Rhode Island And Southeastern Massachusetts

Dredging Needs Survey 1985-1995

Disposal Area Monitoring System Damos

DRAFT

Contribution 45

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US Army Corps of Engineers
New England Division

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RHODE ISLAND AND SOUTHEASTERN MASSACHUSETTS DREDGING NEEDS SURVEY

1985 - 1995

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APPENDIX

1.0 INTRODUCTION

Considerable concern has been expressed during the last several years by operators of water dependent businesses (ports and marinas) and environmentalists over the safe disposal of dredged material along coastal Rhode Island and Southeastern Massachusetts. Two previous reports, the RI Dredging Needs Survey (1980-1985) and the New England River Basins Commission Long Range Dredging Study (1981-1990) have suggested that there was a need for dredging operations in the southeastern New England region. The concern over the apparent need for dredging and the safe disposal of dredged materials has raised the issue of the designation of a regional disposal site, either on land, in open water, or both.

To further define the need for a regional disposal site, it was deemed necessary to reassess the dredging needs on a regional basis. The objectives of this survey are the identification, classification, and projection of anticipated dredging needs for a ten year period from 1985-1995. This is part of a joint effort by EPA Region I and the New England Division of the Army Corps of Engineers. The results of this study will be incorporated into an EIS currently under development by EPA to facilitate the formal designation of a regional disposal site(s). The geographical study limits (Fig. 1-1) for this study are:

Western Limit	- Rhode Island/Connecticut State Line
Eastern Limit	- From RI/MA border east to outer Cape Cod area to Pleasant Bay (inclusive)
Islands	- Martha's Vineyard, Nantucket Island and Block Island
Other	- Cape Cod Canal from Buzzard's Bay to Sagamore Bridge

The study builds upon and extends the information and the area of the original study which the University of Rhode Island's Marine Advisory Service completed several years ago. This study has the following objectives:

1. Identification and projection of the magnitude of 1985-95 dredging needs in Rhode Island and Southeastern Massachusetts coastal areas.

2. Identification of locations where this need is most pressing.

3. Identification of past (1981) perceived need for dredging and work actually accomplished between 1981 and the present in Rhode Island.

4. Identification of user group perceptions of quality of dredged material and preferred means of disposal.

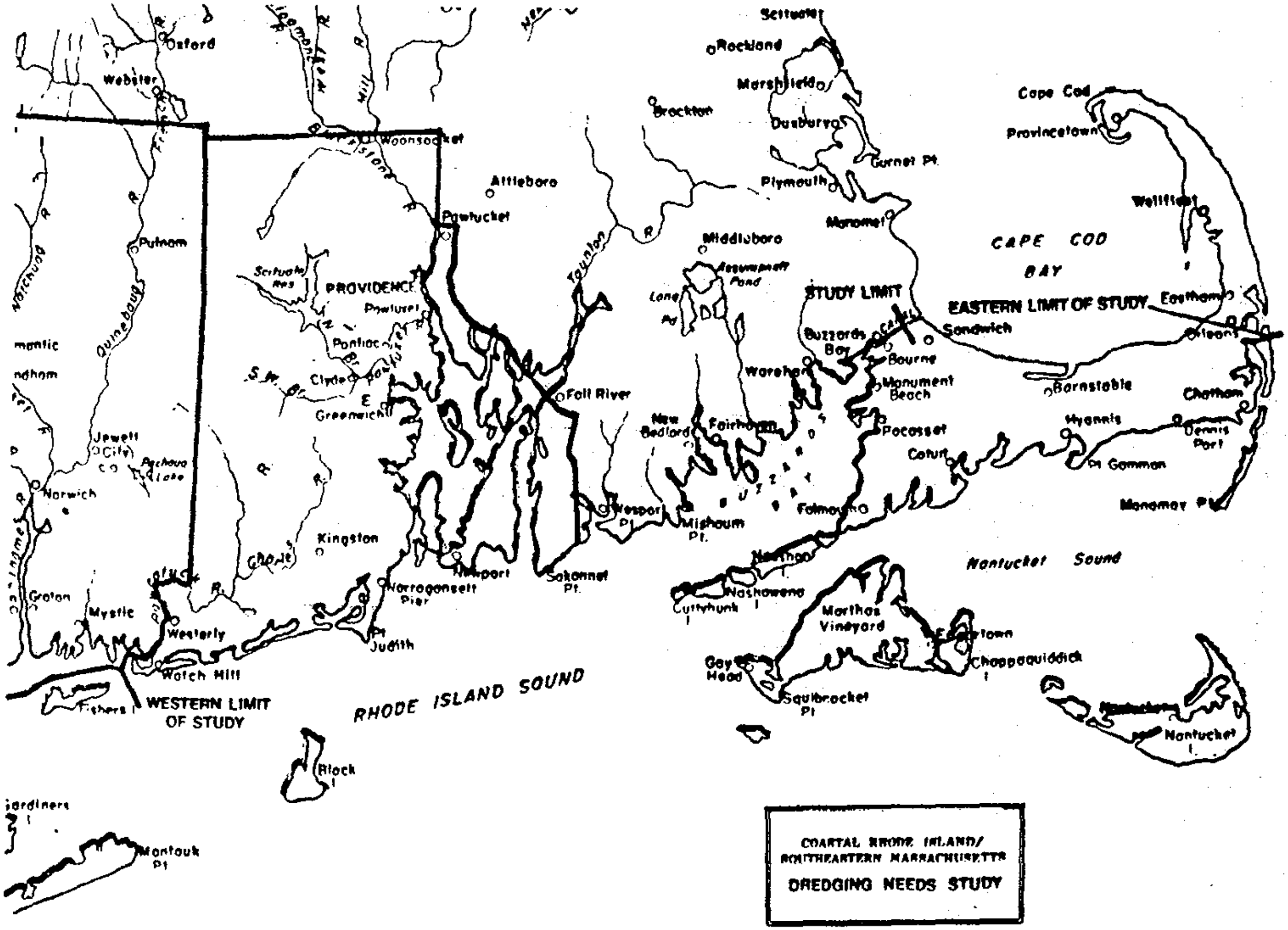

Figure 1-1. Dredging Needs Study Area

5. Identification of perceptions of users related to
   (a) regulatory system,
   (b) impact on existing and future operations,
   (c) preferred means of disposal.

6. Identification of qualitative characteristics of dredged material that may be expected to be dredged during the study period.

2.0 METHODS

The procedures used in this effort closely followed those which were used in a similar study undertaken in 1980. The previous project was undertaken by the Marine Advisory Service at URI and estimated the dredging needs between 1980 and 1985. The information necessary to cover the 1985-95 period was basically obtained in two ways. First, permit records at the New England Division of the Army Corps of Engineers for the period 1978-1984 were reviewed. From these records, a list was compiled of those persons, organizations, towns, etc. that had received dredging permits and hence would be likely to dredge in the future. Secondly, reference publications such as the Boating Almanac, Waterways Guide and Coastal Zone Management (CZM) Atlas were used used to generate a comprehensive listing of boatyards, marinas, yacht clubs, and municipal coastal facilities. From these two lists, a master list was developed for mailing purposes.

A preliminary questionnaire (Table 2-1), consisting of fifteen questions, was drawn up. Since no formal survey pretesting was possible, in part because a complete census was intended, a few additional questions were added to the RI Survey subsequent to finalization of the survey instrument. Since the summer is the busiest time for marina operators, boatyards, and sail clubs, the list of questions was mailed out prior to the actual interviews. The intent was to minimize the time required to complete the interviews, most of which were conducted by telephone. Approximately one week after the questionnaires were mailed out, the interviews began. To minimize bias, all interviews were done by one person, although when specific questions arose, the principal investigator recontacted the respondent. In a few cases, the interviews were conducted face to face, necessitating some travel. When multiple State or Federal projects, (either ongoing or projected) were involved, the interviews were conducted in person. Only one private respondent requested a personal interview, and since several proposed projects were involved, we felt it more efficient to obtain this information in person.

A total of 295 facilities were identified in Rhode Island (Appendix: Table 1) and 212 in Massachusetts (Appendix: Table 2). In the RI survey, only 10 firms, usually consisting of small marinas and boatyards, refused to participate or could not

Table 2-1

RI-MA Dredging Needs Survey, 1984

1. Do you plan to dredge your facility within the next ten years?
   Yes No
2. If not, why not?
   No physical need
   Cost too high
   Regulatory system too involved
   Other
3. If you do plan to dredge, is this to be considered
   Expansion of existing facilities
   Maintenance
4. If you do plan to dredge, which part of your operation will this benefit or improve?
   Berths or slips
   Channels
   Mooring basins
   Ramps/Marine RR/Piers
5. How has your operation been affected by your need to dredge?
   Berths or Slips
   Moorings
   Channels
   Ramps
6. If you do not dredge within the next ten years, how will this affect your operation?
   Berths or slips
   Moorings
   Channels
   Ramps/Marine RR/Piers
7. How much material must be removed?
8. How will it be disposed of?
   On land
   In water near operation
   In water away from operation, please cite the specific waterbody if known.
9. How would you prefer to dispose of this material?
10. Have any tests been made to determine the composition or quality of the sediments?
11. Please explain what was found.
12. Based on your own observation, how frequently do you expect to dredge in order to maintain your current operation?
13. On what basis did you determine this need?
14. Which of the following best characterizes your operation?
    Port, ships and terminal facility
    Recreational Club
    Commercial Marina or Boatyard
    Commercial Fishing Port
    State Facility
    Municipal Facility
    Private
15. What is the limiting distance beyond which open water disposal would be clearly impractical for your project?

be contacted. This represents a remarkably high success rate, approaching 97%. In Massachusetts, of the 212 facilities identified, 103 or 77% responded to the survey. While no specific question was included to ascertain the reason for the relatively high response in RI, we believe that industry awareness related to the issues of dredging and coastal zone management, and the great importance which the state government has placed on both tourism and boating, has created an environment of cooperation between the private and public sectors.

At the termination of the interviewing process, all information was coded and processed at the University of Rhode Island, where the Statistical Analysis System (SAS) was used for the subsequent analysis. This program is especially useful when the data consists of both parametric and nonparametric data. Plotting and graphing was accomplished using CALCOMP plotting routines. Printouts of the raw data appear in Appendix: Tables 3 and 4.

Immediately following this section is an overview summarizing the data and information for both states. Past dredging activities within the state (covering the period 1981-1985) are addressed, followed by an assessment of the perceived needs during the next ten years (1985-1995).

The next section disaggregates the information by region and is accompanied by a series of maps which seek to identify both past and future (anticipated) dredging needs by the respondents.

In reading the report, it should be kept in mind that the information provided by the respondents was based on recollection, rough estimates, and obtained generally without the benefit of detailed engineering and benefit/cost estimates.

3.0 DREDGING NEEDS

3.1 Past Dredging Activities, 1981-1985

The types of facilities which responded to the survey are shown in Table 3-1. In the ensuing analysis, commercial marinas and boatyards consist of private for profit corporations servicing boating needs both on land and in the water. Municipal facilities include piers and ramps and such other facilities operated by the coastal community, servicing predominantly recreational boating, although commercial fishing may also be serviced by these facilities. The distinction between these and fishing ports is one of degree. A fishing port (Galilee and, to a lesser extent, Newport) is a specialized function created and primarily operated to service the state's fishing industry.

Private facilities include non-profit privately owned structures which could serve more than one user, but which have not formally been incorporated. State facilities consist

Table 3-1

Categories of Responding Facilities

Respondents	RI #	RI % of Total	MASS #	MASS % of Total
1. Commerical Marinas and Boatyards	99	34.7	77	47.2
2. Municipal Facilities	45	15.8	20	12.3
3. Private Facilities	33	11.6	32	19.6
4. State Facilities	29	10.2	1	.6
5. Port Authorities/Shipping and Terminal Facilities	27	9.5	3	1.8
6. Yacht, Fishing and Other Recreational Clubs	25	8.8	10	6.1
7. Federal Projects	19	6.7	12	7.4
8. Fishing Ports *	0	0	0	0
9. Other	8	2.7	8	4.9
Total Number of Respondents	285		163	

* While several ports exist within the survey area, no dredging need was identified

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primarily of ramps, slips and mooring areas which are operated principally to service the recreational boating demand. Port authorities, shipping and terminal facilities include both commercial facilities, and projects intended to service the commercial shipping industry.

Yacht, fishing and other recreational clubs include organizations created to service the needs of privately organized groups seeking recreational access to the water.

Federal projects are those which, while initiated by the general public, are deemed to have wider social value in which the benefits are accruing to the general public and not to an individual, organization or corporation.

Most of the respondents with identified needs consisted of commercial marinas and boatyards (RI - 35.2%; MA - 48.0%), yacht clubs and other water based recreational organizations, reflecting the heavy emphasis which both states have placed on developing their coastal oriented tourism and boating activities (Table 3-1). This is especially evident in Massachusetts, where the large number of private facilities (20.1%) reflects the growing tourist industry of Cape Cod. These facilities cater to large pleasure craft and the recreational boating needs. The next largest category consisted of projects which tend to favor the fishing industry. Most municipal facilities (16.0% in RI and 12.6% in MA) are geared toward providing the fast growing fishing industry with sufficient berth space. In Rhode Island, this demand has manifested itself in two ways. First, the fishing fleet has increased numerically. One estimate suggests that since the passage of the Fishery Conservation and Management Act, which extended the previously protected fishing zone to 200 miles, the fleet has grown by approximately one third (R. Boragine, personal communication, Sept. 1984). Second, a very distinct evolution is taking place where the tendency has been to move from relatively small inshore day boats to offshore trawlers and other multi-purpose vessels which are better capable of utilizing the fish stocks located offshore.

Both developments appear to have put severe strains on many shore facilities which traditionally have serviced the fishing fleet. Greater numbers of fishing vessels require more berth space, while larger vessels often require deeper channels; these may not be available in rapidly silting locations or those facilities which are able to service only the smaller inshore vessels.

Another major group identified particularly in Rhode Island was commercial shipping, which makes up slightly less than 10% of the total. While this industry has undergone some changes during the past few years, these have not been as dramatic, and may have reduced the relative demand for dredging projects within the study area. Providence's most important cargo used to consist of oil products. With decreasing demand, followed by a greater dependence on truck transport, a significant amount of oil related import/export cargoes to Providence now come by way of shallow draft tanker barges. Considerable efforts have been made to expand upon the Port of Providence general cargo capacity especially by attracting container shipping and automobile cargoes. At best, these efforts have been only marginally successful, and appear not to have been adversely affected by the need for deeper channels, berths and turning basins.

