrocarbon development activities in this area, such prohibition is unnecessary at this time, and would result in duplicative regulation.

9. Operation of Commercial Vessels

a. No Regulation: The term "commercial vessel" includes any vessel engaged in the trade of carrying cargo, including but not limited to tankers and other bulk carriers and barges, vessels used in seismic surveys, and vessels engaged in the trade of

servicing offshore installations. The operation of commercial vessels is currently controlled by existing Coast Guard regulations. Under the "no regulation" alternative, commercial vessels would still be subject to the Sanctuary's regulations relating to discharges.

Under this alternative, the Sanctuary program would work with existing agencies and authorities recommending investigations into the level of commercial vessel collisions with cetaceans to determine the need for reducing vessel speeds during seasons when cetaceans are present in the area of the Sanctuary, or during other times which may require reductions in speed, or other measures necessary for the prevention of such collisions.

b. Identify the Activity as Subject to Sanctuary Regulation: **This is the preferred regulatory alternative.** NOAA believes there is insufficient documentation presently available related to vessel speed and collisions with cetaceans to justify the imposition of speed limitations on commercial vessels within the Sanctuary at this time.

Further data are necessary to determine the level of vessel collisions with cetaceans and to make sound decisions regarding the protection of Sanctuary resources, such as seasonal (or other) restrictions on vessel speeds, or on other vessel activities in the proximity of cetaceans within the Sanctuary. The Sanctuary program will support investigations into commercial vessel speeds and the incidence of collisions with cetaceans. Investigations into the feasibility of communicating real time sighting data to commercial vessels in the Sanctuary is also a possible area of Sanctuary support, as well as enhancement of information available to commercial shippers and the public on vessel/cetacean interactions.

If the results of such further investigations demonstrate that current commercial vessel speeds are causing harm to Sanctuary resources (i.e., cetaceans), and that seasonal (or other) reductions in commercial vessel speeds would significantly reduce the level of harm, then the Sanctuary would impose, through regulation, seasonal (or other) restrictions on commercial vessel speeds through the Sanctuary. Documentation of conflicts is required

before a recommendation can be supported for seasonal restrictions on commercial vessel speed. Also, any proposed regulation affecting the navigation of vessels on the high seas is subject to endorsement by the International Maritime Organization (IMO), before its application to foreign vessels.

c. Regulation of Commercial Vessels: Under this alternative, reductions in commercial vessel speed (or other restrictions) would be imposed during seasons when endangered cetaceans are present in the area of the Sanctuary. The Sanctuary program would propose coordination of Sanctuary enforcement personnel with National Marine Fisheries Service agents and other cetacean research organizations to provide enforcement of this regulation.

Although the immediate regulation of commercial vessel speed may have some benefit on endangered cetaceans in the Sanctuary, NOAA believes there currently is no firm evidence that such regulation is necessary, or therefore supportable.

10. Lightering

a. No Regulation: Under this regulatory alternative, existing authorities affecting the at-sea, ship-to-ship transfer of petroleum products would continue in effect. Any lightering activities occurring within the Sanctuary would be regulated via the Oil Pollution Control Act of 1990 (33 U.S.C. § 2701).

b. Identify the Activity as Subject to Regulation: Lightering presently occurs in areas closer to shore, e.g., within and just outside Boston Harbor. There is no current information indicating that lightering occurs in the area of the Sanctuary. In the event that lightering activities may be proposed to occur within the Sanctuary in the future, NOAA will consider the need to regulate this activity, to ensure the safety of Sanctuary resources and qualities.

c. Regulate the Activity: **This is the preferred regulatory alternative.** Under this regulatory alternative, NOAA would impose a prohibition on

lightering within the boundaries of the Sanctuary. While there is no firm information indicating that lightering presently occurs within the area of the Sanctuary, and although any possible future lightering activities occurring in this area would be regulated by the Oil Pollution Act of 1990, it is not likely that such activities would be directly monitored by the U.S. Coast Guard, given their distance from shore.

Sanctuary regulation of lightering, via a prohibition, would prevent any accidental spillage of petroleum products resulting from this activity, thereby providing better protection of Sanctuary resources and qualities. A prohibition on lightering would also provide the opportunity, via Sanctuary enforcement personnel, for an extended area of observation to ensure that no potential threats to the marine environment occur as a result of this possible activity.

11. Operation of Commercial Charterboats

The licensing and operation of commercial whalewatch and sportfishing vessels, like commercial fishing vessels, are regulated by existing authorities. Licensing requirements will not be changed by Sanctuary designation, nor will any existing requirements or restrictions on vessel operations be affected. Guidelines or regulations relating to vessel operation in the vicinity of marine mammals apply to all commercial fishing, commercial whalewatch, and commercial sportfishing vessels, as well as to recreational/private vessels. Those guidelines or regulations also will not be affected by Sanctuary designation. The Sanctuary staff will work closely with commercial vessel captains through the New England Fishery Management Council and other appropriate entities such as charterboat associations, to ensure vessel operators are fully informed about applicable requirements for their activities within the Sanctuary.

a. No Regulation: The national whalewatching vessel regulations currently being developed by NMFS should provide mechanisms to ensure protection for endangered and other whales in the Sanctuary area from harassment by all vessel operators. The Sanctuary staff will work closely with NMFS managers to help ensure adequate

enforcement of NMFS whalewatching regulations. The Sanctuary Program may also be able to provide assistance in NMFS (and other) efforts to inform the user public about vessel operation in the vicinity of whales.

b. Identify the Activity as Subject to Sanctuary Regulation: **This is the preferred regulatory alternative.** NOAA recognizes that current NMFS whalewatch guidelines are generally followed on a voluntary basis by commercial whalewatch vessel operators. Commercial sportfishing vessels are also subject to current guidelines; however, as discussed previously, the guidelines are not enforceable as law. Therefore, real protection to marine mammals is limited to the extent of voluntary compliance. Additionally, there are currently no restrictions on the number of whalewatch vessels operating in the vicinity of marine mammals. Under the preferred regulatory alternative, the Sanctuary staff will have the necessary means to determine whether regulations additional to the pending NMFS whalewatch regulations are necessary. Additionally, the Sanctuary staff will work closely with NMFS personnel and whalewatch captains in making these determinations.

c. Regulation of Whalewatching and Sportfishing Vessels: Promulgation of whalewatching and sportfishing vessel regulations in the Sanctuary would provide for protection of whales within the Sanctuary boundaries, but would also create regulations somewhat duplicative to currently pending NMFS whalewatch regulations. Moreover, there is presently no firm documentation that additional regulations are necessary.

12. Operation of Recreational Vessels

a. No Regulation: Under this regulatory alternative, existing authorities affecting the operation of recreational (non-commercial) vessels would be relied upon for the protection of marine mammals from harassment and/or collisions. Those authorities include regulations implementing the Endangered Species Act and the Marine Mammal Protection Act. Whalewatch guidelines for vessel operators in the Gulf of Maine would also continue to apply to recreational vessels (although those guidelines are not enforceable), until such

time as they are replaced with national whalewatch regulations issued by NMFS.

Existing enforcement and educational outreach efforts would likely continue at a minimal level, relying largely on voluntary compliance with existing authorities by vessel operators.

b. Identify the Activity as Subject to Sanctuary Regulation: **This is the preferred regulatory alternative.** NOAA believes that while NMFS whalewatch regulations currently in development will address the need to close the existing regulatory gap related to enforcement of both commercial and recreational whalewatch activities, it is nonetheless likely that private, recreational vessel operators (particularly those not engaged in whalewatching activity), may not become informed of these intended NMFS regulations. Because many recreational vessels operate within the area of the Sanctuary, NOAA also believes overall protection and management of Sanctuary resources, especially endangered cetaceans, would be enhanced by NOAA's ability to impose regulation of recreational vessel operation if the need to do so arises in the future.

To this end, NOAA intends to coordinate and assist other agencies and organizations in the development of better information on the incidence of marine mammal/vessel collisions. NOAA will also coordinate and work closely with NMFS and cetacean research and educational organizations to ensure that all vessel operators in the Sanctuary are fully informed of existing regulations related to the protection of marine mammals.

c. Regulate the Activity: Under this alternative, NOAA would regulate recreational (non-commercial) vessel operation within the Sanctuary. Such regulation would likely be focused on vessel speeds and maneuvering in the proximity of marine mammals, particularly during seasons of the year when cetaceans are present in the Sanctuary. These are the same management areas currently being addressed by NMFS in its development of national whalewatch regulations. Therefore, NOAA believes additional regulation of recreational vessel operation at this time is not necessary. If the need for additional regulation is

demonstrated in the future, such need may be met by the adoption of alternative b., above.

13. Installation or Placement of Submerged Pipelines and Cables

a. No Sanctuary Regulation: Under this alternative, the permitting of any activity involving the installation of pipelines or cables on or adjacent to Stellwagen Bank would be affected by the Sanctuary designation only through comments provided to the relevant regulatory authorities, who must formally recognize the presence of the Sanctuary to varying degrees. If the activity is subject to Section 404 of the Clean Water Act (i.e., any portion of the project within territorial waters and involving the placement of "fill"), it would be subject to greater scrutiny by Federal permitting agencies because it would pass through the Sanctuary, which would be considered a "special aquatic site," as defined in the CWA's Section 404(b)(1) guidelines. The project would also be subject to various state authorizations, including CZM Federal Consistency and Water Quality Certification, which would informally acknowledge the presence of the Sanctuary in their permitting reviews. This alternative would place few administrative burdens on Sanctuary management beyond commenting to regulatory agencies on any proposed project involving the installation of pipelines or cables.

b. Installation Subject to Sanctuary Certification: As a regulated activity under the provisions of Title III (Section 310), a Special Use Permit could be issued for each proposal involving the installation of pipelines or cables. Given the generally-held view that most installations would result in few significant environmental impacts, the Special Use Permit process, or the certification of other permits would allow the Sanctuary the flexibility to accommodate acceptable projects. However, the problems associated with potential leaks in pipelines and electrical cables would remain.