Another dimension of potential impact to operators relates to the specific facilities which would be affected in the absence of dredging. A total of 165 projects in Rhode Island were cited as having been adversely impacted by not being dredged during the period 1981-1984, while in Massachusetts approximately half that number (84) cited adverse impacts (Table 3-2).

Table 3-2 reinforces the tentative conclusions drawn from information contained in Table 3-1. Recreational boating in its many forms seems to be more impacted by the absence of dredging than either commercial fishing or shipping. Several factors may account for this. First, most berths and slips are located in relatively sheltered bays, inlets, ponds and rivers, where natural sedimentation rates would be expected to be higher. Since wave action and currents are weaker in these areas, seaward accretion and filling proceed at a faster rate compared to less protected waterbodies where active erosion is most often the case. Another consideration which may be even more important relates to previously dredged areas which may become sinks. Sedimentation sinks are areas in which sediments will tend to be deposited. Since the ocean bottom can be viewed as a surface in steady state affected by such factors as wave action, currents, and sediment load, dredging activities are often only temporary solutions. Most dredged areas will tend to revert back to this original state, given that the forces creating them in the first place have not been altered. While there are exceptions, both in the rate of filling and the overall need for dredging, most projects can expect to require maintenance dredging in the future.

One question was included in the surveys seeking to determine the amount of material (in cubic yards) the respondents dredged during the 1981-1984 period. While virtually no significant dredging has occurred in Massachusetts during this period, a modest amount of dredging has taken place in Rhode Island, totalling 343,737 cubic yards (Table 3-3). There are probably several reasons for this. There is a history of public concern about the potential adverse impacts caused by dredging. To a considerable extent, this concern was in response to several pieces of environmental legislation which addressed coastal environmental projects, including the National Environmental Policy Act (NEPA), Coastal Zone Management Act (CZMA), Clean Water Act (CWA), and the Rivers and Harbors Act (RHA), as amended. There is no doubt that the regulatory system which was created in part to deal with dredge and fill projects has delayed and/or discouraged several respondents from proceeding with projects.

Table 3-2

Functional Impacts to Facilities Because of No Past Dredging

1981-1984

# of Respondents Citing Impacts On:	RI #	RI % of Total	MASS #	MASS % of Total
Berths & Slips	53	18.6	32	19.6
Mooring Area	1	0.3	3	1.8
Channels	29	10.2	19	11.6
Haul-Out Facilities	27	9.5	7	4.3
Berths, Slips & Channels	30	10.5	5	3.1
Berths, Slips & Haul-Out	10	3.5	0	0
Mooring Areas & Channels	3	1.0	3	1.8
Channels and Haul-Out Facilities	4	1.4	3	1.8
Berths, Slips, Mooring Areas & Channels	2	0.7	3	1.8
Berths, Slips, Channels and Haul-Out Facilities	5	1.7	3	1.8
Berths, Slips, Mooring Areas, Channels & Haul-Out Facilities	1	0.3	6	3.7
Facilities Not in Need of Dredging During 1981-1984	120	42.1	10	6.1
No Response	0	0	69	42.3
Totel Number of Respondents	285		163	

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Table 3-3. Volume of Past Dredging Operations by Facility (yd^3) during 1981-1984.

	RI	MASS
Port Authorities & Shipping Terminals	88,500	0
Recreational Clubs	3,700	0
Commercial Marinas	137,160	0
State Facilities	25,227	0
Municipal Facilities	0	0
Private Facilities	1,150	0
Federal Facilities	88,000	0
TOTAL	343,737	0

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Again, the dredging volumes of the commercial marinas and boatyards exceed those of any of the other identified groups, followed by federal and commercial ports and terminals. The dredging of the remaining groups were minimal, with the exception of state facilities, and absent for both the fishing ports and the municipalities. The absence of dredging projects for the two latter categories may relate to the hard fiscal conditions confronting the municipalities during this period and the expectation by the commercial fishing community that dredging is the obligation of the public agency responsible for operating the port.

Two questions addressed problems related to both past and future dredging needs and concerned the quality of the dredged material. This issue has received as much attention as the quantity of the dredged material, and may, in some cases, have a greater bearing on environmental impact.

Table 3-4 sought to identify the number of respondents who had undertaken qualitative tests of the sediments, while Table 3-5 attempts to identify the nature of the sediment without seeking to determine whether and to what degree these sediments were polluted. The sediment testing question is a very important one, although there was considerable reluctance or, more likely, inability to respond to this question (35% in MA, 10.8% in RI). Pollution levels would have to be determined through detailed sedimentation analysis.

With this in mind, slightly less than one quarter to one third of the projects included in our analysis had tests undertaken with an additional 10-12% not being sure. The balance, 55 and 64% in Massachusetts and Rhode Island, respectively, either had not conducted tests or did not respond to this question.

Five major sediment types make up about 2/3 of the projects included in the Rhode Island analysis, with mud, sand and silt constituting the predominant types. Shells, while a distinct sediment type, are found only in conjunction with two or more of the primary sediment types (Table 3-5). The same general sediment types were identified in the Massachusetts survey, however, sand is by far the predominant class (60.5%). This is not surprising, considering the high energy physical regime of southern Cape Cod.

3.2 Future Dredging Needs

In the Rhode Island survey, the projects included in the analysis were about evenly divided between those anticipating a demand for dredging during the next ten years (47.0%) and those not anticipating any such needs (47.7%). In Massachusetts, there were a higher number of respondents anticipating dredging, 64.2%, while 33.3% had no dredging needs during the next ten years. Approximately 5% or less were unable to respond to this question, probably because a sedimentation history has not yet been established (Table 3-6).

Table 3-4. Impact of Sediment Testing Prior to Dredging

	RI		MASS	
	#	% of Total	#	% of Total
Number of Respondents Who Had Undertaken Sediment Tests	69	23.4	55	33.7
Number of Respondents Who Were Not Sure	37	12.5	17	10.4
Number of Respondents Who Had Not Undertaken Sediment Tests	157	53.2	34	20.9
Number of Respondents Who Did Not Respond	32	10.8	57	35.0
TOTAL	295	100.0	163	100.(

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Table 3-5

Predominant Sediment Composition By Type

Type	#	% of Total Responding	#	% of Total Responding
Mud	75	30.1	2	4.4
Silt	25	10.0	5	11.1
Sand	47	18.9	26	57.8
Gravel	11	4.4	1	2.2
Rock	7	2.8	1	2.2
Mud & Silt	10	4.0	1	2.2
Mud & Sand	25	10.0	4	8.9
Silt & Sand	13	5.2	5	11.1
Other (Shells etc)	36	14.4	0	0
TOTAL RESPONDING	249	99.8	45	100.0

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Table 3-6

Projected Dredging Needs 1985-1995

	RI		MASS	
	#	% of Total	#	% of Total
Number of Respondents Anticipating Dredging Between 1985-1995	132	47.0	104	63.8
Number of Respondents Not Anticipating Dredging Needs Between 1985-1995	134	47.7	54	33.1
Number of Respondents Unsure As to Future Dredging Needs	15	5.3	5	3.1
TOTAL RESPONDENTS	281	100.0	163	100.0

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Of those facilities which expect to dredge during the next decade, nearly half were marinas and boatyards, followed by private, municipal, and federal project areas; yacht, fishing, and other recreational clubs; state facilities; and commercial ports and terminals. Fishing ports again played a minor role in both states (Table 3-7).

Tables 3-8 and 3-9 identify the potential impacts to those projects that require future dredging in the event that no dredging occurs. The data included in Table 3-6 suggests that 132 and 104 projects in RI and MA, respectively, will require further dredging, yet Table 3-8 indicates that a greater number of the projects will be severely affected without future dredging. While these two tables may appear inconsistent, the question on which Table 3-8 was based was speculative, and did not, a priori, infer a need. Undoubtedly, all of the projects included in this study are also included in Table 3-6. A number of additional respondents who answered this question do not presently anticipate a need during the next ten years. With these qualifications, it appears that more dredging projects will be required related to all aspects of recreational boating (Table 3-9), which tends to reinforce information collected from past dredging operations. Berths and slips, channels and a combination of the two are the predominant impact types.

In Rhode Island, total demand for dredging of 3.7 million cubic yards was identified with nearly two thirds of the volume related to expansion of existing facilities and the balance identified as maintenance dredging (Table 3-10). In Massachusetts, that demand is similar with 87.3% of the dredging needs necessary for expansion. Table 3-10b compares federal versus non-federal projects. It should be noted here that estimates of sediment to be dredged are based only on the perceptions of the facility operator. They were given no guidelines as to dredging methods or how they should make estimates. Where hard data were not available, they should be viewed as rough estimates.

Several questions dealt with the quantity of material to be dredged. As would be expected, future estimates are considerably higher than past dredging activities would suggest. Several reasons may account for this. First, the time horizon of the two periods (past and future) is not identical. The past period only covered five years, while the future dredging needs cover a full ten year period. Perhaps more importantly, the estimates were made without including any constraints such as costs, time, or perceived permitting delays on the part of the respondent. Finally, in assessing the overall demand for dredging, it should be kept in mind that these estimates probably include projects which would have been initiated and completed in the past, had the need for dredging been recognized earlier and had there been a regional disposal site.

Table 3-7

Facilities Expecting Dredging Between 1985-1995

	RI		MASS	
	#	% of Total	#	% of Total
Port Authorities & Shipping Terminals	8	6.1	3	2.9
Recreational Clubs	12	9.2	4	3.9
Commercial Marinas & Boatyards	65	49.2	44	41.7
Fishing Ports	1	0.8	0	0
State Facilities	11	8.3	1	1.0
Municipal Facilities	9	6.8	16	15.5
Private Facilities	13	9.8	22	21.4
Federal Projects	13	9.8	12	11.7
Wholesale Fish Processing Facility	0	0	2	1.9
TOTAL	132	100	104	100.0

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Table 3-8

Potential Adverse Impacts in the Event of No Future Dredging: 1985-1995

Respondents	RI #	RI % of Total	MASS #	MASS % of Total
Number of Respondents Citing No Adverse Impacts	95	33.6	29	18.7
Number of Respondents Citing Adverse Impacts	188	66.4	126	81.3
Total Number of Respondents Answering This Question	283	100.0	155	100.0

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Table 3-9

If No Future Dredging - Types of Functional Impacts

	RI		MASS	
	#	% of Total	#	% of Total
Berths & Slips	62	35.5	32	34.8
Moorings	2	1.1	5	5.4
Channels	27	15.5	14	15.2
Haul-out Facilities	23	13.1	10	10.9
Berths, Slips & Moorings	1	0.6	5	5.4
Berths, Slips & Channels	31	17.7	6	6.5
Berths, Slips & Haul-out Facilities	13	7.4	5	5.4
Moorings & Channels	5	2.9	2	2.3
Channels and Haul-out Facilities	2	1.1	3	3.3
Berths, Slips, Moorings & Channels	2	1.1	2	2.3
Berths, Slips, Channels and Haul-out Facilities	6	3.4	3	3.3
Berths, Slips, Mooring Areas, Channels & Haul-out Facilities	1	.6	5	5.4
TOTAL	175	100.0	92	100.0

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Table 3-10A

Projected Volume of Dredged Material By Maintenance vs. Expansion or New Work.

	RI		MASS	
	%	Mill yd^3	%	Mill yd^3
Maintenance of Existing Facilities	35.1	1.3	10.9	0.6
Expansion of Existing Facilities	64.9	2.4	87.3	4.8
Both Maintenance & Expansion	0	0	1.4	0.1

Table 3-10B

Federal Projects vs. Non Federal

	RI				MASS	
	#	Past	#	Projected	#	Projected
Federal	(3)	88,000	(12)	495,500	(10)	5,075,740
Non Federal	(35)	227,106	(35)	3,101,223	(49)	649,465

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Since this study surveyed the projects without allowing for any of the constraints listed above, it is highly likely that the figures on which this report is based are larger than the actual need. To assess this problem, it was decided to review the results of the 1981 Needs Study and compare these estimates with the projects actually undertaken during the 1980-1985 period. The actual dredging which did take place during the 1980-1984 period was considerably smaller than would be expected compared to the amount dredged prior to 1980 and may even be proportionately less than can be expected during the 1985-1995 period. Reasons for this are that permitting procedures have become relatively easier and many from the fishing industry and the environmental coalition have come to recognize the need to regularly dredge of legitimate marine dependent businesses.

The 1981 study identified the need to dredge 1,683,902 yd^3 in Rhode Island, or about 45% of the 3.7 million yd^3 projected in RI for the 1985-1995 period. However, only 343,727 yd^3 of the 1981 identified need were actually dredged. This represents about 20% of the amount the respondents identified. Considering the very liberal assumptions and the many unknown factors influencing the needs for future dredging in Rhode Island, one should not infer that this coefficient (.20) will hold for the future. Chances are good that the actual amount of material dredged will be greater than 750,000 yd^3 (representing 20% of 3.7 million yd^3) and less than the maximum amount identified in the present study.

Of the 120 Rhode Island projects included in this part of the analysis, berths and slips again account for the largest group of projects and largest volume of material to be dredged (Table 3-11). This table is interesting because of the high correlation between the number of projects in each category and the amount of anticipated material to be dredged. Of the four distinct functional categories, berths and slips, channels, mooring areas, and haul-out facilities, only the haul out facilities account for a disproportionately small percentage of material (.8%) compared to the number of identified projects (12 or 10%).

In the Massachusetts survey (Table 3-12), channel maintenance accounts for 83.8% of the anticipated dredging volume. These estimates are not directly related to recreational boating needs, as in Rhode Island, but with the channel maintenance and improvement of Fall River Harbor.

What these tables do not address is the relationship between projects. Thus, no dredging immediately surrounding existing berths or slips will accomplish its intended purpose if the channel leading to the marina or shipping terminal is so shallow as not to service the intended clientele. Similarly, it does not make a great deal of sense to dredge haul-out facilities if the marina or yacht club equipment is unable to handle boats the size of which the haul-out facility is intended to service. Both types of projects should be identified as expansion.

Table 3-11

Projected Volume of Dredged Material By Type of Function - Rhode Island

	RI			
	#	% of Projects	yd^3	% of Volume
Berths & Slips	46	38.4	1,373,353	36.5
Channels	8	6.7	395,890	10.5
Mooring Areas	1	.8	25,000	.7
Haul-out Facilities	12	10.0	30,090	.8
All of the Above	1	.8	58,000	1.5
Berths, Slips & Channels	22	18.3	1,594,715	42.4
Berths, Slips & Moorings	1	.8	4,500	.1
Berths, Slips & Haul-out Facilities	17	14.2	79,700	2.1
Channels & Moorings	3	2.5	80,000	2.1
Berths, Slips, Channels, & Haul-out Facilities	9	7.5	116,000	3.1
TOTAL	120	100.0	3,757,248	

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Table 3-12

Projected Volume of Dredged Material By Type Of Function - Massachusetts

	MASS			
	#	% of Projects	yd^3	% of Volume
Berths & Slips	17	34.7	27,625	0.5
Channels	5	10.2	4,345,000	83.8
Mooring Areas	2	4.1	1,400	0.02
Haul-out Facilities	4	8.2	4,290	0.1
All of the Above	2	4.1	15,600	0.3
Berths, Slips & Channels	5	10.2	8,950	0.2
Berths, Slips & Moorings	1	2.0	10,000	0.2
Berths, Slips & Haul-out Facilities	2	4.1	6,000	0.02
Channels & Moorings	1	2.0	5,000	0.1
Channels & Haul-out	2	4.1	10,100	0.2
Haul-out, Berths & Slips	1	2.0	10,000	0.2
Berths, Slips, Channels & Moorings	2	4.1	38,500	0.7
Berths, Slips, Channels & Haul-out	1	2.0	534,470	10.3
Berths, Slips, Moorings & Haul-out	1	2.0	10,000	0.2
Channels, Moorings & Haul-out	3	6.1	155,000	3.0
TOTAL	49	100.0	5,181,935	

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These comments are directly related to the types of impacts a given facility would confront in the event that no future dredging were to take place. No economic impacts were sought even though in the final analysis such information may be necessary and of utmost importance to the individual facility. Such analysis simply was not possible given the very limited time available. Instead, information related to the type of impacts which would occur was sought in the RI survey as an additional feature. This information appears in Table 3-13. Not surprisingly, all responses are negative in the sense that some action would be required by the operator to cope with the conditions at hand. Of equal importance is that all actions imply some adverse impacts to the operator of the facility and perhaps to the consuming public as well.

More than 43% mentioned moving from larger to smaller boats as one coping mechanism. A surprisingly small number thought of moving from sail to power, which might be the one option that would minimize the economic impacts. Since sailboats have deeper drafts compared with powerboats of equal length and cost, a switch from one to the other may minimize the impacts associated with a shallow waterbody. Some impacts would result however, as marinas are beginning to cater to one type as opposed to the other. Boating, while involving an increasingly broad spectrum of the general public, is becoming more and more specialized. Sailboats require services (sail lofts, riggers and haul-out facilities) which are either non-existent or different for power boats. Similarly, power boats have greater needs for some services which are smaller or absent in the case of sailboats. To change a facility from catering to one type of boat group to another may require an extensive investment, which many marina operators would find difficult if not impossible to make.

Approximately 43% of the respondents from both states who answered the question of favored disposal site preferred to discharge this material on either private or public land. A number indicated that they would prefer to dispose of it within their own operations as part of fill for extending bulkheads or other uses. A slightly higher proportion of Rhode Island respondents, 26% versus 17.4% in Massachusetts, felt that disposal in water would be preferred. Responses from both areas were about evenly divided between those who prefer disposal in water adjacent to the site and those who prefer disposal in the water but "away" from the project. Some 17% in Rhode Island and 31% in Massachusetts were uncertain about the disposal option. Slightly more than 10% cited more than one disposal alternative (Table 3-14).

The majority of respondents in each state saw the need to dredge at least every ten years (Table 3-15), with the urgency for dredging more evident in Massachusetts (84.3%). This is probably because very little dredging has occurred in Southeastern Massachusetts over the last five years.

In response to the question regarding the maximum limiting distance for disposal, there were no responses in the

Table 3-13

Types of Impacts with No Future Dredging - Rhode Island

	RI #	RI % of Total
Facility would have to move from larger to smaller boats	52	43.3
Facility would have to move from sail to power boats	3	2.6
Overall limit to growth	25	20.9
Facility would have to move from larger to smaller boats, as well as move from servicing sail to power boats	8	6.6
Facility would have to move from larger to smaller boats which would limit growth opportunities for the facility	8	6.6
Facility would have to close	24	20.0
Total number of respondents	120	100.0

SAIC

Table 3-14

PREFERRED DISPOSAL OPTIONS

	RI		MASS	
	#	%	#	%
Public Land	27	18.0	28	26.9
Private Land	37	24.7	17	16.3
In Water Near Operation	20	13.3	9	8.7
In Water Away From Operation	19	12.7	9	8.7
Uncertain	26	17.3	33	31.7
Would Choose Cheapest Disposal Site	5	3.3	0	0.0
Multiple Response	16	10.7	8	7.7
Total Number of Respondents	150	100.0	104	100.0

Table 3-15

FREQUENCY OF FUTURE DREDGING NEEDS

	RI		MASS	
	#	%	#	%
More Frequent than every 5 years	27	17.5	39	47.0
5.1 - 10 years	66	42.9	31	37.3
10.1 - 15 years	22	14.3	8	9.6
15.1 - 20 years	25	16.2	3	3.6
Every 20 years or more	14	9.1	2	2.4
Total Number of Respondents	154	100.0	83	100.0

Rhode Island survey. In Massachusetts, responses were given in only 16 townships (Table 3-16) and indicated an average mean limiting distance of 11 miles.

4.0 REGIONAL ANALYSIS

4.1 Rhode Island

The regional analysis is divided into three parts. The first consists of a discussion and description of the demand by townships. The second part is a brief regional analysis based on the clustering of boatyards, fishing ports and other facilities. Since the development of these facilities is based on the physical characteristics of the shoreline, the distribution of the facilities does not necessarily follow established municipal boundaries. Finally, the raw data on which this analysis is based is presented both graphically and in tabular forms, in Appendix: Table 3.

The information on which this analysis is based has been assembled in a series of comparative tables to summarize the pertinent data across the 21 municipalities which make up the Rhode Island shoreline. These are presented in Tables 4-1 through 4-11 on the following pages.

As indicated in Section 2.0, a very distinct regional distribution is presented in the type of water-dependent facilities with a demand for dredging. Ports and terminals are concentrated at the head of Narragansett Bay (Providence and East Providence) and the Sakonnet River (Tiverton). Commercial marinas and the few fishing ports are in the southern part of the state. Recreational boat clubs, private, municipal and federal facilities are distributed nearly randomly along the shoreline.

4.1.1 Geographical Areas

Charlestown

Only seven operators were identified in Charlestown. The reader is cautioned when interpreting the relative responses since a few answers in one category may unduly bias the analysis. State facilities comprise the largest category with commercial boat facilities (marinas and boatyards) and private respondents making up the balance (Table 4-1). The sedimentation problems associated with the Charlestown Breachway and the considerable flood tidal delta created in the pond represents one of the major coastal issues at the present time. Five of the seven respondents (71%) expected to require dredging within the next 10 years (Table 4-2). All but one respondent had been adversely affected by the absence of dredging during the 1980-1984 period, with channels and haul-out facilities being especially impacted (Table 4-3). Similarly, all respondents expect to require some dredging within the next ten years. The problem of inadequate channel depths appears to be the major problem, followed by inadequate depths at haul-out facilities, and around the berths and slips (Table 4-4). In the event of a "no future dredging"

Table 3-16

Minimum, Maximum, and Mean Limiting Distance for Disposal of Those Townships Responding

	Mean Distance	Maximum Distance	Minimum Distance
Bourne	28.5	50.0	7.0
Chatham	13.3	20.0	0.0
Edgartown	20.0	20.0	20.0
Fairhaven	25.0	30.0	20.0
Harwich	2.0	2.0	2.0
Hyannis	2.5	5.0	0.0
Marion	12.5	20.0	5.0
Mattapoisett	7.5	10.0	5.0
Nantucket	5.0	5.0	5.0
Onset	0.0	0.0	0.0
Osterville	1.5	3.0	0.0
S. Dartmouth	5.0	10.0	0.0
S. Yarmouth	10.0	10.0	10.0
Vineyard Haven	15.0	15.0	15.0
Wareham	15.0	15.0	15.0
Falmouth	12.5	25.0	0.0

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Table 4-1. RI - Projection by Type of Facility

Township	Ports Terminals #	Ports Terminals %	Boat Clubs #	Boat Clubs %	Commercial Marinas #	Commercial Marinas %	Fishing Ports #	Fishing Ports %	State #	State %	Private #	Private %	Federal #	Federal %	Municipal #	Municipal %
Westerly	0	0	3	18.8	11	68.8	0	0	0	0	0	0	1	6.3	1	6.3
Charlestown	0	0	0	0	2	28.6	0	0	3	42.9	2	28.6	0	0	0	0
South Kingstown	0	0	2	8.7	15	65.2	0	0	1	4.4	1	4.4	1	4.4	3	13.0
Narragansett	0	0	0	0	0	0	1	7.7	4	30.8	4	30.8	4	30.8	0	0
Block Island	2	16.7	0	0	5	41.7	0	0	0	0	1	8.3	2	16.7	2	16.7
North Kingstown	0	0	4	26.7	6	40	0	0	1	6.7	1	6.7	0	0	3	20
Jamestown	0	0	1	11.1	4	44.5	0	0	1	11.1	0	0	0	0	3	33.3
East Greenwich	0	0	1	11.1	4	44.5	0	0	0	0	2	22.2	0	0	2	22.2
Warwick	0	0	2	5.6	12	33.3	0	0	5	13.9	3	8.3	2	5.6	12	33.3
Cranston	0	0	3	60.0	2	40.0	0	0	0	0	0	0	0	0	0	0
East Providence	6	54.6	1	9.1	3	27.3	0	0	0	0	0	0	0	0	1	9.1
Providence	18	81.8	0	0	1	4.6	0	0	0	0	1	4.6	1	4.6	1	4.6
Pawtucket	1	50	0	0	0	0	0	0	0	0	0	0	1	50.0	1	50.0
Barrington	0	0	1	14.3	4	57.1	0	0	1	14.3	0	0	0	0	1	14.3
Warren	0	0	0	0	4	30.8	1	7.7	0	0	7	53.9	0	0	1	7.7
Bristol	0	0	1	7.7	1	7.7	0	0	7	53.9	0	0	1	7.7	3	23.1
Portsmouth	0	0	0	0	7	70.0	0	0	2	20.0	1	10.0	0	0	0	0
Middletown	0	0	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0
Newport	0	0	4	10.0	13	33.3	2	5.1	2	5.1	8	20.5	2	5.1	8	20.5
Tiverton	2	16.7	1	8.3	2	16.7	0	0	0	0	1	8.3	2	16.7	4	33.3
Little Compton	0	0	1	20.0	2	40.0	0	0	0	0	1	20.0	0	0	1	20.0
	28	10.0	25	8.9	98	35.0	4	1.4	28	10.0	34	12.1	17	6.1	46	16.4

Table 4-2. RI - Future Dredging Plans

Township	Plan To Dredge		No Plans To Dredge		Unsure	
	#	%	#	%	#	%
Westerly	13	81.3	3	18.7	0	0
Charlestown	5	71.4	2	28.6	0	0
S. Kingstown	10	43.5	10	43.5	3	13.0
Narragansett	7	53.9	5	38.5	1	7.6
Block Island	5	41.7	5	41.7	2	16.6
N. Kingstown	4	26.7	10	66.7	1	6.6
Jamestown	6	66.7	3	33.3	0	0
E. Greenwich	4	44.4	5	55.6	0	0
Warwick	17	47.2	18	50.0	1	2.8
Cranston	4	80.0	1	20.0	0	0
E. Providence	6	54.6	5	45.5	0	0
Providence	6	27.2	12	54.6	4	18.2
Pawtucket	2	100.0	0		0	0
Barrington	3	42.9	4	57.1	0	0
Warren	9	69.2	4	30.8	0	0
Bristol	2	15.4	10	76.9	1	7.7
Portsmouth	6	60.0	3	30.0	1	10.0
Middletown	1	100.0	0	0	0	0
Newport	14	35.9	25	64.1	0	0
Tiverton	2	16.7	9	75.0	1	8.3
Little Compton	2	40.0	3	60.0	0	0

Table 4-3. RI - How Has Your Operation Been Affected By No Dredging?

Township	No Effect		Berths & Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	1	7.7	5	38.5	0	0	3	23.1	0	0	4	7.7
Charlestown	1	14.3	0	0	0	0	2	28.6	2	28.6	2	28.6
S. Kingstown	3	13.0	4	17.5	0	0	5	21.7	3	13.0	8	34.8
Narragansett	4	30.8	2	15.4	0	0	2	15.4	1	7.7	4	30.7
Block Island	4	33.3	0	0	0	0	6	50.0	0	0	2	16.7
N. Kingstown	6	40.0	3	20.0	0	0	3	20.0	1	6.7	2	13.3
Jamestown	2	22.2	0	0	0	0	0	0	4	44.4	3	33.3
E. Greenwich	5	55.6	1	11.1	0	0	2	22.2	1	11.1	0	0
Warwick	9	25.7	7	20.0	0	0	1	2.9	10	28.6	8	22.9
Cranston	1	20.0	2	40.0	0	0	0	0	0	0	2	40.0
E. Providence	5	45.6	4	36.4	0	0	0	0	0	0	2	18.2
Providence	14	63.6	7	31.8	0	0	1	4.6	0	0	0	0
Pawtucket	0	0	0	0	0	0	1	50.0	0	0	1	50.0
Barrington	2	28.6	2	28.6	0	0	0	0	0	0	3	42.9
Warren	6	41.2	4	30.8	0	0	0	0	1	7.7	2	15.4
Bristol	8	61.5	0	0	0	0	0	0	1	7.7	4	30.8
Portsmouth	5	50.0	2	20.0	0	0	0	0	2	20.0	1	10.0
Middletown	0	0	1	100.0	0	0	0	0	0	0	0	0
Newport	26	66.7	6	15.4	0	0	2	5.1	0	0	5	12.8
Tiverton	8	66.7	3	25.0	1	8.3	0	0	0	0	0	0
Little Compton	1	20.0	1	20.0	0	0	1	20.0	1	20.0	1	20.0

Table 4-4. RI - Type of Operation Function That Will Be Affected If No Dredging Takes Place During The Period 1985-1995

Township	No Effect		Berths & Slips		Moorings		Channels		Haul-out		Multiple Impacts		Unsure	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	1	7.1	5	35.8			3	21.4					5	35.7
Charlestown			1	14.3			3	42.9	2	28.3			1	14.3
South Kingstown	2	8.7	7	30.4			4	17.4	2	8.7	1	4.4	7	30.4
Narragansett	4	30.8	1	7.7			2	15.4					6	46.2
Block Island	3	25.0					2	16.7					7	58.3
North Kingstown	5	33.3	2	13.3			3	20.0	1	6.7			3	20.0
Jamestown	2	22.2	1	11.1					4	44.4			2	22.2
East Greenwich	4	44.4	1	11.1			2	22.2	1	11.1			1	11.1
Warwick	10	27.8	8	22.2			1	2.8	8	22.2			9	25.0
Cranston	1	20.0	3	60.0									1	20.0
East Providence	5	45.5	2	18.2									4	36.4
Providence	9	40.9	10	45.6									3	13.6
Pawtucket							1	50.0					1	50.0
Barrington	3	42.9	1	14.3									3	42.9
Warren	3	23.1	7	53.9					1	7.7			2	15.4
Bristol	7	53.9					1	7.7	1	7.7			4	30.8
Portsmouth	3	-30.0	1	10.0			1	10.0	2	20.0			3	30.0
Middletown													1	100.0
Newport	24	61.5	8	20.5			3	7.7					4	10.3
Tiverton	8	66.7	3	25.0	1	8.3								
Little Compton	1	20.0	2	40.0					1	20.0			1	20.0
	95	34.2	63	22.7	1	100.0	26	9.4	23	8.3	1	.4	69	24.8

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Table 4-5. Given That There Will Be An Adverse Impact If There Is No Future Dredging, How Does The Facility Respond?