It does not appear likely that such projects will be proposed in the foreseeable future. If such a project is proposed, a review would be undertaken by the Sanctuary staff, and a permit processed

under standard Title III procedures for such actions. The use of the process allowing for certification of other permits would be somewhat less burdensome administratively than the Special Use Permit process.

c. **Prohibition of Installation Within Sanctuary Boundaries:** This is the preferred regulatory alternative. Under this option, the installation of pipelines or submarine cables within the Sanctuary would be prohibited. This prohibition would eliminate any possibility of damage-induced leaks within the Sanctuary in pipelines and electrical cables, as well as any potential adverse impacts associated with installation. Additionally, possible damage to fish spawning areas, fishing gear, or archeological sites will be prevented by adoption of this alternative.

14. Fishing Activities

a. **No Regulation:** This is the preferred regulatory alternative. Under the regulatory status quo, commercial fishing activities, as well as some recreational fishing activities, would continue to be regulated by various fishery management plans (FMPs) developed by Fishery Management Councils and approved by the Secretary of Commerce. Implementation of FMPs would continue to be the responsibility of NMFS, the U.S. Coast Guard, and an FMP Technical Monitoring Group. Fishing activities involving Atlantic bluefin tuna would continue to be subject to landing quotas established via the International Commission for the Conservation of Atlantic Tuna (ICCAT), and allocated through NMFS. (Note, however, the recent inclusion of the bluefin tuna fishery into the reauthorization of the FCMA, in order to enhance NMFS's ability to provide improved species management.)

In addition to direct regulation imposed through FMPs, fishing activities are also subject to existing regulations pertaining to provisions of the MMPA and the ESA, as well as to NMFS guidelines related to operation of fishing vessels in proximity to marine mammals.

Within the context of NOAA's consideration of this area for National Marine Sanctuary designation,

fisheries have been identified as a resource of national significance. Also established is the presently overfished, or potentially overfished, status of several groundfish stocks within the Sanctuary and the extended marine areas surrounding it. A primary objective under Title III is to ensure the long-term protection and viability of this resource. As discussed at Part Two, Section II.C.1.d., the regulatory mechanism established by the FCMA provides for comprehensive authority over fishing activities. NOAA/OCRM believes the existing mechanism for regulation of fishing is appropriate and sufficient to attain the objective of species protection and maintenance shared by the FCMA and Title III. NOAA/OCRM recognizes, however, that the current implementation of that existing mechanism is inadequate. In response to the identified problems, a number of initiatives have been implemented to restore depleted stocks, and to better manage fisheries generally.

NOAA/OCRM does not believe the imposition of Sanctuary fishing regulations would provide any constructive benefit to the issues currently being addressed by other authorities. One factor in this determination is the existing authority of the Fishery Management Councils and NMFS to address fisheries management from the perspective of a larger geographic area than that encompassed by the Sanctuary. In addition, NOAA/OCRM believes that appropriate Sanctuary management does not necessarily mandate regulation. In this instance, the role of the Sanctuary should be to work in close coordination with both NMFS and the Fishery Management Councils to ensure that: necessary scientific and management information is provided; appropriate information to the user and other concerned public is provided; and assistance in enforcement efforts is made available.

b. **Identify the Activity as Subject to Regulation:** Under this regulatory alternative, no Sanctuary regulation of fishing activities would be proposed at this time. The appropriate Fishery Management Councils and NMFS would continue to exercise their mandates under the FCMA, and in response to recent initiatives to restore depleted groundfish stocks. However, under this alternative, NOAA/OCRM would be provided with the means to fill any regulatory gap related to fishing activities

which may be identified in the future. No Sanctuary regulation of fishing activities would be proposed, however, without following the procedures required by Title III of the MPRSA (found at 15 CFR § 922.31(f)). Those procedures include providing the appropriate fishery management council the opportunity to prepare and recommend draft regulations for fishing within the Sanctuary.

c. **Regulation of Fishing Activities:** Under this regulatory alternative, NOAA/OCRM would regulate fishing activities in the Sanctuary. The intent of such regulation would be the preservation of fishery resources, which have been identified as a nationally-significant quality of the Sanctuary. However, such measures by the Sanctuary would also create duplicative and overlapping regulations. Such regulations are not supported by a demonstrated need, particularly in light of recent management mandates imposed upon the FMCs and NMFS to rectify the currently-overfished status of several groundfish stocks within the Sanctuary area.

PART FOUR: ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES OF SANCTUARY DESIGNATION

Section I: Environmental Consequences of Alternatives

In selecting appropriate institutional, boundary, management and regulatory alternatives for the Stellwagen Bank National Marine Sanctuary, NOAA evaluated the environmental consequences of their implementation. This section discusses these consequences.

A. Status Quo Alternative

Under the status quo alternative, no implementation of the Congressional designation would occur. In addition to the prohibition on mining of sand and gravel resources within the Sanctuary mandated by the Congressional designation (P.L. 102-587, §2202), other existing Federal and State authorities would be relied upon for long-term protection and management of the Stellwagen Bank area and its resources. Existing resource protection and management authorities, however, are generally mandated to manage single species or areas of particular human activities. Apart from the efforts of some private organizations, there is very little potential under existing management authorities for education/interpretive activities addressing the Stellwagen Bank area. Likewise, scientific studies involving the Bank area generally are focused on individual species or human activities. While the data resulting from these studies are unquestionably useful, there are limited mechanisms for coordinating and disseminating these data to decisionmakers who must address the multiple facets of ocean system management. Existing mechanisms also do not provide for the long-term monitoring and assessment of biological and other trends occurring in the Stellwagen Bank system. Such assessment of resources and environmental conditions is critical to determinations on both the adequacy of current regulatory and management schemes, and on the specific regulatory and management needs for this system. The status quo alternative would leave to chance coordination among research, education, and management

institutions.

Significant gaps in the protection of the overall Stellwagen Bank system would remain, due to the structure of single-resource management or individual human activity management authorities. These gaps have become more visible as the results of real or potential human activities have been identified. There is little question that human activities directly involving the Stellwagen Bank and its resources will increase in the future, and existing authorities may well lose their ability to function at full effectiveness. As both human uses and individual agency mandates increase, so too does the potential for overlapping and confusing jurisdictional authorities. There is presently no single institutional entity with the ability to facilitate conflict resolution; given the variety and level of human uses, such a presence would greatly enhance overall system protection.

The Commonwealth of Massachusetts's Ocean Sanctuaries Program is primarily a regulatory mechanism available to control human activities occurring within designated areas. The Program does not, however, attempt to inform the public about the need to protect these areas, nor does it engage in long-term monitoring and research necessary for appropriate management of these areas.

The Massachusetts Bays Program, initiated in 1988 by the Commonwealth (and now progressing in cooperation with the Environmental Protection Agency, through its National Estuary Program), is primarily focused on the development of a comprehensive conservation and management plan for the Bays areas. There are similar objectives between this Program and the National Marine Sanctuary Program, and thus the potential exists for a natural link between programs to achieve a coordinated, comprehensive, and long-term management scheme for the entire Massachusetts Bay/Cape Cod Bay/Stellwagen Bank ecosystem. Without Sanctuary designation, however, there will be little attention directed at the Stellwagen Bank environment, which is immediately adjacent to the Bays areas, and directly influences it.

Thus, the environmental consequences of not

implementing the National Marine Sanctuary designation at Stellwagen Bank are likely to be negative over time, resulting in part from a fragmented approach to resource protection and human activity management.

1. Resource Protection

Resource protection directed at species and individual habitats currently is the responsibility of a limited number of Federal authorities, including the National Marine Fisheries Service (NMFS), the Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (COE), the U.S. Coast Guard (USCG), and the U.S. Department of the Interior (DOI). Agency responsibilities are described in PART THREE, Section I.

a. Ocean Discharge and Deposit Activities

Under the status quo alternative, protection of the Stellwagen Bank environment from possible harmful effects of deposit and discharge activities would be dependent on existing regulatory authorities which are mandated to conduct those activities in an environmentally safe manner. Currently, regulations exist addressing the contamination of marine areas by deposits and discharges from a variety of sources, including:

1) point sources (which require a National Pollutant Discharge Elimination System permit); 2) discharges of oil or other hazardous substances; and 3) ocean dumping. These activities are regulated by the Clean Water Act (CWA), Title I of the Marine Protection, Research and Sanctuaries Act (MPRSA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the National Contingency Plan (NCP).

The Clean Water Act prohibits discharge of oil or other hazardous substances "which may affect natural resources ... under the exclusive management authority of the United States".

(33 U.S.C. §§ 1251-1367). The National Contingency Plan, established under the CWA, includes guidance to contain, disperse, or remove oil and hazardous substances following a spill. Although the CWA provides some protection for marine resources, its penalties for violation are

minimal, and do not provide strong disincentives. In contrast, violation of Title III regulations under the MPRSA (establishing the National Marine Sanctuary Program) carries maximum penalties of \$50,000 per day.

The CWA also controls discharges from point sources through the National Pollutant Discharge Elimination System (NPDES), which issues permits for discharge activities in navigable waters.

Title I of MPRSA prohibits nearly all ocean disposal activities. It allows certain disposal actions under permits issued (in the instance of dredged materials) by the Corps of Engineers. Title I is administered by the EPA.

While effective management and administration of these authorities provide reasonable protection for the resources in the immediate vicinity of the activity in question, there is no particular consideration given at the time of permit application review to the overall marine system in which these activities occur. Therefore, in the absence of implementing the National Marine Sanctuary designation, individual deposit and discharge activities will continue to be regulated by existing authorities, without the benefit of a comprehensive perspective of the possible cumulative effects of such activities on the surrounding marine environment.

In the absence of continuing research/monitoring and review from the wider perspective of effects on the Stellwagen Bank system, it may be anticipated that the environmental effects of the status quo alternative are potentially negative over the long-term.

b. Ocean Incineration

At present, there is no site designated for ocean incineration, pursuant to Title I of the MPRSA, nor is there a pending proposal for incineration activities within the Sanctuary's boundaries. Under the status quo alternative, although proposals for ocean incineration activities would be required to meet the provisions of MPRSA's Title I (40 CFR §§ 220.3(f) and 228.4(b)), there is no particular assurance that: 1) an ocean

incineration site would not be designated within the Sanctuary; or 2) in the absence of a designated ocean incineration site, that a "research" or "interim" permit for ocean incineration would not be granted for areas within the Sanctuary.

Thus, the status quo alternative would offer no particular protection for Sanctuary resources and qualities from the effects of ocean incineration activities. The environmental consequences of possible incineration activities on Sanctuary resources are presently not fully known. At a minimum, it may reasonably be anticipated that ocean incineration activities within the Sanctuary would adversely affect the site's aesthetic qualities. Therefore, adoption of the status quo alternative may be expected to leave open the potential for adverse impacts on Sanctuary qualities and/or resources.

c. Offshore Industrial Materials Development

Pursuant to §2202(d) of P.L. 102-587, exploration for, and mining of sand and gravel and other minerals is prohibited within the Sanctuary. Thus, the status quo alternative of no programmatic implementation of the Congressional designation of the Sanctuary would result in no environmental consequences to the productivity of the Bank and thus to the living resources dependent upon the Bank beyond those resulting from the Congressional prohibition.

d. Alteration of or Construction on the Seabed

The status quo alternative would result in reliance on existing Federal authorities to protect the seabed from the effects of various human activities, e.g., the construction of fixed artificial platforms. However, during the permit evaluation process, no particular emphasis or attention would be afforded to the importance of the Stellwagen Bank feature and the area surrounding it. The environmental consequences of the status quo alternative are somewhat uncertain, depending upon the emphasis given to the Bank feature itself when considering permit requests.

e. Mariculture Activities

Under the status quo alternative, the siting, establishment, and operation of any mariculture facility would remain subject to existing authorities. These authorities include specific requirements under § 10 of the Rivers and Harbors Act, §§ 402 and 404 of the Clean Water Act, and various permit conditions related to the protection of endangered species and marine mammals. In addition, the issuance of permits for the construction of mariculture facilities generally are also subject to existing COE guidance prohibiting the siting of such facilities in sensitive areas designated by Act of Congress, Presidential Proclamation, or federal agencies (although this guidance does not specifically identify National Marine Sanctuaries as such "sensitive areas").

Assuming successful compliance with these requirements, a mariculture operation could be established within the Sanctuary's boundary, or in close proximity to the Sanctuary, under the status quo alternative. This type of operation is largely untested in ocean areas such as that around the Stellwagen Bank feature. There may be potential for fish pen structure damage during storm events. There also may be some potential for marine mammal, marine reptile, seabird, or other fish entanglement, notwithstanding permit conditions designed to prevent such occurrences. Additionally, issues related to permanent private commercial uses of Federal waters would not be addressed.

In general, the environmental consequences of the status quo alternative are somewhat unpredictable, but are, at a minimum, potentially negative.

f. Removing, Taking or Injuring Historical or Cultural Resources

There are some data existing on the presence of shipwrecks within the Sanctuary which may be of historical significance. However, a complete and detailed inventory is lacking. Currently, there are no such resources listed on the National Register (under the Historic Preservation Act), administered by the Department of the Interior. Although such listing would make available possible funding from

DOI for identification and assessment activities, there is no protection against removal of, or damage to, such resources. There also has been a recent discovery of a potentially historical wreck, the Portland. Under the status quo alternative, there would be no special protection provided to these resources in Federal waters.

The environmental consequences, therefore, of the status quo alternative are anticipated to be potentially negative to any such resources existing within the Sanctuary.

g. Taking of Marine Mammals, Marine Reptiles, or Seabirds

All marine mammals are afforded some protection from taking under the provisions of the Marine Mammal Protection Act, as amended. Additionally, threatened or endangered marine mammals are also protected under the Endangered Species Act (ESA), as are marine reptiles (sea turtles) and listed bird species. Migratory seabirds generally are protected from taking activities by the Migratory Bird Treaty Act (MBTA), with the exception of hunting licenses issued under that Act.

Despite these existing regulatory authorities, protection is in reality only provided on a case-by-case basis, with no particular consideration of the species' importance to the Stellwagen Bank system.

The status quo alternative would continue the present regulatory regime; environmental consequences would be anticipated as slightly negative to the living resources of the Bank system, when viewed from a long-term perspective.

h. Offshore Hydrocarbon Development

There is currently in place a moratorium on leasing of OCS tracts in the area of Stellwagen Bank until the year 2000. Therefore, the status quo alternative would have no effect on the potential for exploration, development, or production of hydrocarbon resources in this area until at least 2000.

In the event of increased industry interest in this area at a date beyond 2000, hydrocarbon activities would be regulated by the provisions of the

Outer Continental Shelf Lands Act Amendments (OCSLA), and a variety of additional regulations and directives covering spill prevention; protection of sensitive areas; and preservation of the marine environment. However, despite these existing protective regulations, there is still some potential for environmental damage and/or general degradation of the area resulting from exploration, development, production, and transportation operations.

Therefore, in the event of proposed OCS leasing following the year 2000, the status quo alternative may be anticipated to result in potentially negative effects on the Bank system.

i. Operation of Commercial Vessels

The status quo alternative would not affect current vessel operations; existing Coast Guard regulations would remain in effect. Under the direction of the National Marine Fisheries Service (NMFS), recommendations in the Draft Right Whale Recovery Plan may result in future investigations into the level of vessel collisions with cetaceans, and the possible need to institute changes in vessel speeds when traversing the Stellwagen Bank area. These investigations, however, would proceed independently under the status quo alternative.

There have been documented incidents of commercial vessel collisions with marine mammals within the Sanctuary area. Recommendations have come from both private and government sectors for further investigation into commercial vessel/marine mammal interactions, so that appropriate decisions may be made regarding actions to reduce such interactions. At this time, however, no specific actions have been taken affecting commercial vessel operation. The status quo alternative would rely on existing authorities to address such interactions. The environmental consequences of the status quo alternative are therefore not precisely known at this time.

j. Lightering Activities

There is presently no confirmed documentation that lightering occurs within the Sanctuary's

boundaries. The activity does occur, however, in entrance areas to Boston Harbor. Lightering activities are currently subject to the provisions of the Oil Pollution Control Act of 1990 (33 U.S.C. § 2701).

Under the status quo alternative, lightering activities would continue to be monitored on a discretionary, as needed basis by the U.S. Coast Guard. Some lightering activities would also likely continue to occur without prior notification by vessel operators to the Coast Guard's Marine Safety Office. There is always some potential for accidental spillage of petroleum products into areas near or inside Sanctuary boundaries during ship-to-ship transfer operations. In the absence of direct monitoring by the Coast Guard, there is also a potential for delay in spill response actions.

Although the likelihood is remote, the status quo alternative would result in the possibility for accidental environmental damage to Sanctuary resources and qualities resulting from spilled petroleum products.

k. Operation of Commercial Charterboats

Under the status quo alternative, the operation of commercial charterboats would not be affected; existing applicable Coast Guard regulations would remain in effect. Currently, NMFS whalewatch guidelines apply to all vessels, whether or not they are engaged in commercial operations. Generally, these guidelines are adhered to by the commercial charterboat industry via voluntary compliance. There have been some incidents of marine mammal harassment; and they may inadvertently continue, particularly if the number of whalewatch, sportfishing, and other vessels whose activities focus on Stellwagen Bank increases. NMFS intends to propose enforceable national whalewatch regulations during 1992.

Environmental consequences of the status quo alternative may be slightly negative, given the lack of enforceability of existing guidelines; the necessary time involved in implementing enforceable regulations; the realistic need to rely upon voluntary compliance; and the lack of control over the number of vessels (commercial or otherwise)

operating in proximity to marine mammals.

l. Operation of Recreational Vessels

The status quo alternative would have no effect on operation of recreational vessels. All vessels, including recreational vessels, are subject to current NMFS whalewatch guidelines designed to minimize harassment of marine mammals. However, recreational vessel operators are more likely to be unaware of these guidelines, and may therefore be more likely to violate them. There have been instances of smaller, recreational vessels harassing marine mammals within the Sanctuary area.

As is true with regard to the operation of commercial vessels, the environmental consequences of the status quo alternative may be slightly negative, for the same reasons cited for that activity.

m. Installation or Placement of Submerged Cables and Pipelines

Under the status quo alternative, the placement or installation of submerged cables or pipelines on the seabed of the Sanctuary would be subject to existing conditions imposed by current authorities. These authorities may, depending upon various circumstances, include § 404 of the Clean Water Act. There would be no particular consideration given to the possible effects of electrical transmission cables or oil pipelines on Sanctuary resources or on fishing gear.