Township	Large to Small Craft		Sail to Power Craft		Close		Limit Growth		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%
Westerly	3	37.5	1	12.5	3	37.5	1	12.5		
Charlestown					1	33.3	1	33.3	1	33.3
South Kingstown	7	63.6			2	18.2	1	9.1	1	9.1
Narragansett	2	40.0					2	40.0	1	20.0
Block Island					1	33.3	2	66.7		
North Kingstown	3	37.5			2	25.0	1	12.5	2	25.0
Jamestown	3	50.0			2	33.3			1	16.7
East Greenwich	3	100.0								
Warwick	9	47.4	1	5.3	3	15.8	2	10.5	4	21.1
Cranston					2	100.0				
East Providence	1	20.0			1	20.0	2	40.0	1	20.0
Providence	2	20.0			4	40.0	4	40.0		
Pawtucket	1	100.0								
Barrington	1	25.0			1	25.0	1	25.0	1	25.0
Warwick	3	42.9					4	57.1		
Bristol	3	100.0								
Portsmouth	2	33.3	1	16.7			3	50.0		
Middletown									1	100.0
Newport	5	45.6			2	18.2	2	18.2	2	18.2
Tiverton	3	100.0								
Little Compton	1	100.0								

Table 4-6. RI - Do You Plan To Use The Same Disposal Site That Was Used Before?

Township	Yes		No		Unsure		No Response	
	#	%	#	%	#	%	#	%
Westerly	5	31.3	2	12.5			9	56.2
Charlestown	7	100.0						
S. Kingstown	4	16.7					20	83.3
Narragansett	1	7.7	1	7.7	1	7.7	10	76.9
Block Island	4	25.0					8	75.0
N. Kingstown	1	6.3	1	6.3			14	87.4
Jamestown	1	11.1					8	88.9
E. Greenwich	1	11.1	1	11.1			7	77.8
Warwick	1	2.4					40	97.6
Cranston							5	100.0
E. Providence	2	18.2					9	81.8
Providence	1	4.5	1	4.5			20	91.0
Pawtucket							2	100.0
Barrington			1	14.2			6	85.8
Warren	2	15.4			1	7.7	10	76.9
Bristol							15	100.0
Portsmouth	1	10.0	1	10.0	1	10.0	7	70.0
Middletown							1	100.0
Newport	1	2.5			1	2.5	38	95.0
Tiverton	1	7.7					12	92.3
Little Compton							5	100.0
	33	11.3	8	2.7	4	1.4	246	84.5

Table 4-7. RI - How Do You Plan To Dispose Of The Sediment?

Township	Public Land		Private Land		In Water Near Operation		In Water Away From Site		Combined	
	#	%	#	%	#	%	#	%	#	%
Westerly	2	15.4	6	46.2	1	7.7	3	23.1	1	7.7
Charlestown	3	50.0	2	33.3	1	16.8				
S. Kingstown	1	9.1	8	72.7			2	18.2		
Narragansett	7	77.8	1	11.1			1	11.1		
Block Island	3	33.3	2	22.2			4	44.4		
N. Kingstown	2	25.0	1	12.5	1	12.5	4	50.0		
Jamestown			1	16.7	1	16.7	4	66.7		
E. Greenwich	1	25.0	1	25.0			2	50.0		
Warwick	5	27.8	8	44.4			3	16.7	2	11.2
Cranston			1	25.0			2	50.0	1	25.0
E. Providence			3	50.0	1	16.7	1	16.7	1	16.7
Providence			1	12.5	1	12.5	6	75.0		
Pawtucket					1	50.0	1	50.0		
Barrington			2	50.0			2	50.0		
Warren			5	50.0			5	50.0		
Bristol	1	25.0					3	75.0		
Portsmouth			2	33.3	1	16.7	1	16.7	2	33.3
Middletown					1	100.0				
Newport			2	14.3	1	7.1	10	71.4	1	7.1
Tiverton			1	33.3			2	67.7		
Little Compton			2	100.0						

Table 4-8. VOLUME OF PAST AND FUTURE DREDGING ACTIVITIES (in cubic yards)

Township	PAST	FUTURE			PERCENT			AV.
	Total Vol.	Expansion	Maintenance	Unspec.	Exp.	Maint.	Unspec.	Project
Westerly	16,665		59,510	21,700		73	27	5,075
Charlestown	0		150,610	850		95	5	2,273
South Kingstown	108,450	23,000	68,633	11,050	22	67	11	4,464
Narragansett	25,450		21,200					1,631
Block Island	49,200	15,000	25,000	37,000	19	33	48	5,133
North Kingstown	980	1,250,000	48,065	0	96	4		86,537
Jamestown	329		8,300	1,950		81	19	1,139
E. Greenwich	3,770		3,085					342
Warwick	120	97,000	93,140	30,700	44	42	14	6,134
Cranston	0			26,100			100	52,500
E. Providence	41,660	502,500	3,400		99	1		45,990
Providence	10,000	5,200	547,500		1	99		25,123
Pawtucket	0		35,000			100		17,500
Barrington	3,000		270	50,575		1	99	7,264
Warren	975	9,400	5,165	1,100	60	33	7	1,205
Bristol	0		4,500			100		346
Portsmouth	6,107	26,500		40,000	39		40	6,650
Middletown	0			58,400			100	58,400
Newport	38,000	368,000	10,537		97	3		9,706
Tiverton	10,000		35,000					2,917
Little Compton	0		2,200	5,000		31	69	1,440

Table 4-9. RI TESTS ON SEDIMENT COMPOSITION

Township	YES		NO		UNSURE	
	#	%	#	%	#	%
Westerly	5	33.3	10	66.7	0	0
Charlestown	1	14.3	4	57.1	2	28.6
South Kingstown	6	27.3	12	54.6	4	18.2
Narragansett	2	15.4	6	46.2	5	38.5
Block Island	2	20.0	5	50.0	3	30.0
North Kingstown	2	14.3	11	78.6	1	7.1
Jamestown	0	0	8	88.9	1	11.1
E. Greenwich	2	22.2	4	44.5	3	33.3
Warwick	19	57.6	13	39.4	1	3.0
Cranston	3	60.0	2	40.0	0	0
E. Providence	5	45.5	5	45.5	1	9.0
Providence	4	22.2	9	50.0	5	27.8
Pawtucket	1	50.0	0	0	1	50.0
Barrington	2	33.3	4	66.7	0	0
Warren	3	25.0	8	66.7	1	8.3
Bristol	0	0	10	88.3	2	16.7
Portsmouth	1	10.0	8	80.0	1	10.0
Middletown	0	0	1	100.0	0	0
Newport	8	21.1	26	68.4	4	10.5
Tiverton	1	8.3	9	75.0	2	16.7
Little COmpton	2	40.0	3	60.0	0	0

Table 4-10. RI - Sediment Types

Township	Mud		Silt		Sand		Gravel		Rock		Combination	
	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	1	6.7	2	13.3	1	6.7	3	20.0	1	6.7	7	46.7
Charlestown	0	0	0	0	1	14.3	1	14.3	1	14.3	4	57.1
South Kingstown	6	26.1	2	8.7	2	8.7	1	4.4	0	0	12	52.3
Narragansett	1	7.7	1	7.7	5	38.5	0	0	1	7.7	5	38.5
Block Island	0	0	0	0	7	58.3	0	0	0	0	5	41.7
North Kingstown	6	46.2	0	0	2	15.4	0	0	0	0	5	38.5
Jamestown	0	0	0	0	5	62.5	0	0	0	0	3	37.5
East Greenwich	4	50.0	2	25.0	2	25.0	0	0	0	0	0	0
Warwick	11	34.4	3	9.4	7	21.9	3	9.4	0	0	8	25.0
Cranston	0	0	1	50.0	1	50.0	0	0	0	0	0	0
East Providence	2	28.6	1	14.3	0	0	1	14.3	0	0	3	42.9
Providence	6	42.9	3	21.4	1	7.1	0	0	0	0	4	28.6
Pawtucket	0	0	2	100.0	0	0	0	0	0	0	0	0
Barrington	2	33.3	0	0	1	16.7	0	0	1	16.7	2	33.3
Warren	5	38.5	1	7.7	1	7.7	0	0	0	0	6	46.2
Bristol	5	62.5	0	0	1	12.5	1	12.5	0	0	1	12.5
Portsmouth	0	0	1	10.0	2	20.0	1	10.0	0	0	6	60.0
Middletown	0	0	0	0	0	0	0	0	0	0	1	100.0
Newport	20	52.3	3	7.9	3	7.9	0	0	4	10.3	8	21.1
Tiverton	5	45.6	2	18.2	2	18.2	0	0	0	0	2	18.2
Little Compton	0	0	0	0	2	40.0	0	0	0	0	3	60.0

Table 4-11. RI - How Frequent Do You Need To Dredge?

Township	Less Than 5yrs		5.1 - 10yrs		10.1 - 15yrs		15.1 - 20yrs		More Than 20yrs		Unsure	
	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	3	20.0	6	40.0	0	0	2	13.3	3	20.0	1	6.7
Charlestown	3	50.0	1	16.7	1	16.7	0	0	1	16.7	0	0
South Kingstown	0	0	10	45.5	4	18.2	3	13.6	2	9.1	3	13.6
Narragansett	2	15.4	4	30.8	0	0	2	15.4	3	23.1	2	15.4
Block Island	4	33.3	2	16.7	0	0	0	0	4	33.3	2	16.7
North Kingstown	1	6.7	0	0	6	40.0	2	13.3	6	40.0	0	0
Jamestown	1	12.5	3	32.5	1	12.5	0	0	3	37.5	0	0
East Greenwich	0	0	4	44.5	0	0	0	0	2	22.2	3	33.3
Warwick	5	14.7	7	20.6	4	11.8	3	8.8	11	32.4	4	11.8
Cranston	0	0	3	60.0	0	0	2	40.0	0	0	0	0
East Providence	1	10.0	2	20.0	0	0	2	20.0	1	10.0	4	40.0
Providence	1	5.0	6	30.0	1	5.0	1	5.0	6	30.0	5	25.0
Pawtucket	0	0	2	100.0	0	0	0	0	0	0	0	0
Barrington	1	14.3	1	14.3	0	0	2	28.6	3	42.9	0	0
Warren	0	0	4	36.4	1	9.1	1	9.1	4	36.4	1	9.1
Bristol	0	0	0	0	0	0	1	8.3	5	41.7	6	50.0
Portsmouth	1	10.0	1	10.0	2	20.0	1	10.0	4	40.0	1	10.0
Middletown	0	0	1	100.0	0	0	0	0	0	0	0	0
Newport	4	10.8	5	13.5	3	8.1	1	2.7	22	59.5	2	5.4
Tiverton	0	0	3	25.0	0	0	1	8.3	8	66,7	0	0
Little Compton	0	0	0	0	1	25.0	1	25.0	2	50.0	0	0
	27	10.1	65	24.5	24	9.1	25	9.4	90	34.0	34	12.8

policy, severe impacts to future growth could ensue, including closing the facility (Table 4-5).

All of the respondents expect to dispose of dredged materials at previously used sites (Table 4-6). Since much of the land in Charlestown is managed by the public sector, 50% of the respondents saw disposal on public land as the preferred option, followed by the private land and "in the water near the proposed operation" as viable disposal options (Table 4-7).

None of the respondents reported dredging during the 1980-1985 period, yet nearly 16,000 yds^3 have been projected for the 1985-1995 period, most of which is identified as maintenance dredging (Table 4-8). Only one respondent had undertaken tests on the quality of the sediment (Table 4-9), although all were aware of the type of sediments characterizing their sites. Nearly half of the respondents cited combinations of sand, gravel and rocks with the balance of the respondents believing the sediment types were made up of two or more types (Table 4-10). The perceived frequency of dredging tends to corroborate previous responses with 50% of those responding expecting dredging to be required within the next five years (Table 4-11).

Westerly

Considering the number of respondents located in Westerly (16), (Table 4-1), a high proportion of these facilities expect to dredge within the next 10 years (81.3%) (Table 4-2) compared to the state as a whole (45.7%). Nearly 3/4 of the projected volume (81,210 cubic yards) (Table 4-2) is considered maintenance. About one third of the respondents expect to use the same disposal sites as in the past, nearly half of the respondents (46.2%) preferred disposal on private land, with the majority suggesting that their own land be used.

This response is undoubtedly related to the high number (twelve out of thirteen) of respondents who claimed adverse impacts to their operations as a result of no dredging (Table 4-3). The areas especially in need of dredging in the past included berths and slips as well as access channels. The past experience appears to have influenced the respondents' perception of future impacts in the event dredging does not become a reality (Table 4-4). When analyzing the specific impacts and the remedies available to the respondents, 37.5% mentioned closing the facility as a distinct possibility. Other coping strategies included changing the service from larger to smaller boats and from sail to power (12.5%) (Table 4-5).

About one third had undertaken tests of the sediments, nearly half of which was made up of a combination of mud, silt, sand, gravel and rock (Table 4-10). The perceived need of dredging is significantly greater than for the state as a whole. Twenty percent of the Westerly respondents felt a need to dredge as frequently as once every five years with an additional 40% of the opinion that dredging would be required between 5 and 10 years (Table 4-11). It is likely that the high energy regime characterizing the western portion of the state are such that maintenance dredging poses especially severe constraints on the operators located there.