Additionally, the presence of pipelines or electrical transmission cables within the Sanctuary would always present the possibility of leaks, which could cause localized injury or mortality to benthic organisms, and could also contaminate surrounding waters. The environmental consequences of the status quo alternative are thus potentially negative on Sanctuary resources and qualities.

n. Fishing Activities

Under the status quo alternative, fishing in the Sanctuary would continue to be regulated by the New England Fishery Management Council and the National Marine Fisheries Service, through fishery management plans developed for various fisheries.

Therefore, there are no consequences expected to the conduct of fishing activities under the status quo alternative. However, absent implementation of the National Marine Sanctuary designation, there may be anticipated indirect negative effects on fishing activities through adverse environmental consequences to the fishing environment, e.g., habitat degradation.

o. Defense Activities

The status quo alternative is not expected to have any consequence to military activities, since Sanctuary prohibitions or other restrictions set forth in the Sanctuary regulations do not apply to activities of the Department of the Defense (DOD) or to the Coast Guard (USCG), if they: 1) are being carried out as of the effective date of Sanctuary designation; 2) have no potential for any significant adverse impacts on Sanctuary resources or qualities; or 3) are exempted by the NOAA following consultation between the NOAA and the Department of Defense (in instances where the activities have a potential for significant adverse impact on Sanctuary resources or qualities).

p. Enforcement

Under the status quo alternative, the level of enforcement presence would likely remain constant, unless other existing regulatory authorities are able to supplement funding necessary for enforcement activities and personnel. The need for additional enforcement, particularly in the areas of marine mammal/vessel interactions and fishing activities, has been identified; however, agency budgets have generally precluded increasing existing levels of personnel. The longer-term environmental effects of static enforcement capabilities may be anticipated to be negative to Sanctuary resources.

2. Research and Education

Under the status quo alternative, there will be no research or education programs established that focus on the national priorities of ensuring the long-term protection of the Stellwagen Bank system. Individual scientific studies of various single species, or single issues will likely continue under the aegis of private, university, or other governmental

agencies. There will be no particular mechanism for coordination of research results and findings, unless one is possibly developed under the Massachusetts Bays Program for nearshore waters. Additionally, it is unlikely that needed baseline or monitoring data will be developed relative to the Stellwagen Bank environment. Also, under the status quo alternative, it is unlikely that any concerted effort will be undertaken to locate and identify potential historical or cultural resources which may exist in the area of Stellwagen Bank.

Education or interpretive programs addressing the importance of the Stellwagen Bank area will not be developed under the status quo alternative. Public information center(s) will not be established to serve as focal points for the user and other interested public to learn about the significance of Stellwagen Bank, and the importance of its protection.

In general, the status quo alternative may, over the long-term, contribute indirectly to the gradual deterioration of the Stellwagen Bank system, if the user and other public are not made aware, through education and interpretation, of both its special qualities and the importance of its long-term protection and management.

3. Management

Under the status quo alternative, there will be no comprehensive and integrated management of the Stellwagen Bank area. Existing management initiatives will continue as presently structured, i.e., the Ocean Sanctuaries Program (Commonwealth of Massachusetts); the Massachusetts Bays Program/National Estuary Program (Commonwealth of Massachusetts/EPA); the Gulf of Maine Initiative (MA/NH/ME/Nova Scotia/New Brunswick); and the Cape Cod National Seashore (DOI) (Figure 23). Of these, the Massachusetts Bays Program/National Estuary Program is beginning development of a comprehensive conservation and management plan (CCMP) for the Bays area. The CCMP will not directly include the Stellwagen Bank, which is immediately adjacent to Massachusetts Bay. The Gulf of Maine Initiative has developed the framework for a coordinated monitoring program

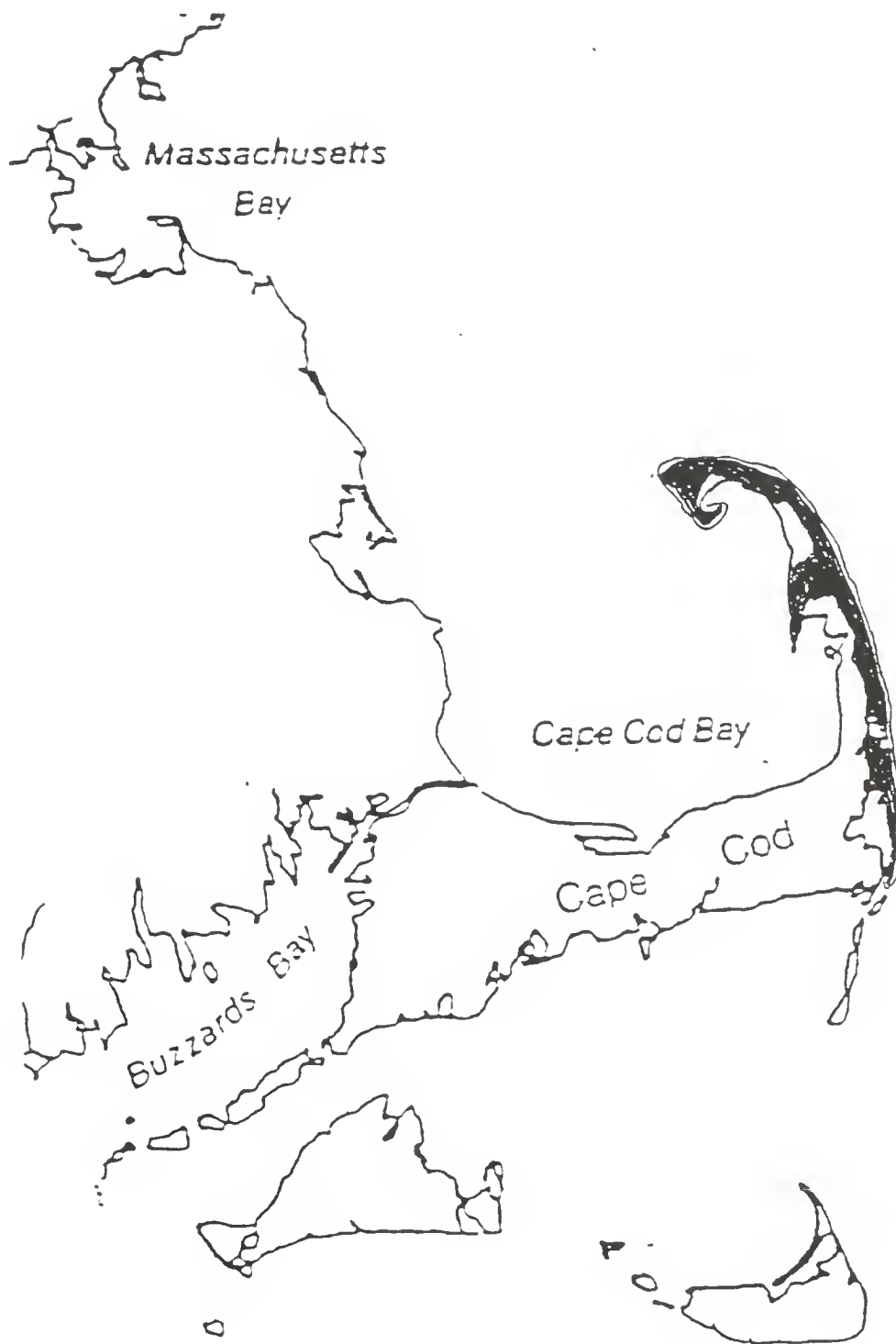


FIGURE 23: CAPE COD NATIONAL SEASHORE

for the entire Gulf of Maine, and has implemented pilot monitoring studies. Stellwagen Bank is included within this large general area.

While these management initiatives are highly worthwhile, under the status quo alternative there would be no particular focus on management of the Bank system; nor would there be established any opportunities for local and regional involvement in these efforts by those either directly or indirectly dependent on the Bank's resources. As with research and education/ interpretation programs, therefore, it may be generally anticipated that the status quo alternative (i.e., no Stellwagen Bank management program), may result in gradual deterioration or diminishment of the Bank's resources.

B. Sanctuary Designation: The Preferred Alternative

Designation of the Stellwagen Bank National Marine Sanctuary will permit the implementation of a coordinated and comprehensive management scheme, resulting in the most efficient means of protecting the resources of the Stellwagen Bank system. System-wide resource protection will be promoted by Sanctuary designation in three ways: 1) existing regulatory and resource protection mechanisms will be enhanced, and resource protection gaps filled; 2) a coordinated research program will be established to expand current knowledge of the Stellwagen Bank system, thus providing the foundation for sound management; and 3) a broad-based education/interpretive program will be established to improve public understanding and appreciation of the importance of the Stellwagen Bank system as habitat for a nationally-significant community of marine organisms providing important livelihoods; and of the need for a comprehensive management framework to ensure the future of this habitat.

The highly-productive, yet relatively unspoiled environment of the Stellwagen Bank is unique, given its proximity to several points of access, and the relatively high levels of human activities. The Stellwagen Bank area supports a variety of important human activities: a large commercial fishing industry and commercial whalewatching

industry, shipping, scientific research, education, and recreation. Although the historic level of these activities has not been intense, in recent years these and other new planned human activities have begun to indicate potential conflicts and adverse impacts on the area's natural resources. Possible development activities, such as extraction of sand and gravel resources from the Bank feature itself, have posed particular threats to the continued vitality of the overall system. Also of concern are the possible long-term consequences to living resources of habitat degradation from activities such as dredged materials disposal operations.

The preferred boundary alternative is particularly appropriate for two reasons: it encompasses identified important habitats, including the entirety of the Stellwagen Bank feature, Tillies Bank, and portions of Jeffreys Ledge, which collectively support them; and it is immediately adjacent to the boundaries of the Cape Cod Bay, Cape Cod, and North Shore Ocean Sanctuaries, already designated as protected areas by the Commonwealth. The latter factor enhances the potential for Federal-State coordination in working toward effective ocean system management. The Commonwealth of Massachusetts has long recognized the importance of establishing long-term and comprehensive management for coastal areas and offshore areas subject to increasing pressures from human activities. To that end, the Commonwealth established its Ocean Sanctuaries Program, to provide the mechanism for such management. Although the Stellwagen Bank system is uniformly recognized as an especially productive area from which many residents make a living, it occurs outside the boundaries of Commonwealth jurisdiction, thus exposing it to the potentially adverse effects of uncontrolled human activities.

Designation of the Stellwagen Bank National Marine Sanctuary will allow NOAA to: 1) assist in coordinating activities undertaken by existing authorities (such as the Ocean Sanctuaries Program); 2) support and coordinate research on and monitoring of Bank resources; 3) enhance public awareness of and appreciation for the value and sensitivity of the Bank system; 4) formulate long-range plans for responding to currently unforeseen threats to the Bank system; and 5)

regulate activities which either currently threaten significant damage to the area's resources; or which may pose greater adverse impacts on the area as human activities increase. Acknowledgement of the species and habitat values of the Stellwagen Bank system, through Sanctuary designation, should focus national, as well as regional, attention on the importance of ensuring the future of this area.

1. Resource Protection Regime

Designation of the Sanctuary will improve resource protection by instituting new regulatory measures, and by enhancing present surveillance and enforcement activities. The overall effect of these proposed regulations, focused on specific activities, will be beneficial to the Bank system. The impacts of each regulation are discussed below.

a. Ocean Discharge and Deposit Activities

The following activities will be prohibited by Sanctuary regulations:

- Discharging or depositing, within the boundary of the Sanctuary, any material or other matter, except for:
 - fish, fish parts and chumming materials (bait) used in or resulting from traditional fishing operations in the Sanctuary;
 - biodegradable effluents incidental to vessel use generated by marine sanitation devices approved by the U.S. Coast Guard;
 - water generated by routine vessel operations (e.g., cooling water, deck washdown, and graywater as defined by the FWPCA) excluding oily wastes from bilge pumping); and
 - engine exhaust.
- Discharging or depositing, from beyond the boundary of the Sanctuary, materials or substances of any kind, other than those listed above, that subsequently enter the Sanctuary and injure a Sanctuary resource or Sanctuary

quality.

According to COE/EPA studies, disposed dredged materials at the "interim" MBDS do not enter the Sanctuary or harm Sanctuary resources or qualities. Thus, disposal activities should continue following the effective date of final Sanctuary designation. In addition disposal of dredged materials will be relocated to a permanently-designated MBDS outside the Sanctuary. Assuming disposal continues to be conducted without harm to Sanctuary resources, no certification of disposal permits will be required. However, NOAA will actively participate in the EPA/COE review process for disposal events to ensure the effects of such disposal do not enter the Sanctuary and cause harm to Sanctuary resources or qualities. The preferred Sanctuary regulatory alternative (prohibiting disposal within the Sanctuary) is anticipated to be beneficial to maintaining water quality (and thus living marine resources).

Although Title I and its regulations provide a comprehensive framework for management and regulation of ocean disposal of dredged materials, they are nonetheless directed at a single activity. As areas of "special national significance", national marine sanctuaries require a broader context for regulatory decision-making. The proposed Sanctuary regulation, prohibiting discharge or deposit activities from outside the Sanctuary boundary which enter and harm resources or qualities will improve and complement existing regulatory mechanisms for ocean deposit and discharge activities, by 1) imposing a larger, system-wide framework upon those authorities empowered to issue such permits, within which they would be required to consider the merits (and effects) of such activities; and 2) ensuring that those considerations and determinations would be made based in part on Sanctuary research data relevant to the proposed disposal or discharge activity.

This expanded level of scrutiny due to national marine sanctuary designation will aid in overall efforts to maintain the reasonably good water quality currently found in the Stellwagen Bank system, by ensuring that localized effects of disposal actions are minimized and contained; and also by providing the regulatory mechanism to stop such

disposal actions if they are determined to be harmful to the Sanctuary's resources or qualities.

The preferred regulatory alternative of prohibiting ocean outfall discharges into the Sanctuary is anticipated to be environmentally beneficial to Sanctuary resources and qualities. The MWRA outfall, to be located approximately 12 miles from the Sanctuary site, will not likely be affected directly by this prohibition. However, in coordination with the Massachusetts Bays Program (MBP), the Sanctuary will provide a larger contextual framework for far-field monitoring and consideration of possible effects to the Sanctuary from the outfall.

b. Ocean Incineration Activities

Incineration in the Sanctuary of any materials, such as waste and trash, from onboard any vessel, will be prohibited in the Sanctuary.

The environmental consequences of a prohibition on incineration of waste and trash materials from onboard any vessels will be both directly and indirectly beneficial to Sanctuary resources and qualities. In addition to preventing incineration activities from occurring within the Sanctuary, this prohibition will effectively preclude the possible designation of ocean incineration sites within the Sanctuary under Title I of the Marine Protection, Research and Sanctuaries Act (MPRSA). Sanctuary prohibition of this activity will also prevent the issuance of any "research" or "interim" permit under Title I regulations for ocean incineration within the Sanctuary.

Although the environmental consequences of ocean incineration activities on marine resources are presently not fully known, the proposed prohibition is, at a minimum, anticipated to be beneficial to the Sanctuary's aesthetic qualities.

c. Offshore Industrial Materials Development Activities

Exploring for, developing or producing clay, stone, sand, gravel, metalliferous and nonmetalliferous ores, and any other solid material or substances of commercial value ("industrial

materials") in the Sanctuary is prohibited.

The prohibition of sand and gravel mining activities (classified as "industrial materials" by the Minerals Management Service), is particularly important to protection of the physical structure of the Bank itself, whose features would be altered or destroyed by development operations. Mining technologies involve scraping the surface and excavation of pits and tunnels into the surface. Variations of these methods likely involve the use of dredges, which unquestionably cause destruction of existing benthic biota; resuspension of fine sediments; and introduction of pollutants or undesirable nutrients. These consequences may result in interference with filtering, feeding, and respiratory functions of marine organisms; loss of food sources, spawning areas and other habitats; diminished photosynthesis and oxygen levels, and possibly degraded appearance of Sanctuary waters.

In addition to adverse effects on the living resources of the Bank system, changes made to the Bank feature would also likely result in changes in the causal relationship between the Bank and the production of internal waves and seasonal upwelling, both necessary to the biological productivity of the Bank system. Given the national significance of the Sanctuary's resources and the Bank feature which is essential to the continued health and vitality of the overall system, the prohibition of sand and gravel mining is necessary.

A prohibition on sand and gravel extraction activities within the Sanctuary will prevent any alteration of the physical structure of the Bank feature, in addition to preventing physical and possible chemical disturbances to the Bank and surrounding water associated with extraction activities.

The environmental consequences of a prohibition on the extraction of sand and gravel resources from the Stellwagen Bank feature, or from areas surrounding the Bank therefore, will be beneficial to Sanctuary resources and qualities.

Socioeconomic consequences of this regulation may include the necessity for locating alternative sources of sand and gravel deposits. However, from

the perspective of supply for the currently-initiated or planned large public works projects in the Boston metropolitan area, the need to remove sand and gravel resources from Stellwagen Bank is highly questionable. Additionally, the Bureau of Mines, within the Department of the Interior, has already performed preliminary investigations into other potential sources for these materials; further investigations would be needed before actual development and production activities could proceed. Such investigations would need to include detailed cost-benefit analyses in order to rank sites on an economic basis. Consideration of exact material needs and availability (e.g., grain size) would also be necessary to assist in determining the feasibility of commercial operations. It is unlikely that Stellwagen Bank would be the most desirable site available. Because of this and the availability of additional sources of sand and gravel, any possible negative socioeconomic consequences of a Sanctuary prohibition are expected to be minimal.

d. Alteration of, or Construction on, the Seabed

Constructing, placing, or abandoning on the seabed of the Sanctuary any structure or material; drilling through the seabed of the Sanctuary; or dredging or otherwise altering the seabed of the Sanctuary will be prohibited. This prohibition will not apply if any of the above results from anchoring vessels, commercial fishing, or installation of navigation aids.

This proposed prohibition will prevent the placement of fixed offshore platforms, or "artificial islands" anywhere within the Sanctuary; and will also prevent any other construction, placement, or abandonment activities anywhere on the Sanctuary's seabed. Included in this prohibition is the placement or use of submerged pipelines and cables.