South Kingstown

South Kingstown is the largest municipality in Rhode Island and also one of the communities with the greatest number of water-dependent operations (Table 4-1). As indicated above, most of the facilities in the state's southern region are devoted to recreational boating. About half of those responding expected to require some dredging within the next ten years (Table 4-2). Since all of the facilities are located on salt ponds with the attendant problems of siltation, and since dredging activities have been quite limited during the 1980-1985 period, it is not surprising that 87% of the 23 South Kingstown respondents identified adverse impacts to their operations during this period. What perhaps is surprising is the area of perceived problems which includes channels (22%), berths and slips (17%), haul-out facilities (13%) and combinations thereof (35%), (Table 4-3). This relatively wider distribution is probably related to the distribution of facilities on the Salt Pond and the importance which this water body has on both fishing and commercial shipbuilding.

Projecting the needs for the 10 year planning period, dredging around berths and slips is mentioned by about 30%, followed by channel dredging. The relatively greater emphasis on recreational boating in South Kingstown is probably a reflection of the significant growth in boating which has taken place in Rhode Island and the extent to which Rhode Island services boating needs for Connecticut and Massachusetts.

Projecting adverse impacts and strategies which the operators are likely to adopt reflect the less severe conditions which the Salt Pond is subjected to compared to some of the ponds in Charlestown and Westerly. The preferred coping mechanism by the South Kingstown marina operator is to move from the service of large boats to smaller, more shallow drafted boats. Only 18% referred to closing the facility as a distinct possibility (Table 4-5).

The response concerning the preferred disposal site of the South Kingstown respondents was basically inconclusive. Fewer than 17% (Table 4-6) preferred the previous site with 83% having no clear preference. However, nearly 73% preferred to dispose of the dredged material on private land (Table 4-7).

The projected volume of dredged material from future projects was slightly less than the amount dredged during the preceeding period (Table 4-8). About 22% of the approximately 102,000 yds^3 is related to expansion compared to 67% specified for maintenance. Nearly 55% had not undertaken any qualitative sedimentation test, which reflects a condition very close to that of the state as a whole (Table 4-9). Mixed sediments contribute the largest group, followed by silt (26%) (Table 4-10). The urgency to dredge is not as strong as in the previous case studies. Less than 46% indicated a need to dredge more frequently than between 5 - 10 years and none perceived the need so critical as to require dredging at more frequent intervals than once every five years.

Narragansett

The Narragansett respondents are about evenly divided between private and state facilities, the latter including the Port of Gallilee and several boating ramps operated by the Department of Environmental Management (DEM) (Table 4-1). About half the respondents felt a need to dredge within the ten year planning period (Table 4-2), with about one quarter indicating no adverse impact as a result of the limited dredging activity during the 1980-1984 period (Table 4-3). About 30% felt they would not be adversely affected in the event that this policy would continue between 1985-1995. Nearly half (46%), identified a combination of projects principally related to berth and slip dredging and deepening existing channels (Table 4-4). Those operators (5) who perceived an adverse impact cited servicing smaller boats as the principal coping mechanism should future dredging operations be denied or severely delayed (Table 4-5). No strong feeling or opinion was expressed relating to the use of former disposal sites/methods (Table 4-6). More than 3/4 of those responding preferred a disposal site on public land (Table 4-7).

The relationship between previous and future dredging again is nearly identical and similar to that identified for South Kingstown and categorized as strictly maintenance (Table 4-8). Only two out of a total of 13 respondents had performed sediment tests (Table 4-9). Sand and mixed sediments are the predominant sediment types. The perceived frequency again is very similar to that identified for South Kingstown with some 45% of those responding citing a need to dredge within the next ten years (Table 4-11).

Block Island

Block Island's dredging needs are uniquely associated with tourism and recreational boating. The island is serviced by several ferries and tourboats and several marinas in both the New and Old Harbor. In this regard the island is illustrative of the state's other tourist oriented municipalities (Table 4-11).

The need to dredge within the planning period is not as severe as in some of the other municipalities (Table 4-2). One third of the 12 respondents were not adversely affected by the absence of dredging between 1980-1984. Channel dredging was identified as the principal area in need of attention (Table

4-3). The channel leading into New Harbor has recently been dredged which probably accounts for the changed orientation from channel (past) to berths and slips (projected) (Table 4-4).

Only three of the 12 Block Island respondents answered the question about future business impacts with no dredging policy. Two respondents mentioned a reduction in the facility's growth potential while one cited the possibility of closure. Similarly, only a few responded to the question related to the preference of utilizing previous disposal sites (Table 4-6) indicating the limited amount of land and the high preference for disposing of dredged material in the water away from the dredging (Table 4-7). This selection is followed by public land as the preferred disposal site, with only two respondents preferring a private site.

About 77,000 yds^3 of material is projected for disposal compared to 49,000 yds^3 during the 1980-1984 period (Table 4-8). Slightly less than 20% is associated with the expansion of existing facilities, with nearly one third identified as maintenance dredging (Table 4-9). Twenty percent of the respondents had qualitative sediment tests done. Nearly 60% of those responding identified sand as the principal sediment (Table 4-10). The proportion of respondents mentioning dredging needs within the next ten years has dropped to 50% (Table 4-11), no doubt reflecting the minimum modification to which the island has been subjected.

North Kingstown

The heavy dependence of recreational activities is evident for North Kingstown as well with somewhat greater emphasis on recreational clubs (27%) as opposed to commercial marinas (40%) (Table 4-1). Of the 15 respondents two-thirds did not anticipate any need to dredge during the planning period (Table 4-2). This is reflected in the answers dealing with the immediate past where 40% of the respondents did not experience any adverse impacts as a result of previous dredging activities. Those respondents who indicated an adverse impact were divided evenly between need to dredge around berths and slips and deepening the channels. Slightly more than 13% indicated multiple impacts (Table 4-4). Future expectations are almost replicating past perceptions. One third of the respondents did not anticipate dredging needs during the next ten years and of those who did, most see a need to deepen channels (20%) and areas surrounding berths and slips (13%) (Table 4-4). Eight of the respondents did indicate some adverse impacts to their operation. The typical response mechanism would be to emphasize service to smaller boats. Twenty -five percent did mention the prospects of having to close the facility (Table 4-5). Only two of the respondents had opinions related to the use of past disposal sites, perhaps reflecting the relatively low demand (past and future) for dredging (Table 4-6). Of the eight who responded to the question dealing with the preferred disposal site, fifty percent would prefer to discharge this material in the water but away from the dredge operation. Only 2 respondents indicated private land as a preferred option (Table 4-7).

North Kingstown is the community with the largest amount of sediment projected to be moved during the 1985-1995 planning period, nearly all of it associated with the Quonsett-Davisville port facility. Furthermore, of the nearly 1.3 million cubic yards of sediment projected for removal, 96% is related to new projects. It should be noted in this context that Quonsett-Davisville is in the process of being developed as the state's premier commercial port/industrial park. This facility already houses one of the state's largest employers (General Dynamics) whose future expansion may depend upon adequate depth in the approach channels (Table 4-8).

Only two of the fourteen respondents had undertaken qualitative physical analysis of the sediments (Table 4-9). Nearly half of the respondents identified mud as the principal sediment type followed by mixed sediment types and sand (Table 4-10).

The need to dredge within the next ten years was expressed by only one respondent, while 40% indicated a need to dredge at an interval between 10 and 15 years. Finally, another 40% did not expect to dredge within the next 20 years (Table 4-11).

<u>Jamestown</u>

The rural and suburban character of Jamestown is also reflected in the make-up of the marine related activities on the island. More than half of the respondents (5) identified themselves as marinas, boatyards and recreational clubs with another three projects identified as municipal (Table 4-1). Jamestown currently services a much larger boating clientele than is currently residing on the island. Two-thirds of the respondents planned to dredge within the next ten years (Table 4-2). All but two of the respondents felt that their operations had been adversely affected by the limited dredging during the 1980-1984 period (Table 4-3). Most of these projects (4) were associated with haul-out facilities with another three respondents indicating several projects in need of dredging. Only two respondents (out of 9) indicated no need to dredge (Table 4-2). This finding was replicated when the respondent was asked to project the future impact of a limited or no dredging policy (Table 4-4). Two of the six respondents (Table 4-5) indicated the possibility of having to close the facility in the event of a "no action alternative", while half indicated that a move from large to smaller boats would be necessary. Two-thirds (4) preferred to dispose of dredged material in the water but away from the dredge site (Table 4-7).

The projected amount of sediment associated with Jamestown operations is comparatively small, less than 11,000 yds^3, nearly all of which is identified as maintenance (Table 4-8). Nearly two-thirds of the projects have sediment consisting of sand (Table 4-10) and fifty percent identified a need to dredge within the next ten years (Table 4-11).

East Greenwich

A total of nine projects were identified in East Greenwich, at least five of which were associated with recreational boating, as compared to commercial shipping and fishing (Table 4-1). More than 50% (5) of the respondents did not indicate a need to dredge within the next ten years (Table 4-4), nor had they experienced any adverse impacts through the lack of dredging during the previous five years (Table 4-3). Half of those who identified a need to dredge during the 1980-1984 period cited shallow depths in channels as the principal problem (Table 4-4). All who responded to possible coping mechanisms mentioned moving from servicing large to smaller boats as the preferred way of dealing with such a problem (Table 4-5). Of the four who responded to where such material should ideally be deposited, two indicated preferrence for an "in the water but away from project site." Public and private land disposal were each cited by one respondent (Table 4-7).

The projected amount of sediment to be dredged was slightly less than the amount actually removed during 1980-1984 and all was associated with maintenance projects (Table 4-8). Two respondents had conducted sediment tests while three were unsure. Four indicated that no such testing had been done (Table 4-9). Half of the respondents indicated that the sediment consisted of mud, with sand and silt sharing the balance (Table 4-10).

Only forty-four percent indicated a need to dredge within the next ten years and none saw a need to undertake such action within the next five years. Three of the respondents were not sure (Table 4-11).

Warwick

Warwick is the community with the second largest number of projects (36), second only to Newport (Table 4-1). Nearly half, 47%, indicated a need to dredge during the next ten years (Table 4-2), although when asked to identify areas affected by the dredging activities during the 1980-1984 period 75% of the respondents identified specific impacts. Of these almost 30% related to haul-out facilities followed by areas surrounding berths and slips, while 23% indicated multiple projects (Table 4-3).

Nearly 28% (10) indicated that they would not be adversely affected in the event of a continuation of a limited dredging policy during the next ten years. Of those projects which would be affected, haul-out and areas around existing berths and slips would be most affected (Table 4-4).

The preferred coping mechanism cited by about half (47%) would be to move from servicing large to smaller boats. The prospect of closure was cited by fewer than 16%, although ten percent felt that the lack of future dredging would limit growth prospects (Table 4-5). Only one respondent had undertaken a test of the sediments (Table 4-6). Private land was seen as the preferred disposal site by 44% followed by public land, which was cited by nearly twenty-eight percent. In the water, but away from the dredge site was mentioned by only 17% (Table 4-7).

The volume of dredged material associated with the thirty-six projects total 220,000 yds^3, nearly evenly divided between expansion and maintenance (Table 4-8). Two respondents had had sediment tests done, while three were unsure and four indicated no tests had been done (Table 4-9). Most of the sediment consists of mud (34%), sand (22%), silt (9%) and gravel (9%) (Table 4-10).

The frequency of future dreding was almost evenly divided between those requiring dredging within ten years (12) and those with no perceived dredging needs within the next twenty years (11). Seven respondents saw dredging needs between 10 and 20 years (Table 4-11).

Cranston

Cranston is the last community on the western shore of Narragansett Bay which caters almost exclusively to the needs of the recreational boating public. Furthermore, the number of respondents was only five, three of which are clubs (Table 4-1). As the tidal effects decrease, the greater the probability of sedimentation. This is especially so at the head of the bay. Eighty percent of the projects included in Cranston will require dredging during the next ten years (Table 4-2), and only one project was not adversely impacted as a result of no dredging during the 1980-1984 period. Two of the five respondents identified silting problems adjacent to berths and slips, while the balance identified two or more projects in need of dredging (Table 4-3). The past often appears to be a pattern of the future which seems to be the case for Cranston. Three of the five respondents believed dredging around the berths and slips would be required (Table 4-4). Only two respondents answered the questions dealing with the impacts to the business in the event that no dredging activities would take place. Both respondents saw closure as the distinct possibility (Table 4-5).

None of the five Cranston respondents answered the questions dealing with future disposal sites (Table 4-6). Two of the four respondents prefer disposing of the dredged material in the water away from the dredge site, with public and private land sharing the balance (Table 4-7).

No dredging activities took place during the 1980-1984 period and only 26,000 yd^3 is identified during the next decade, all of it unspecified with respect to maintenance or expansion (Table 4-8). Three of the five respondents had undertaken sedimentation test, the highest rate of any of the coastal municipalities included in the survey (Table 4-9). Forty percent of the respondents (2) were aware of the sediment type. Those were divided between silt and sand (Table 4-10). Sixty percent (3) believed dredging would be required between 5 and 10 years, with the balance requiring dredging between 15 and 20 years (Table 4-11).

Providence

Tables 4-1 through 4-11 are derived directly from the responses obtained from the questionnaires, except that they have been disaggregated by coastal municipalities (Figure 4-1). Thus, Providence had a total of 18 projects which were port related (Table 4-1). In addition, one project each was identified that was with a commercial marina, private, federal and municipal operation.

Located at the head of the bay, nearly eighty-two percent of the projects in Providence are related to commercial port activities (Table 4-1). Six of the 22 projects expect to dredge within the next ten years (Table 4-2). Seven projects (32%) experienced difficulties around the berths and slips (Table 4-3) and nearly 60% felt that their operations would be adversely affected in the event that no dredging would take place. Ten of these (46%) are associated with berths and slips (Table 4-4). Fifty percent would have to close, while another fifty percent would experience limited growth. Only twenty percent (2) of the respondents would move from servicing large to smaller vessels (Table 4-5). Seventy-five percent (6) preferred to dispose of the dredged material "in the water away from the site" of the dredging activity (Table 4-7).

Providence is the municipality with the largest projected dredging volume, totalling more than half a million cubic yards (Table 4-8), nearly all of which is associated with maintenance projects. Four respondents (22%) had undertaken sediment tests (Table 4-9). Seventy percent of the respondents identified sediments as mud (43%), silt (21%) and sand (7%) (Table 4-10).