Effects of the construction and operation of the currently-proposed offshore fixed platform include: operation of necessary on-shore support facilities for the platform; increased boat and barge traffic and trips to and from Stellwagen Bank; interaction with commercial and recreational fisheries on the Bank; and potential environmental harm to fishery

resources and overall Bank ecology. The latter effect would result from: construction activities; volume and composition of discharges; fuel and other spills occurring during transfer operations; accidental loss of debris and litter; noise and light-induced changes in fish behavior; potential environmental harm to threatened and endangered species of cetaceans and marine turtles resulting from noise and vessel traffic; and interaction with whalewatch vessels. The proposed prohibition will preclude the development of this proposed artificial platform anywhere within the Sanctuary; and the environmental consequences of this proposed regulation are anticipated to be beneficial to the entire array of living and non-living resources in the Stellwagen Bank system.

e. Mariculture Activities

Constructing, placing, operating, or maintaining any structure relating to any phase of mariculture activities will be subject to Sanctuary regulation. No Sanctuary regulation of this activity is proposed at this time. Therefore, there are no environmental or socioeconomic consequences resulting from the listing of this activity as subject to Sanctuary regulation.

f. Removing, Taking or Injuring Historical or Cultural Resources

Moving, possessing, or injuring, or attempting to move, possess, or injure, a Sanctuary historical or cultural resource will be prohibited in the Sanctuary. This prohibition does not apply to accidental moving, possession, or injury occurring during traditional fishing operations.

This proposed regulation protects any historical or cultural resources which may be located within the Sanctuary. Currently, incomplete information exists on the number, location and condition of any historical or cultural resources which may be situated within the Sanctuary; however, the presence of some historical/cultural resources is known. Following final Sanctuary designation, efforts will be initiated to inventory historical/cultural resources. Educational and interpretive programs on submerged historical and cultural resources in the Sanctuary will enhance the public's involvement and understanding of the

importance of preserving these resources.

NOAA may also seek to have identified resources listed on the National Register, under the National Historic Preservation Act. Such listing would make survey and other funding available from the Heritage Conservation and Recreation Service (Department of the Interior), to assist in identification of resource distribution and historical/cultural significance. Such listing does not, however, prevent removal or damage of historical or cultural resources by non-Federal entities. Therefore, the proposed regulation will protect these resources from disturbance and damage.

The environmental consequences of this proposed prohibition will be beneficial to the resources, and is not anticipated to affect other existing activities in the Sanctuary.

g. Taking of Marine Mammals, Marine Reptiles, or Seabirds

Taking of any marine mammal, marine reptile, or seabird will be prohibited in the Sanctuary, except for those marine mammals taken incidentally to commercial fishing operations in accordance with § 114 of the MMPA; those marine species taken by permit issued under the Endangered Species Act (ESA) or MMPA; or except for those seabirds taken by permit issued under the Migratory Bird Treaty Act (MBTA).

All marine mammals are provided with some protection from "taking" under provisions of the Marine Mammal Protection Act, and threatened or endangered marine mammal species are additionally protected under the Endangered Species Act (ESA). The ESA also protects marine reptiles (i.e., sea turtles) from "taking", inasmuch as all species of sea turtles are currently listed as either threatened or endangered. Migratory seabirds are generally protected under the Migratory Bird Treaty Act; and particular species listed as either threatened or endangered under the ESA, and also protected from taking.

Overall, these Acts only provide protection on a case-by-case basis, without any particular

consideration given to the species' role within an ecosystem. The proposed prohibition is designed to provide equal protection to all marine mammals, marine reptiles, and seabirds, in recognition of their importance and inter-relationships within the Sanctuary. (Marine mammals taken incidentally to commercial fishing operations would continue to be exempted from this prohibition, pursuant to §114 of the Marine Mammal Protection Act.)

The environmental consequences of this proposed regulation will be beneficial to the Sanctuary's resources; and are not anticipated to impose any economic or other hardships on commercial users of the Sanctuary.

h. Offshore Hydrocarbon Development Activities

The exploration for, development of, or production of, offshore hydrocarbon resources will be subject to Sanctuary regulation. No Sanctuary regulation of this activity is proposed at this time. Therefore, there are no environmental or socio-economic consequences resulting from the listing of this activity as subject to Sanctuary regulation.

If, in the future, industry interest in the Stellwagen Bank area increases, and there is no Congressional or other existing moratorium precluding leasing of OCS tracts over the Bank, then a regulatory means exists for determining whether restrictions or a prohibition on hydrocarbon activities should be put into place within the Sanctuary's boundaries.

The potential risks and adverse environmental effects of oil and gas production include well blowouts; oil spills and pipeline leaks; noise and visual disturbances; pollution from aquatic discharges; and disruption from pipeline construction. The biological resources of the Stellwagen Bank system, in particular endangered cetacean species, are vulnerable to the effects of oil and gas activities. Indirectly, therefore, the proposed potential for regulation will have beneficial environmental effects on the Sanctuary system, by ensuring the means for protection of its resources if the need arises in the future.

i. Operation of Commercial Vessels

Operation of commercial vessels in the Sanctuary will be subject to Sanctuary regulation. There is no Sanctuary regulation of this activity proposed at this time. Therefore, no environmental or socioeconomic consequences will result from the listing of this activity as subject to Sanctuary regulation.

Stellwagen Bank lies beneath an established Vessel Traffic Separation Scheme (VTSS) serving Boston, which is heavily used throughout the year. The operation of commercial vessels is controlled by existing Coast Guard regulations. Vessel cargo is dominated by petroleum products; and thus the greatest potential environmental threat is that of oil spills. However, the Bank feature is well below the point at which vessel groundings are a possibility; and the safety record of the VTSS indicates the potential for a collision is very minimal. Therefore, NOAA does not currently propose or anticipate any need for the proposal of any Sanctuary regulation of vessel traffic.

Based upon the results of future investigations into the level of vessel collisions with cetaceans, NOAA may determine a need to regulate commercial vessel speeds during seasons when cetaceans are present in the Sanctuary, or to impose other measures to ensure the safety of cetaceans. The proposed listing of this activity as subject to Sanctuary regulation provides a means of addressing these possible determinations.

j. Lightering

Ship-to-ship transfer of petroleum products, or "lightering" activities will be prohibited in the Sanctuary.

Although there is presently no firm documentation that lightering activities occur in the immediate vicinity of the Sanctuary, the activity does occur in areas near the entrance to Boston Harbor. Because some of these activities are not directly monitored by the U.S. Coast Guard, there is always some potential for accidental spillage of petroleum products into the marine environment. Additionally, the distance of such areas from shore, combined

with the absence of Coast Guard presence, may also result in delayed responses to spill events.

The prohibition on lightering in the Sanctuary will prevent any accidental spillage of petroleum products, and thus provide better protection of Sanctuary resources and qualities. Additionally, the prohibition will provide the opportunity for extended monitoring, via Sanctuary personnel, to ensure that no potential threats to the marine environment occur as a result of lightering activities. Therefore, the environmental consequences of this prohibition will be beneficial to the Sanctuary's living and non-living resources, and to its overall qualities.

k. Operation of Commercial Charterboats

Operation of commercial charterboats in the Sanctuary will be subject to Sanctuary regulation. There is no Sanctuary regulation of this activity proposed at this time. Therefore, no environmental or socioeconomic consequences will result from the listing of this activity as subject to Sanctuary regulation.

l. Operation of Recreational Vessels

Operation of recreational vessels in the Sanctuary will be subject to Sanctuary regulation. No Sanctuary regulation of this activity is proposed at this time. Therefore, no environmental or socioeconomic consequences will result from the listing of this activity as subject to Sanctuary regulation.

m. Installation or Placement of Submerged Cables and Pipelines

The installation or placement of submerged cables and pipelines in the Sanctuary will be prohibited. The principal potential environmental impact from the presence of submerged electrical transmission cables, or from pipelines carrying petroleum products, is the possibility of leaks, which could cause environmental damage to Sanctuary resources or qualities. Although one or more proposals for transmission cables have been discussed, there are no cables or pipelines currently planned or installed across Stellwagen Bank or

through the Sanctuary.

A prohibition on the installation of transmission cables and pipelines will also prevent the possibility of disturbance and/or damage to fishing gear, fish spawning areas, and marine archeological sites, which may result from trench-and-fill activities necessary for burying cables and pipelines.

Therefore, this proposed regulation is anticipated to be environmentally beneficial to Sanctuary resources and qualities by preventing these particular potentials for resource damage.

n. Defense Activities

No prohibition or other restriction set forth in the Sanctuary regulations shall apply to Department of Defense (DOD) or Coast Guard activities that: 1) are being carried out as of the effective date of Sanctuary designation; 2) have no potential for any significant adverse impacts on Sanctuary resources or qualities; or 3) although having the potential for significant adverse impacts on Sanctuary resources or qualities, are exempted by the Director of the Office of Ocean and Coastal Resource Management after consultation between the Director and the Department of Defense. Department of Defense activities are required to be carried out in a manner that minimizes any adverse impact on Sanctuary resources and qualities. In the event of threatened or actual destruction of, loss of, or injury to a Sanctuary resource or quality resulting from an untoward incident, including but not limited to spills and groundings, caused by it, the Department of Defense must promptly coordinate with the Director for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the Sanctuary resource or quality.

o. Enforcement

Designation of the Sanctuary will provide the opportunity for improved surveillance and enforcement. Coordination among the Sanctuary, NFMS and the Coast Guard will enhance commercial and recreational fishing activity enforcement efforts, which are presently understaffed. Although the Sanctuary occurs

entirely in Federal waters, it is adjacent to State-designated protected marine areas. NOAA anticipates a continuing coordination with the Commonwealth of Massachusetts toward the objective of enhanced enforcement efforts for protection of these ocean areas. The enhancement of enforcement and surveillance efforts is anticipated to be environmentally beneficial to the Bank's resources.