While the need to dredge was considerable, only seven respondents (35%) felt that dredging would be required more frequently than every ten years (Table 4-11).

East Providence

East Providence is the municipality with the second largest commercial shipping port in Rhode Island. Almost 55% of the eleven respondents identified themselves with the commercial shipping industry. This was followed by commercial marinas (27%), and boat clubs and municipal projects, each identifies with one respondent (Table 4-1).

About fifty-five percent (6) plan to dredge during the next ten years; the balance (5) indicating no need to dredge within this period (Table 4-2). When seeking information about past such impacts, five respondents (46%) indicated no adverse impacts with four claiming a need to dredge around berths and slips (Table 4-3). When assessing future impacts, five respondents (45%) did not expect any adverse impact in the event of a continued limited dredging policy (Table 4-4). Five of the respondents felt some adverse impacts. These were almost evenly divided among the five alternate coping mechanisms (Table 4-5). Only two respondents indicated an interest in using the same disposal site as in the past (Table 4-6). Three (50%) of the six respondents who answered the question about the preferred disposal site indicated private land as the preferred option while the balance preferred water disposals and one respondent opted for a combination of sites (Table 4-7).

The amount of sediment to be removed from the East Providence projects is almost as large as the amount estimated for Providence. The exception is that more than 99 percent is for expansion projects (Table 4-8). Nearly half of the respondents had tests done to determine sediment quality (Table 4-9). Two of the respondents indicated the presence of mud, followed by silt and gravel as the predominant sediments, each accounting for 14%. Nearly 43% reported the presence of combined sediments (Table 4-10). Only 30% of the respondents indicated a need to dredge within the next ten years (Table 4-11).

Pawtucket

Pawtucket is one of the coastal municipalities with the fewest past or future dredge projects, having neither commercial activities nor club or private projects (Table 4-1). One of the two projects identified is associated with the Pawtucket Redevelopment Agency, and the other a commercial marina. Both projects anticipate a need for dredging during the next ten years (Table 4-2). One of the two projects concern channel dredging (Table 4-3), while the other indicates multiple projects (Table 4-4). Both preferred disposal in the water (Table 4-7). The volume of the sediment totals 35,000 yds3, all identified as maintenance (Table 4-8). One of the respondents had a test done on the quality of sediment (Table 4-9); both projects require dredging within the next ten years (Table 4-11), with the sediments made up primarily of silt (Table 4-10).

Barrington

The importance of recreational boating increases toward the south which is reflected in the make-up of the dredging needs of Barrington. Most respondents expect to dredge within the next ten years (Tables 4-1 & 2). Two of the seven (29%) did not feel any impact as a result of past dredging while another two respondents had experienced silting near berths and slips (Table 4-3). About forty-three percent did not feel that their operations would be adversely affected in the event of no future dredging (Table 4-4). Only one responded to possible coping mechanisms (Table 4-5), and none had any plans to move from disposal sites used in the past (Table 4-6). Two preferred disposal on private land while two opted for an "in the water away from the dredge site" disposal site (Table 4-7). About 50,000 cubic yards were projected for removal (Table 4-8). Two respondents had tests done (Table 4-9). Mud, sand and gravel were the dominant sediments, accounting for about two-thirds of the projects included in the analysis (Table 4-10). Less than 30% of the seven respondents indicated a need to dredge within the next ten years. Nearly 43% (3) indicated no dredging need within the next twenty years (Table 4-11).

Warren

While commercial marinas and boatyards are an important segment of the user community with dredging needs, more than 53% of the projects (7) were private parties (Table 4-1). Of the 13 projects identified in Warren, nearly 70% indicated a need to dredge within the next ten years (Table 4-2), reflecting somewhat more expanded expectations about future needs. During the 1980-1984 period, seven out of the total thirteen respondents (54%) indicated some adverse impacts, mostly around berths and slips. The heavily indented shoreline and the relatively more stagnant water appear to aggravate the silting problem in this part of the bay compared to locations farther south (Tables 4-3 & 4). The expected coping methods are similar to those of the other coastal communities with a significant recreational boating activity. Four of the seven respondents answering this question indicated that their growth potential would be affected while three respondents indicated a change in their operation by moving to servicing smaller boats (Table 4-5). Only two of the thirteen respondents preferred tp use the same disposal site as in the past (Table 4-6). Two disposal methods/sites were mentioned by the few respondents answering this question (Table 4-7) with half indicating private land and half preferring sites "in the water away from the dredge site". A total of 15,600 yd^3 of dredge material was projected by the thirteen respondents with 60% associated with expansion (Table 4-8). One quarter of the twelve respondents had sediment tests made (Table 4-9), most of which consisted of mud, silt, and sand (54%), (Table 4-10). Around 36% indicated a need to dredge between five and ten years with no one indicating a need within the next five years (Table 4-11).

Bristol

Although Bristol is one of the largest and most important boating and boatbuilding/repair communities along the Rhode Island shore, more than 50% of the facilities with dredging needs are operated by the state with another 23% maintained by the municipality. Only two facilities are dirctly associated with either yacht clubs or marinas and boatyards (Table 4-1). Furthermore, only two plan dredging within the foreseeable future (Table 4-2). Similarly, only five of the respondents from Bristol had been affected by the limited dredging during the past ten years (Table 4-3), and only two respondents indicated a potential adverse impact as a result of the limited dredging policy and only three responded to moving from servicing large boats to smaller ones as a potential coping mechanism (Table 4-4 and 5). Nine of the fifteen respondents answered the question dealing with past and future disposal sites (Table 4-6), although 3, (75%), indicated a preference for disposing of this material in the water away from the dredging site. (Table 4-7).

The projected amount was relatively small consisting of only 4500 cubic yards, all related to maintenance projects (Table 4-8). None of the twelve respondents answering the question concerning the quality of the sediment had tests done (Table 4-9). More than sixty-two percent (5) indicated that silt was the predominant sediment, with one facility each characterized by sand, gravel, and mixed sediments (Table 4-10). Only one respondent indicated a need to dredge within the 15-20 year time frame (Table 4-11).

Portsmouth

Ten marine related activities characterize the Portsmouth waterfront, 70% of which are associated with marinas and boatyards (Table 4-1). Six of the facilities indicated a future dredging need, (Table 4-2), although 50% did not experience any adverse impact to their operations as a result of limited past dredging actvities. Forty percent of those who indicated some adverse effect were related to marina and boatyard operations (Table 4-3).

Unlike most of the previous coastal facilities, only 30% of the respondents projected no future effects in the event of a continued restricted dredging practice. Ten percent each indicated dredging needs around haul-out, berths and slips (Table 4-4). Half (3) of the respondents indicated that their operations would suffer in the event of no future dredging, and half indicated a move to smaller vessels (2) and powerboats (1) as possible coping mechanisms (Table 4-5). Only one intended to use the previously used disposal site (Table 4-6), and two respondents (33%) noted private land as the preferred site.

Finally, two indicated in water disposal sites, one near the operation and one away from the dredging site (Table 4-7). Slightly more than 66,000 cubic yards of sediment is projected for removal, 40% of which relates to expansion or new facilities (Table 4-8). Only one of 10 respondents had tests done on the sediments, which showed mainly mixtures of the primary types (Table 4-10). About twenty percent indicated a need to dredge within the next 10 years, with forty percent identifying no such need for the next 20 years (Table 4-11).

Middletown

Only one private respondent was from Middletown (Table 4-1), who plans to dredge a total of 58,000 cubic yards (Table 4-8), divided into maintenance and expansion. Some adverse impacts were felt due to silting around berths and slips (Table 4-3). While no specific impacts could be identified in the event of no future dredging (Table 4-4). The respondent indicated several coping mechanisms should future dredging be limited (Table 4-5). No plans were mentioned with respect to the use of previous dredged disposal sites (Table 4-6). A preference for disposing of future dredged material in the water near the dredge site was expressed (Table 4-7. No tests have yet been conducted analyzing the quality of the sediment (Table 4-9), which consists primarily of combined sand, silt, mud, rock and gravel (Table 4-10). Finally, this operation indicated a need to dredge within a five to ten year period (Table 4-11).

Newport

In terms of sheer numbers, Newport represents the municipality with the highest number of identified projects, and the community which has changed its waterfronts the most. About one third of the projects are associated with marinas and boatyards, followed by municipal projects and private operations (Table 4-1). Slightly more than 36% expect to dredge in the future (Table 4-2). Two thirds (26) had not experienced any adverse impacts due to limited previous dredging activities. Of the 11 respondents who encountered some impacts, six (15%) were related to dredging needs near berths and slips, two (5%) had encountered difficulties with channels, and five (13%) had felt been adversely impacted (Table 4-3).

The immediate past appears indicative of the future as far as projected needs and impacts are concerned. Nearly 62% (24) of the respondents did not anticipate any impacts with no future dredging. About 20% (8) expect difficulties with operation of berths and slips in the event of no future dredging. Relatively few, 3, expect problems with channels. Of the eleven (Table 4-5) who responded to the question dealing with specific coping mechanisms in the event of the implementation of a limited dredging policy, forty-six percent (5) suggested they would move from servicing larger to smaller boats, while the balance (6) were evenly divided among the options of closing, multiple impacts and limited growth. Only one of the respondents expected to use the same disposal site (Table 4-6), and the vast majority (71%) opted for disposing of future dredged material in the water away from the dredge site (Table 4-7).

As discussed above, Newport is the one community which has experienced the greatest amount of shoreline modification during the past ten years, a process which is continuing almost unabated. It is not surprising therefore, that of the 378,000 cubic yards of sediment projected for removal within the next ten years, that 97% is related to expansion (Table 4-8). Eight of the respondents (21%) had quality tests made on the sediments (Table 4-9), which consisted predominately of mud (52%), followed by small amounts of silt (8%), sand (8%) and rock (10%) (Table 4-10). Only nine of the thirty-seven Newport respondents anticipated dredging within the next ten years and only four of those expect need to dredge within the next 5 years (Table 4-11).

Tiverton

Tiverton, located at the confluence of Mount Hope Bay and the head of the Sakonnet River, has twelve facilities with potential dredging needs, one third of which are classified municipal. Nearly seventeen percent each is associated with commercial ports and commercial marinas and boatyards (Table 4-1).

Tiverton is characterized by strong tidal currents which may relate to the relatively small demand for future dredging within this municipality. Only two respondents indicated a need to dredge (Table 4-2) and two-thirds (8), indicated no adverse impact as a result of limited dredging activity between 1980-1984 (Table 4-3). Three respondents indicated future dredging needs around berths and slips and only one expected problems with existing mooring areas (Table 4-4). Again the immediate past appears to be an indicator of the future. Sixty-seven percent do not anticipate any adverse impacts as a result of no future dredging while three operators expect problems with areas around berths and slips, and one with mooring areas. Only three responded to the question of possible coping mechanisms and all would move from servicing large to smaller boats (Table 4-5). Only one indicated interest in using previously used disposal sites. Of these, two respondents preferred disposing of the material in the water away from the dredge site while one preferred a private land site (Table 4-7).

The amount of dredged material totals 35,000 yd^3, all related to maintenance projects (Table 4-8), and only one had quality tests made of the sediment (Table 4-9). Nearly half of the respondents (5) indicated that mud was the dominant sediment type, followed by sand (2), and silt (2), with two respondents indicating mixed sediments. Twenty-five percent indicated a need to dredge between 5 and 10 years, the rest (9), indicated needs beyond the present planning period, 1985-1995 (Table 4-11).

Little Compton

Five projects characterize the Little Compton waterfront, two of which are associated with commercial marinas and boatyards, the remainder are associated with boat clubs, state facilities and a private project (Table 4-1). Two of the five plan to dredge in the future (Table 4-2), but only one respondent had not been adversely affected by past dredging activities. Of the four who claimed to have been affected, berths/slips, channels, and haul-out were each identified by one respondent. The last was identified with more than one type of impact (Table 4-3).

In the event of no future dredging activities, two of the five felt that problems would occur around berths and slips, while one expected to have problems with haul-out facilities (Table 4-4). Only one operator responded to coping mechanisms in the event of no future dredging, with the preferred action being one of moving from servicing large to smaller boats (Table 4-5). None of the five respondents intended to use previous disposal sites (Table 4-6), and the two who responded preferred to dispose of any dredged material on private land (Table 4-7). Of the 7200 yd^3 of sediment projected for removal, 2200 yd^3 (30%) is associated with maintenance projects (Table 4-8). Two respondents had tests conducted on the sediment (Table 4-9) which consisted mainly of mixed material (60%) and sand (40%) (Table 4-10. None of the five respondents indicated a need to dredge within the next ten years (Table 4-11).

4.1.2 Cluster Analysis - Rhode Island

This chapter clusters the project volumes by location irrespective of the township in which the projects are located. A total of forty-nine project clusters have been identified. The analysis is divided into two parts: a cartographic presentation identifying the clusters in addition to the volume of sediments of past projects and the amounts of dredged material projected for removal during the 1985-1995 planning period. Future amounts are also divided into those associated largely with new and/or expansion of existing projects. This map appears as Figure 4-1.

The second part of the cluster analysis consists of a brief written description of the cartographic representation emphasizing the volume of the material projected to be dredged within the next decade. This data is presented by township for Rhode Island.