2. Research and Interpretation/Education

Implementation of both Sanctuary research and education programs will result in positive benefits to the user and other interested public. The research program will be focused on coordination with the efforts of existing institutions, as well as providing funding for individual projects, in order to study the Bank's resources and develop effective management strategies. The education/ interpretation program will be designed to enhance public awareness and appreciation for the special qualities of the Stellwagen Bank system, its resources, and the need to ensure protection for this nationally-significant area.

The research program will initially establish a coordinated approach to obtaining vital baseline and monitoring data on the Bank's resources, and on human activities in the area. More complete information is needed on, for instance, water quality and circulation, geologic composition, species density and distribution, fishery resources, marine mammal interactions with vessels, and seabird interactions with cetaceans. A better understanding of the relationships among these, as well as other resources, will provide the basis for developing well-supported, long-term planning for the Sanctuary. The Sanctuary will initiate coordinating efforts with research institutions and organizations, such as the Woods Hole Oceanographic Institution, Marine Biological Laboratory, National Marine Fisheries Service Northeast Center, Manomet Bird Observatory, Cetacean Research Unit, Center for Coastal Studies, New England Aquarium, and others, to begin compilation of important data.

The education program will seek to improve public awareness and understanding of both the

special qualities of the Stellwagen Bank system, and the importance of ensuring its protection for the future. Educational/interpretive products such as audio/visual materials, exhibits, brochures, etc., will be developed for the visiting public and for dissemination to schools, organizations, and user groups.

The Sanctuary headquarters will also serve as the public information center for the Sanctuary. The Sanctuary facility will serve as a focal point for the interested public to learn about the Sanctuary Program, its resources, its human uses, and the plans for its protective management. In addition to on-site educational materials, the Sanctuary will initiate coordination efforts with existing agencies and programs, such as the Massachusetts Bays Program, the Gulf of Maine Initiative, the Massachusetts Ocean Sanctuaries Program, and the educational programs of organizations such as the New England Aquarium, Center for Coastal Studies, Massachusetts Audubon Society, Manomet Bird Observatory, Cetacean Research Unit, and others, to establish a useful public information center on the Sanctuary. Information collected would include both technical and non-technical references.

The Sanctuary information center could also incorporate information on current research projects and their results; this listing would be updated regularly and made available to the interested public, scientists and decisionmakers. The listing would provide a record of scientific investigations with management implications; contribute to understanding use patterns in the Sanctuary; assist in identifying research areas requiring further attention; and ensure that Sanctuary managers are aware of area-specific studies. The resulting record of researchers with first-hand experience in the Stellwagen Bank area will also provide an important means of coordinating research through multi-disciplinary analyses.

The Sanctuary Program will encourage research directly by establishing a monitoring program, and by providing competitive funding for research. The monitoring program will focus on the overall health of the Sanctuary's resources, and on the level of effects of human activities occurring in the Sanctuary or close to it. Information from the

monitoring program will assist NOAA in ensuring well-reasoned management for the Sanctuary, as well as providing a means for assisting other authorities in carrying out their responsibilities in the area.

An important objective of the Sanctuary will also be to complete an inventory of historical or cultural resources existing in the Sanctuary. Very limited archeological research has been conducted in the Stellwagen Bank area, and research into and mapping of possible historical artifacts around the Bank area will be a necessary element of the Sanctuary program.

3. Boundary Alternatives

All five of the boundary alternatives presented in this document would provide protection to the Stellwagen Bank feature, and to the biological resources in its immediate vicinity.

Boundary alternative #1 (Figure #18) is the smallest of areas considered for Sanctuary designation, encompassing approximately 259 square nautical miles. The boundary forms a rectangular area close around the Bank feature itself. Most of the species found in the larger boundary alternatives are found within this alternative, with the possible exception of some of the fish and invertebrate species. However, important habitat and feeding areas are not included in this alternative.

The focus of this alternative is the protection of the Bank feature, as both habitat and causal feature in the production of internal waves and upwelling, which contribute to the biological productivity of the overall Stellwagen Bank and Basin area. Boundary alternative #1 would provide the means for protection of the Bank from the effects of activities such as sand and gravel extraction, and from the effects of offshore oil and gas development activities. Thus, the environmental consequences of boundary alternative #1 would be beneficial to the Bank feature itself; however, similar protection would not be extended to important habitat and human use areas surrounding the Bank.

Designation of boundary alternative #1 would not provide for the establishment of a natural link between the National Marine Sanctuary Program and the Commonwealth of Massachusetts' Ocean Sanctuary Program; or between the NMSP and the Massachusetts Bays/NEP. Additionally, designation of boundary alternative #1 would not permit the development of research or education/interpretive programs founded in a system-wide approach.

Boundary alternative #2 (Figure 19) encompasses approximately 453 square nautical miles of Federal waters. The boundary forms an approximately rectangular area around the Stellwagen Bank feature, with the southern border extended to coincide with the seaward limit of the Commonwealth's jurisdictional waters. The northern and southern borders of boundary alternative #2 are of approximately equal distance from the land points of Cape Cod (Race Point) and Cape Ann (Gloucester).

In addition to the entirety of the Bank feature, boundary #2 incorporates important marine habitats which result from, and are sustained by the cyclic upwelling and mixing processes caused by the presence of the Bank. Endangered and other species of cetaceans, pinnipeds, and numerous species of commercially-important fish and invertebrates depend on the habitats included in this boundary alternative. The most frequently-utilized feeding and nursery areas for the largest high-latitude population of humpback whales in the contiguous United States are included in this boundary alternative, as well as spawning areas for the humpbacks' primary prey, the American sand lance. This and other species of endangered large cetaceans attract large numbers of seasonal commercial and recreational whalewatch vessels, as well as significant scientific interest, to the area included in boundary alternative #2.

The commercial value of fisheries existing within boundary alternative #2 is also well-established, generating multi-million-dollar revenues to the regional economy. The tradition of fishing within the Stellwagen Bank system is historically the most important human activity in the New England region, dating from the time of the early Colonists.

The southern border of boundary alternative #2 coincides with the seaward limit of Commonwealth jurisdictional waters adjacent to the Cape Cod Bay Ocean Sanctuary; and is also tangential to waters designated by the Commonwealth as the Cape Cod Ocean Sanctuary, creating the potential for Federal-State coordination in ocean system management initiatives.

Boundary alternative #2 does not include any of the Massachusetts Bay Disposal Site (MBDS), as currently proposed for permanent designation by EPA. However, the MBDS (if designated at the site proposed by EPA) will be situated in close proximity to the Sanctuary. Designation of both sites will provide the opportunity for coordinated management considerations to enhance scrutiny of disposal activities, in particular from the perspective of Sanctuary protection.

The environmental consequences of boundary alternative #2 would be expected to be beneficial to a significant portion of the overall Stellwagen Bank system, due in part to the manageability of the site, and to the realistic potential for coordinated efforts with the Commonwealth of Massachusetts through its Ocean Sanctuaries Program, and through the Massachusetts Bays Program/NEP planning efforts.

Boundary alternative #3 (Figure 20), encompassing approximately 702 square nautical miles of Federal waters, is the largest boundary option considered by NOAA for Sanctuary designation. The boundary includes all of Stellwagen Bank, as well as additional submerged features, i.e., Tillies Bank and southern portions of Jeffreys Ledge, located north of Stellwagen Bank. Boundary alternative #3 also extends into Stellwagen Basin, west of the Bank feature.

This boundary alternative includes additional important habitat areas important to invertebrate, fish, and cetacean species, as well as human activities. The northwest border of this boundary alternative also is extended to coincide with the North Shore Ocean Sanctuary, designated by the Commonwealth. Adoption of this boundary alternative would therefore offer enhanced opportunities to ensure that management planning for resource protection, research, and education

would be developed from the perspective of ecosystem relationships and interdependence.

Inclusion of most or all of the MBDS within this boundary alternative would increase the possibility for direct and indirect environmental damage to Sanctuary resources or qualities; and could also potentially increase the administrative costs of Sanctuary management. Real costs to the Sanctuary could also be increased under this boundary alternative, if in the future clean-up of hazardous materials in the vicinity of the MBDS is required. While the environmental consequences of boundary alternative #3 would be anticipated to be beneficial to the Stellwagen Bank system overall, the increased costs to the Program may delay complete achievement of Sanctuary goals.

Boundary alternative #4 (Figure 21), encompassing 330 square nautical miles, is similar in configuration to boundary alternative #1, except that the western border extends further into Stellwagen Basin, to the west of the Bank feature. The configuration of this alternative is primarily premised on a Sanctuary which would protect the Stellwagen Bank feature; encompass the entirety of the Massachusetts Bay Disposal Site (MBDS); and otherwise be limited in its physical coverage. Alternative #4 was also suggested to NOAA for its consideration as an area identified by LORAN-C lines. This is the primary method utilized by many vessel operators of determining vessel location within the Sanctuary area.

Although alternative #4 would provide an area within which the opportunity exists for protection of the Stellwagen Bank feature, several important habitat areas for invertebrate, fish and cetacean species are excluded. Because of these exclusions, areas of concentrated human activities are not fully encompassed by this boundary alternative. Moreover, inclusion of the MBDS within Sanctuary boundaries may also increase the management responsibilities and costs to NOAA, related to possible clean-up requirements in the area of the MBDS. Under this alternative, therefore, the objective of system protection would not be fully possible, due to limitations in NOAA's ability to protect important resources and habitat areas; and to the potential for increased administrative and

management costs.

The environmental consequences of boundary alternative #4 would be of limited benefit to the resources and qualities of the overall Stellwagen Bank system.