The forty-nine clusters have been broken down into six groups based on the volume of material to be dredged. The smallest group, consisting of four clusters (Table 4-12), accounts for 76% of the total volume projected to be dredged within the next ten years, divided into 12 projects. All but one of the clusters are located in the mid to upper portion of the bay, Coasters Harbor which includes the proposed Rose Island

Figure 4-1

RHODE ISLAND DREDGING VOLUME

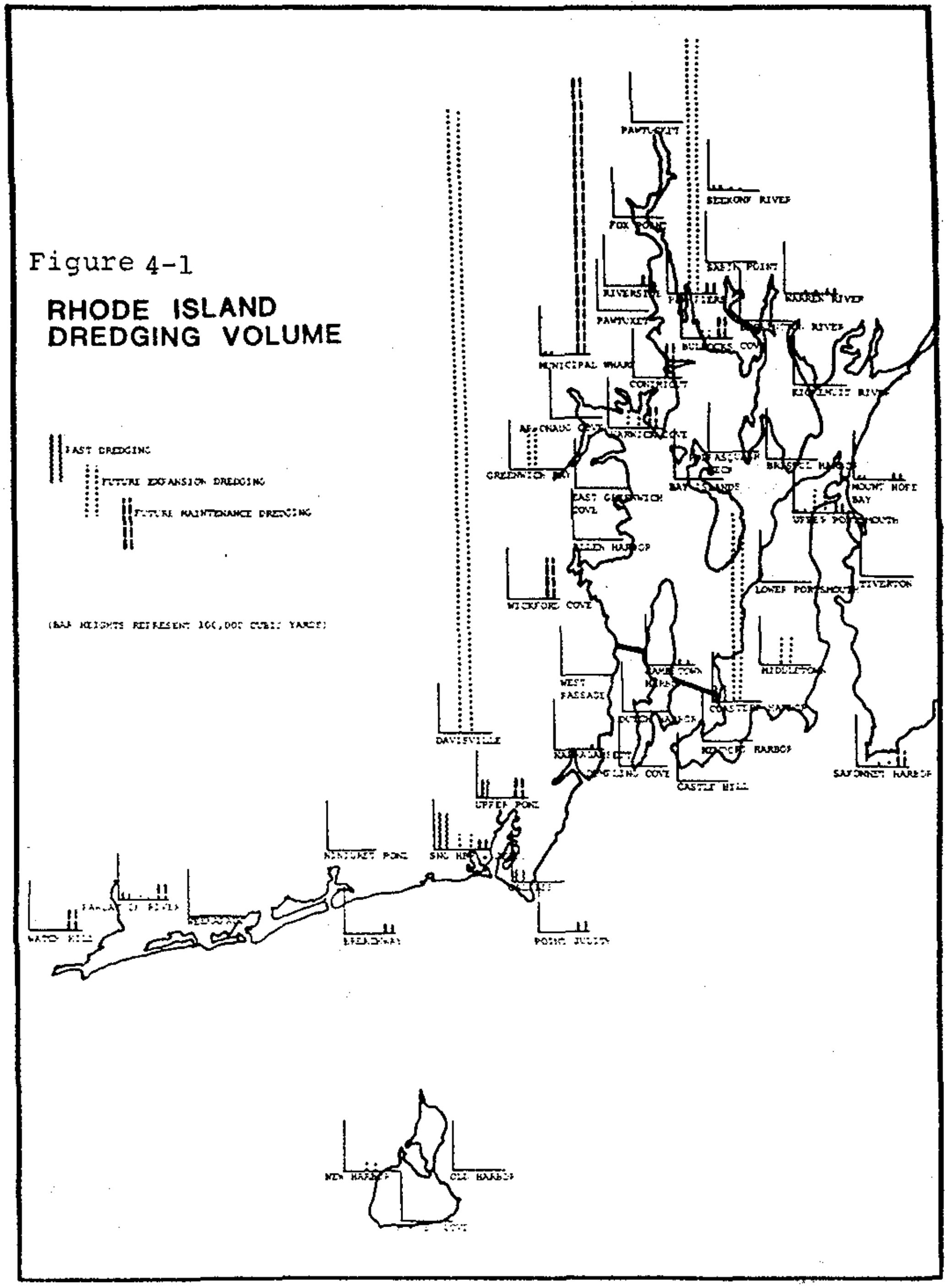

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Table 4-12. Projected Dredge Volume By Clusters in Rhode Island: In Thousand Cu Yds (1984-1995)

	Total Volume		Expansion		Maintenance	
	Vol	# of Proj.	cu yds	%	cu yds	%
Quonsett-Davisville	1,250.0	(1)	1,250.0	100.0		
Municipal Dock	535.0	(6)			535.0	100.0
Providence	512.5	(2)	500.0	97.6	12.5	2.4
Coasters Harbor	426.6	(3)	420.5	98.7	6.1	1.4
	2,724.1		2,170.5	79.7	553.6	20.3
Greenwich Bay	90.5	(4)	80.0	88.4	10.5	11.6
Warwick	81.6	(10)	30.2	37.0	38.4	47.1
Wickford	78.0	(7)			78.0	100.0
New Harbor	77.0	(4)	15.5	20.1	26.5	34.4
Upper Portsmouth	60.0	(4)	41.5	69.2	18.5	30.3
Middletown	58.0	(1)	50.0	86.0	8.0	14.0
Snug Harbor	50.5	(8)	25.0	50.0	25.3	50.0
Bullocks Cove	50.2	(2)	10.0	19.9	40.2	80.3
Upper Pond	45.9	(5)	1.5	3.3	44.4	96.7
Pawcatuck	41.9	(7)	3.0	49.7	21.9	52.3
Watch Hill	37.7	(3)			37.5	99.5
Conimicut/Pawtuckett	70.2	(3)			75.2	100.0
Sakonnet	32.2	(2)	4.0	12.4	28.2	87.8
Riverside	26.1	(3)			26.1	83.4
	799.8		260.1	28.4	473.8	62.7
Point Judith	20.0	(1)			20.0	100.0
Charlestown	15.0	(1)			15.0	100.0
Apponaug	13.5	(2)			13.5	100.0
Warren River	10.1	(7)	4.9	43.8	5.2	46.4
Mount Hope Bay	10.0	(1)			10.0	100.0
	68.6		4.9	7.1	63.7	92.9

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Table 4-12. Cont.

	Total Volume		Expansion		Maintenance	
	Vol	# of Proj.	cu yds	%	cu yds	%
Narragansett	6.8	(1)			6.8	100.0
Lower Portsmouth	6.5	(1)	6.5	100.0		
Jamestown Harbor	6.3	(2)			6.3	100.0
Newport	6.2	(7)			6.2	100.0
Fox Point	5.2				5.2	100.0
Seekonk	5.0		2.5	50.0	2.5	50.0
Kickemuit	4.5		4.5	100.0		
Bristol	4.5				4.5	100.0
Castle Hill	4.0				4.0	100.0
Greenwich Cove	3.1				3.1	100.0
Dutch Harbor	2.8		.8	19.6	2.0	80.4
Weekapaug	2.4				1.6	66.6
	56.3		13.5	23.9	37.1	65.8
Dumplings	1.1		.3	27.3	.8	72.7
Sabin Point	.9				.9	100.0
Gallilee	.7				.7	100.0
Hog Pen	.7		.7	100.0		
Barrington River	.6				.6	100.0
Pawtucket	.13		.08	61.5	.05	38.5
Ningret	.05			50.0	.05	50.0
	4.18		1.08	25.8	3.10	74.2

Marina in Newport being the exception with sediment loads somewhat lower than the remaining three. Nearly 80% of the total volume, 2.2 million yd^3, is associated with expansion projects and more than half identified with one project (Quonset-Davisville). In fact, all of the dredging projected for these areas is related to expansion of new projects. Only the respondents included in the Municipal Dock cluster in Providence have designated all of their dredging as maintenance.

The second group is made up of fourteen clusters, representing a total of 62 projects. In the cartographic representation these volumes were divided evenly between the two categories while Table 4-12 only included the actual volumes reported for new projects/expansion and maintenance. This cluster accounts for about 21% of the total projected dredged material (741,000 yd^3). Twenty-eight percent (210,000 yd^3) is associated with new or expansion of existing projects, while sixty-two percent is maintenance related. It will be noted that the projected material associated with expansion and maintenance may not total 100%. Several respondents were not able to identify whether the project belonged to one or the other category. The fourteen clusters range from 26,100 yd^3 in the case of Riverside to more than 90,000 yd^3 for Greenwich Bay.

No clear geographical distribution is apparent in this group. Two of the clusters are located outside of Narragansett Bay (New Harbor, Snug Harbor, Upper Pond, Watch Hill and Sakonnet). Several are located in decidedly suburban locations where they appear to be servicing a growing demand for slip and mooring sites from the more urban locations.

Only three of the clusters identify most of their dredging needs in the expansion and new project category (Greenwich Bay, Upper Portsmouth, and Snug Harbor), all of which are located well within the suburban fringe discussed above.

Although all fourteen clusters identify some need to have maintenance dredging done within the next ten years, nine claim all or most of their dredging as maintenance. Furthermore, most of those are located in areas where tides, especially ebb tides, may be less active compared to flood tides, thus aggravating sedimentation. These sites include Wickford, Bullocks Cove, Upper Pond, Watch Hill, Conimicut, Pawtucket, Sakonnet and Riverside.

The third group consists of five clusters, comprising 12 projects with projected dredging needs ranging from 10,000 yd^3 (Mt. Hope Bay) to 20,000 yd^3 (Pt. Judith). All but one of the five clusters designated their projected needs in the maintenance category. All are located in the urbanized portion of the state.

The fourth group consists of twelve clusters which account for a total of 56,000 yd^3, 16.6% of the sediment projected for removal during the next ten years. Twenty-eight projects are included in this category. About 26%, 13,500 yd^3

is associated with expansion, with the balance, 37,000 yd^3, or 66% projected as maintenance. The amount of sediment identified for removal ranges from 2,400 yd^3 in the case of Weekapaug to 6,800 yd^3 for Narragansett.

Although the average dredged amount designated for expansion and new projects is 24%, eight of the clusters have no plans to expand. Furthermore, most of these, Narragansett, Jamestown Habor, Newport, Castle Hill, Dutch Harbor and Weekapaug, are located in the southern part of the state, away from the major center of demand with a presumed reduced incentive to expand or to create new facilities.

The fifth group consists of seven clusters and eleven projects with identified dredging needs totalling 4,150 yd^3. This accounts for a mere .1% of the total identified projected Rhode Island dredging needs for the 1985-1995 planning period.

The amount of dredged material is, by comparison to the previous groups, small, although no less important for the individual marinas, boatyards, ramps or private project. They vary is size from 50 yd^3 for Ninigret to about 1,100 yd^3 for the Dumplings.

Only two projects (Dumplings and Pawtucket) have identified needs for new and/or expansion projects totalling 370 yd^3.

The last group, consisting of seven clusters, has no projected need for dredging. No apparent geographical or locational characteristics appear to summarize these centers. One of the contributing factors to the absence of dredged material associated with this group, is that there are relatively few facilities associated with these clusters.

4.2 Southeastern Massachusetts

The same questionaire was used for acquisition of information in Massachusetts, and tabulated data based on responses from the questionaire and listed by township are presented in Tables 4-13 through 4-22.

The purpose of this section is to outline, geographically, the amount of dredged material that is planned for removal in Southeastern Massachsetts. For purposes of clarity, the Southeastern Massachusetts region covered in this survey has been broken down into six areas as shown in Figure 4-2.

4.2.1 Geographical Areas

Area 1 extends from Chatham in the east to Barnstable in the northwest. This area includes the municipalities of Chatham, Harwich, Dennis, South Dennis, West Dennis, South

Table 4-13. Facility Type

Townships	Ports Terminals		Yacht Clubs		Commerical Marinas		State		Municipal		Private		Federal		Wholesale Fish	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	1	50.0	0	0	1	50	0	0	0	0	0	0
Bourne	0	0	1	33.3	0	0	0	0	0	0	0	0	2	66.7	0	0
Buzz.Bay	0	0	0	0	5	83.3	1	16.7	0	0	0	0	0	0	0	0
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	0	0	0	100.0	0	0
Cataumet	0	0	0	0	2	100.0	0	0	0	0	0	0	0	0	0	0
Chatham	0	0	0	0	3	50.0	0	0	1	16.7	1	16.7	1	16.7	0	0
Chilmark	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0
Cotuit	0	0	0	0	0	0	0	0	0	0	2	100.0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0	0	0
Dartmouth	0	0	0	0	0	0	0	0	1	50.0	1	50.0	0	0	0	0
Dennis	0	0	0	0	1	33.3	0	0	1	33.3	1	33.3	0	0	0	0
Dighton	0	0	0	0	2	66.7	0	0	1	33.3	0	0	0	0	0	0
E. Falmouth	0	0	1	50.0	1	50.0	0	0	0	0	0	0	0	0	0	0
E. Sandwich	0	0	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0
Edgartown	0	0	1	20.0	4	80.0	0	0	0	0	0	0	0	0	0	0
Fairhaven	0	0	0	0	4	66.7	0	0	1	16.7	0	0	0	0	1	16.7
Fall River	0	0	0	0	1	33.3	0	0	0	0	1	33.3	1	33.3	0	0
Harwich	0	0	0	0	1	20.0	0	0	2	40.0	1	20.0	1	20.0	0	0
Hyannis	0	0	1	10.0	5	50.0	0	0	0	0	3	30.0	1	10.0	0	0
Marion	0	0	0	0	2	66.7	0	0	0	0	1	33.3	0	0	0	0
Marstons Mills	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0

Table 4-13. Cont.

Townships	Ports Terminals		Yacht Clubs		Commerical Marinas		State		Municipal		Private		Federal		Wholesale Fish	
Mashpee	0	0	0	0	2	50.0	0	0	2	50.0	0	0	0	0	0	0
Mattapoisett	0	0	0	0	2	66.7	0	0	0	0	1	33.3	0	0	0	0
Menemsha	0	0	0	0	0	0	0	0	2	66.7	0	0	1	33.3	0	0
Nantucket	0	0	0	0	5	83.3	0	0	0	0	0	0	1	16.7	0	0
New Bedford	0	0	0	0	1	16.7	0	0	0	0	2	33.3	0	0	3	50.0
N. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0
Oak Bluffs	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0	0	0
Onset	0	0	1	33.3	2	66.7	0	0	0	0	0	0	0	0	0	0
Osterville	0	0	1	11.1	2	22.2	0	0	0	0	6	66.7	0	0	0	0
Somerset	2	40.0	0	0	2	40.0	0	0	1	20.0	0	0	0	0	0	0
S. Dartmouth	0	0	1	20.0	3	60.0	0	0	0	0	1	20.0	0	0	0	0
S. Dennis	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0
S. Yarmouth	0	0	0	0	1	50.0	0	0	0	0	1	50.0	0	0	0	0
Swansea	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0
Vineyard Haven	1	16.7	0	0	5	83.3	0	0	0	0	0	0	0	0	0	0
Wareham	0	0	0	0	2	66.7	0	0	1	33.3	0	0	0	0	0	0
Waquoit	0	0	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0
W. Dennis	0	0	0	0	2	100.0	0	0	0	0	0	0	0	0	0	0
West Falmouth	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0	0	0
Westport	0	0	0	0	2	50.0	0	0	1	25.0	1	25.0	0	0	0	0
Woods Hole	0	0	1	25.0	0	0	0	0	0	0	1	25.0	1	25.0	0	0

Table 4-13. Cont.