Boundary alternative #5 (Figure 22), encompassing approximately 638 square nautical miles has been Congressionally designated, pursuant to P.L. 102-587, §2202(b). With the exception of its western border, the boundary configuration is the same as boundary alternative #2. The western border extends in a straight line from the southwestern corner of boundary alternative #2, to a west-northwestern point adjacent to Commonwealth jurisdictional waters off Cape Ann (Gloucester). The significant difference between this boundary alternative and alternative #3 is the exclusion of the MBDS currently proposed by EPA for permanent designation. This boundary option includes the habitat areas identified as important to marine mammals, fish, invertebrates, and seabirds. These areas also attract the majority of human activities involving the Stellwagen Bank area.

These "focused" areas of living resource activities within boundary alternative #5, representative of the high natural resource and human use values of the site, provide the basis for sound long-term "management of a conservation unit", as discussed in the NMSP's site identification criteria. The presence of identified management concerns affecting, or possibly affecting, the Stellwagen Bank system, also offer opportunities for coordinated efforts to achieve system conservation and management. Participation of the Commonwealth of Massachusetts, via its Ocean Sanctuaries Program, as well as the Massachusetts Bays Program/NEP, would provide the potential for effective, system-wide management, incorporating long-range planning, for the overall Massachusetts Bay/Stellwagen Bank system.

The administrative costs of boundary alternative #5 are anticipated to be less than those of alternatives #3 or #4, given the exclusion of the MBDS. Exclusion of the MBDS from the Sanctuary is also expected to be beneficial to the Bank system generally, as it eliminates the

possibility of disposal of dredged materials directly within the Sanctuary. The environmental consequences of boundary alternative #5, therefore, are anticipated to be beneficial to living and non-living resources of the Stellwagen Bank/Jeffreys Ledge/Tillies Bank system.

4. Management Alternative

Management alternative #1 would provide Sanctuary management from SRD headquarters in Washington, D.C. Implementation of Sanctuary programs would be coordinated via cooperative agreements and other arrangements with existing Federal, State, and/or regional programs in the area of the Sanctuary.

Although the economic consequences of this alternative are beneficial in at least the short-term, the long-range effects of adopting management alternative #1 would be detrimental to meeting Sanctuary Program goals and objectives. Because Program goals would be difficult to meet, it is likely that the Sanctuary's resources would be, over the long-term, adversely affected environmentally by this alternative.

Under the preferred management alternative #2, Sanctuary administrative functions and programs would be phased in, with initial emphasis placed on research and education/ interpretative activities. An independent administrative and management system would be housed in a NOAA-operated facility; and a Sanctuary Manager and administrative assistant would be identified soon after Sanctuary designation. Additional Sanctuary staffing, consisting of a research coordinator, an education coordinator and at least one enforcement officer, would be identified within a short period of time following initial staffing actions.

The Sanctuary staff would coordinate directly with other existing Federal and State agencies in the implementation of Sanctuary regulations. In combination with a Sanctuary Advisory Committee, the Sanctuary Manager would initiate the processes of informing the public and regional officials of the Sanctuary's mandate, regulations, and research and education programs.

This alternative is immediately cost-effective, and provides the framework for implementing Sanctuary programs within a short period of time. Additionally, the early on-site presence of a modest staff provides the opportunity to determine the feasibility of future "satellite" information centers at one or more locations. It is anticipated that the environmental consequences of this management alternative would be beneficial to Sanctuary resources and qualities, by the initiation of Sanctuary programs, followed by expanded program activities and facilities, as they are identified as necessary.

Management alternative #3 would establish a Sanctuary headquarters within six months following designation, and also provide full staffing, consisting of a Sanctuary Manager, administrative assistant, research coordinator, education coordinator, and one or more enforcement officials. Additionally, "satellite" information centers would be quickly established for the user and other interested public to provide information on the Sanctuary's mandate, regulations, and research and education programs.

This alternative provides for rapid implementation of the Sanctuary program, enhancing the potential for early coordination efforts and cultivation of public support for the Sanctuary. The full-time research and education coordinators would provide the Sanctuary Manager with the opportunity to focus on programmatic coordination with existing management authorities and resource protection efforts.

The initial costs of this management alternative are obviously higher than alternatives #1 or #2. Over the longer-term, these staff and facilities are likely to be necessary to a successful Sanctuary program at Stellwagen Bank; however, in the short-term, full staffing and multiple facilities immediately following Sanctuary designation are likely to be prematurely placed. Environmental benefits to Sanctuary resources and qualities are likely to be better served by implementation of staffing and facilities at a reasonable pace, established as determined necessary for the public.

Section II: Unavoidable Adverse Environmental or Socioeconomic Effects

No unavoidable adverse environmental or socioeconomic impacts due to implementation of the Sanctuary management plan are foreseen. To the contrary, it is possible that there will be a positive local socioeconomic impact due to increased awareness of the Stellwagen Bank's ecological value and visitation by the public.

Section III: Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Sanctuary designation will emphasize the importance of the natural and historical resources of the Stellwagen Bank area. The quality of the Stellwagen Bank environment is still relatively pristine, and the diversity and abundance of the ecosystem is relatively unaltered. National marine sanctuary designation will enhance public awareness of this system, and provide long-term assurances that its natural resources will be maintained for future use and enjoyment. Implementation of the preferred alternative will ensure that any changes in use patterns which degrade the Bank environment are monitored and possibly reversed or halted.

The education, research and resource protection programs will provide information, management and protection that develop a foundation for wise public use of the Stellwagen Bank area, and result in long-term productivity of the system. Similarly, information collected through the research program will assist marine natural resource managers in making better management decisions. Better management in turn will help resolve use conflicts and mitigate the adverse effects of human activities.

PART FIVE: LIST OF PREPARERS

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**PART SIX: LIST OF AGENCIES, ORGANIZATIONS, AND INDIVIDUALS
RECEIVING COPIES OF THE FEIS/MP**

Federal Agencies

Advisory Council on Historic Preservation
Council on Environmental Quality
Department of Agriculture
Department of the Air Force
Department of the Army
Department of the Army/Corps of Engineers
Department of Commerce
Department of Defense
Department of Energy
Department of Health and Human Services
Department of the Interior
Department of Justice
Department of the Navy
Department of State
Department of Transportation, U.S. Coast Guard
Environmental Protection Agency
Federal Emergency Management Agency
Federal Energy Regulatory Commission
Marine Mammal Commission
Maritime Administration
New England Fishery Management Council
Mid-Atlantic Fishery Management Council
National Science Foundation
Nuclear Regulatory Commission

Congressional

U.S. Senate Committee on Commerce, Science and Transportation
U.S. House of Representative Committee on Merchant Marine and Fisheries
Honorable Edward M. Kennedy, U.S. Senate
Honorable John F. Kerry, U.S. Senate
Honorable Gerry E. Studds, U.S. House of Representatives
Honorable Peter Torkildsen, U.S. House of Representatives
Honorable Edward J. Markey, U.S. House of Representatives
Honorable Joseph P. Kennedy II, U.S. House of Representatives
Honorable Barney Frank, U.S. House of Representatives
Honorable John Joseph Moakley, U.S. House of Representatives
Honorable Martin Meehan, U.S. House of Representatives
Honorable Richard E. Neal, U.S. House of Representatives
Honorable John Olver, U.S. House of Representatives
Honorable Peter Blute, U.S. House of Representatives
Honorable Robert C. Smith, U.S. Senate
Honorable Judd Gregg, U.S. Senate
Honorable Bill Zeliff, U.S. House of Representatives
Honorable Dick Swett, U.S. House of Representatives

Honorable William S. Cohen, U.S. Senate
Honorable George J. Mitchell, U.S. Senate
Honorable Thomas Andrews, U.S. House of Representatives
Honorable Olympia Snowe, U.S. House of Representatives

National and Regional Interest Organizations

American Association of Port Authorities
American Bureau of Shipping
American Cetacean Society
American Fisheries Society
Association for the Preservation of Cape Cod
Atlantic Cetacean Research Center
Atlantic Sportfishing Association
Boating Industry Association
Boston Fisheries Association
Boston Pilots
Cape Ann Vessel Association
Cape Cod Charterboat Association
Center for Coastal Studies
Center for Law and Social Policy
Center for Marine Conservation
Cetacean Research Unit
Coast Alliance
Conservation Law Foundation
The Cousteau Society
CZM Newsletter
Defenders of Wildlife
Environmental Policy Center
Environmental Defense Fund, Inc.
Environmental Law Institute
Friends of the Coast
Friends of the Earth
Gloucester Fisheries Association
The Greenpeace Foundation
International Wildlife Coalition
Manomet Bird Observatory
Marine Biological Laboratory
Marine Technology Society
The Marine Wilderness Society
Massachusetts Lobstermen's Association
Massachusetts Inshore Draggermen's Association
Massachusetts Marine Educators
Massachusetts Wildlife Federation
Massport Maritime Department
National Association of Conservation Districts
National Association of Counties
National Audubon Society
National Coalition for Marine Conservation, Inc.
National Federation of Fishermen

National Fisheries Institute, Inc.
National Ocean Industries Association
National Parks and Conservation Association
National Recreation and Park Association
National Wildlife Federation
Natural Resources Defense Council
New England Aquarium
New England Gillnetters Association
The Oceanic Society
Sportfishing Institute
Stellwagen Bank Commercial Fisheries Cooperative
The Sounds Conservancy
The Whale Center
Water Pollution Control Federation
Wilderness Society
Woods Hole Oceanographic Institution
World Wildlife Fund-U.S.