TOWNSHIP	Ports Terminals		Yacht Clubs		Commerical Marinas		State		Municipal		Private		Federal		Wholesale Fish	
Falmouth	0	0	1	7.1	8	57.1	0	0	1	7.1	4	28.6	0	0	0	0
TOTAL	3	2.0	9	5.9	76	50.0	1	.6	19	12.4	31	20.3	10	6.5	4	2.6

Table 4-14. MA - Future Dredging Plans

TOWNSHIP	Plan to Dredge #	Plan to Dredge %	No Plans Dredge #	No Plans Dredge %	Unsure #	Unsure %
Barnstable	2	100.0	0	0	0	0
Bourne	3	100.0	0	0	0	0
Buzz. Bay	3	50.0	3	50.0	0	0
Cape Cod Canal	1	100.0	0	0	0	0
Cataumet	1	50.0	0	0	1	50.0
Chatham	5	83.3	1	16.7	0	0
Chilmark	0	0	1	100.0	0	0
Cotuit	1	50.0	1	50.0	0	0
Cuttyhunk	1	100.0	0	0	0	0
Darthmouth	2	100.0	0	0	0	0
Dennis	2	66.7	1	33.3	0	0
Dighton	1	33.3	2	66.7	0	0
E. Falmouth	1	33.3	1	33.3	1	33.3
E. Sandwich	0	0	1	100.0	0	0
Edgartown	1	20.0	4	80.0	0	0
Fairhaven	3	50.0	3	50.0	0	0
Fall River	1	33.3	2	66.7	0	0
Harwich	4	80.0	1	20.0	0	0
Hyannis	7	70.0	2	20.0	1	10.0
Marion	3	100.0	0	0	0	0
Marstons Mills	0	0	1	100.0	0	0
Mashpee	4	100.0	0	0	0	0
Mattapoisett	3	100.0	0	0	0	0
Menemsha	3	100.0	0	0	0	0
Nantucket	4	66.7	2	33.3	0	0
New Bedford	4	57.1	3	42.9	0	0
W. Falmouth	1	100.0	0	0	0	0
Oak Bluffs	1	50.0	0	0	1	50.0
Onset	2	66.7	1	33.3	0	0

Table 4-14. Cont.

TOWNSHIP	Plan to Dredge		No Plans Dredge		Unsure	
	#	%	#	%	#	%
Osterville	7	77.8	2	22.2	0	0
Somerset	4	80.0	1	20.0	0	0
S. Dartmouth	4	80.0	1	20.0	0	0
S. Dennis	0	0	1	100.0	0	0
S. Yarmouth	1	50.0	1	50.0	0	0
Swansea	0	0	1	100.0	0	0
Vineyard Haven	4	66.7	2	33.3	0	0
Wareham	2	66.7	1	33.3	0	0
Waquoit	1	100.0	0	0	0	0
W. Dennis	1	50.0	1	50.0	0	0
W. Falmouth	0	0	1	100.0	0	0

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Table 4-15. MA - How Has Your Operation Been Affected By No Dredging?

TOWNSHIP	No Effect		Berth Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	0	0	0	0	0	0	2	100
Bourne	0	0	0	0	0	0	0	0	0	0	2	100
Buzz. Bay	0	0	1	25.0	0	0	1	25.0	0	0	2	50.0
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	0	0
Cataumet	0	0	0	0	1	50.0	1	50.0	0	0	0	0
Chatham	0	0	2	50.0	0	0	1	25.0	1	25.0	0	0
Chilmark	0	0	0	0	0	0	0	0	0	0	1	100
Cotuit	0	0	1	100.0	0	0	0	0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	1	100.0	0	0	0	0
Dartmouth	0	0	1	50.0	0	0	0	0	0	0	1	50.0
Dennis	0	0	0	0	1	50.0	0	0	0	0	1	50.0
Dighton	1	50.0	0	0	0	0	0	0	0	0	1	50.0
E. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100
E. Sandwich	0	0	0	0	0	0	0	0	0	0	1	100
Edgartown	2	66.7	1	33.3	0	0	0	0	0	0	0	0
Fairhaven	0	0	1	33.3	0	0	0	0	1	33.3	1	33.3
Fall River	0	0	1	50.0	0	0	1	50.0	0	0	0	0
Harwich	0	0	1	33.3	0	0	1	33.3	0	0	1	33.3
Hyannis	1	14.3	5	71.4	0	0	1	14.3	0	0	0	0
Marion	0	0	2	66.7	0	0	0	0	0	0	1	33.3
Marstons Mills	0	0	0	0	0	0	0	0	0	0	0	0
Mashpee	0	0	1	25.0	0	0	2	50.0	0	0	1	25.0
Mattapoisett	0	0	1	33.3	0	0	1	33.3	0	0	1	33.3
Menemsha	0	0	1	50.0	0	0	0	0	0	0	1	50.0
Nantucket	0	0	2	50.0	0	0	2	50.0	0	0	0	0
New Bedford	1	20.0	2	40.0	0	0	1	20.0	0	0	1	20.0
N. Falmouth	0	0	1	100.0	0	0	0	0	0	0	0	0
Oak Bluffs	1	100.0	0	0	0	0	0	0	0	0	0	0
Onset	0	0	1	50.0	0	0	0	0	0	0	1	50.0
Osterville	1	14.3	1	14.3	0	0	0	0	0	0	5	71.4
Somerset	0	0	1	25.0	0	0	1	25.0	0	0	2	50.0

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Table 4-15. Cont.

TOWNSHIP	No Effect		Berth Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
S. Dartmouth	0	0	1	25.0	0	0	0	0	1	25.0	2	85.0
S. Dennis	0	0	0	0	0	0	0	0	0	0	0	0
S. Yarmouth	0	0	0	0	0	0	0	0	0	0	1	100
Swansea	0	0	0	0	0	0	0	0	0	0	0	0
Vineyard Haven	0	0	0	0	0	0	1	25.0	2	50.0	1	25.0
Wareham	0	0	1	50.0	0	0	0	0	1	50.0	0	0
Waquoit	0	0	0	0	0	0	0	0	0	0	1	100
W. Dennis	0	0	0	0	1	100.0	0	0	0	0	0	0
W. Falmouth	0	0	0	0	0	0	0	0	0	0	0	0
Westport	0	0	1	50.0	0	0	0	0	0	0	1	50.0
Woods Hole	1	100.0	0	0	0	0	0	0	0	0	0	0
Falmouth	2	22.2	2	22.2	0	0	2	22.2	1	11.1	2	22.2

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Table 4-16. Type of Operation Function That Will Be Affected If No Dredging Takes Place During The Period 1985-1995

TOWNSHIP	No Effect		Berths & Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	0	0	0	0	0	0	0	0
Bourne	0	0	0	0	0	0	0	0	0	0	0	0
Buzz. Bay	1	25.0	2	50.0	0	0	1	25.0	0	0	0	0
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	0	0
Catamuet	0	0	0	0	0	0	0	0	0	0	0	0
Chatham	0	0	0	0	1	50.0	1	50.0	0	0	0	0
Chilmark	0	0	0	0	0	0	0	0	0	0	0	0
Cotuit	1	50.0	1	50.0	0	0	0	0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	1	100.0	0	0	0	0
Dartmouth	0	0	1	100.0	0	0	0	0	0	0	0	0
Dennis	0	0	0	0	1	33.3	0	0	1	33.3	1	33.3
Dighton	2	100.0	0	0	0	0	0	0	0	0	0	0
E. Falmouth	1	100.0	0	0	0	0	0	0	0	0	0	0
E. Sandwich	0	0	0	0	0	0	0	0	0	0	1	100.0
Edgartown	1	50.0	1	50.0	0	0	0	0	0	0	0	0
Fairhaven	1	20.0	1	20.0	1	20.0	0	0	1	20.0	1	20.0
Fall River	1	33.3	1	33.3	0	0	1	33.3	0	0	0	0
Harwich	0	0	1	33.3	0	0	1	33.3	1	33.3	0	0
Hyannis	1	20.0	3	60.0	1	20.0	0	0	0	0	0	0
Marion	0	0	2	100.0	0	0	0	0	0	0	0	0
Marstons Mills	0	0	1	100.0	0	0	0	0	0	0	0	0

Table 4-16. Cont.

TOWNSHIP	No Effect		Berths & Slips		Moorigns		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Mashpee	0	0	1	25.0	0	0	2	50.0	0	0	0	25.0
Mattapoisett	0	0	1	100.0	0	0	0	0	0	0	0	0
Menemsha	0	0	0	0	0	0	0	0	0	0	0	0
Nantucket	1	25.0	2	50.0	0	0	1	25.0	0	0	0	0
New Bedford	1	20.0	2	40.0	0	0	1	20.0	1	20.0	0	0
N. Falmouth	0	0	1	100.0	0	0	0	0	0	0	0	0
Oak Bluffs	0	0	0	0	0	0	1	100.0	0	0	0	0
Onset	0	0	2	100.0	0	0	0	0	0	0	0	0
Osterville	2	100.0	0	0	0	0	0	0	0	0	0	0
Somerset	1	25.0	1	25.0	0	0	1	25.0	0	0	1	25.0
S. Dartmouth	1	25.0	1	25.0	0	0	0	0	1	25.0	1	25.0
S. Dennis	1	100.0	0	0	0	0	0	0	0	0	0	0
S Yarmouth	1	100.0	0	0	0	0	0	0	0	0	0	0
Swansea	0	0	1	100.0	0	0	0	0	0	0	0	0
Vineyard Haven	2	40.0	0	0	0	0	0	0	2	40.0	1	20.0
Wareham	0	0	1	33.3	0	0	0	0	1	33.3	1	33.3
Waquoit	0	0	0	0	0	0	0	0	0	0	0	0
W. Dennis	0	0	0	0	1	100.0	0	0	0	0	0	0
W. Falmouth	1	100.0	0	0	0	0	0	0	0	0	0	0
Westport	1	25.0	2	50.0	0	0	0	0	0	0	1	25.0
Woods Hole	3	100.0	0	0	0	0	0	0	0	0	0	0

Table 4-16 Cont.

TOWNSHIP	No Effect		Berths & Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Falmouth	4	44.4	2	22.2	0	0	1	11.1	1	11.1	1	11.1
Total	28	30.1	31	33.3	5	5.4	10	10.7	9	9.7	10	10.7

Table 4-17. Do You Plan To Use The Same Disposal Site That Was Used Before?

TOWNSHIP	Yes		No		Unsure		No Response	
Barnstable	0	0	0	0	0	0	2	100.0
Bourne	0	0	0	0	0	0	3	100.0
Buzz Bay	0	0	0	0	0	0	6	100.0
Cape Code Canal	0	0	0	0	0	0	1	100.0
Cataumet	0	0	0	0	0	0	2	100.0
Chatham	0	0	1	16.7	1	16.7	4	66.7
Chilmark	1	100.0	0	0	0	0	0	0
Cotuit	0	0	0	0	1	50.0	1	50.0
Cuttyhunk	0	0	0	0	0	0	1	100.0
Dartmouth	0	0	0	0	0	0	2	100.0
Dennis	0	0	0	0	1	33.3	2	66.7
Dighton	0	0	0	0	0	0	3	100.0
E. Falmouth	0	0	0	0	1	33.3	2	66.7
E. Sandwich	1	100.0	0	0	0	0	0	0
Edgartown	0	0	0	0	1	20.0	4	80.0
Fairhaven	2	33.3	0	0	0	0	4	66.7
Fall River	0	0	0	0	0	0	3	100.0
Harwich	0	0	0	0	0	0	5	100.0
Hyannis	2	20.0	1	10.0	0	0	7	70.0
Marion	1	33.3	0	0	0	0	2	66.7
Marstons Mills	0	0	0	0	0	0	1	100.0
Mashpee	1	25.0	0	0	0	0	3	75.0
Mattapoisett	1	33.3	0	0	0	0	2	66.7
Menemsha	1	33.3	0	0	0	0	2	66.7
Nantuckett	0	0	0	0	0	0	6	100.0
New Bedford	0	0	0	0	0	0	7	100.0
N. Falmouth	0	0	0	0	0	0	1	100.0
Oak Bluffs	0	0	0	0	0	0	2	100.0
Onset	1	33.3	0	0	0	0	2	66.7
Osterville	3	33.3	0	0	2	22.2	4	44.4
Somerset	0	0	1	20.0	0	0	4	80.0

Table 4-17. Cont.

TOWNSHIP	Yes		No		Unsure		No Response	
S. Dartmouth	2	40.0	0	0	0	0	3	60.0
S. Dennis	0	0	0	0	0	0	1	100.0
S. Yarmouth	0	0	0	0	1	50.0	1	50.0
Swansea	0	0	0	0	0	0	1	100.0
Vineyard Haven	2	33.3	0	0	0	0	4	66.7
Wareham	0	0	0	0	0	0	3	100.0
Waquoit	0	0	0	0	0	0	1	100.0
W. Dennis	1	50.0	0	0	0	0	1	50.0
W. Falmouth	0	0	0	0	0	0	1	100.0
Westport	0	0	0	0	0	0	4	100.0
Woods Hole	0	0	0	0	0	0	4	100.0
Falmouth	2	13.3	0	0	0	0	13	86.7
TOTAL	21	13.5	3	1.9	8	5.1	124	79.5

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Table 4-18. MA - How Do You Plan To Dispose Of The Sediment?

TOWNSHIP	Public Land		Private Land		In Water Near		In Water Away		Combined	
	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	1	100	0	0	0	0
Bourne	0	0	0	0	0	0	1	100	0	0
Buzz. Bay	0	0	0	0	1	50.0	1	50.0	0	0
Cape Cod Canal	0	0	0	0	0	0	1	100	0	0
Cataumet	0	0	0	0	0	0	0	0	1	100
Chatham	4	100	0	0	0	0	0	0	0	0
Chilmark	0	0	0	0	1	100	0	0	0	0
Cotuit	0	0	0	0	0	0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	0	0	0	0
Dartmouth	1	100	0	0	0	0	0	0	0	0
Dennis	1	100	0	0	0	0	0	0	0	0
Dighton	0	0	1	100	0	0	0	0	0	0
E. Falmouth	1	100	0	0	0	0	0	0	0	0
E. Sandwich	0	0	0	0	0	0	0	0	0	0
Edgartown	0	0	0	0	0	0	0	0	0	0
Fairhaven	0	0	1	33.3	1	33.3	0	0	1	33.3
Fall River	0	0	0	0	0	0	1	100	0	0
Harwich	3	100	0	0	0	0	0	0	0	0
Hyannis	1	16.7	2	33.3	1	16.7	1	16.7	1	16.7
Marion	2	66.7	0	0	0	0	0	0	1	33.3
Marstons Mills	0	0	0	0	0	0	0	0	0	0

Table 4-18. Cont.

TOWNSHIP	Public Land		Private Land		In Water Near		In Water Away		Combined	
	#	%	#	%	#	%	#	%	#	%
Mashpee	1	100.0	0	0	0	0	0	0	0	0
Mattapoisett	1	33.3	1	33.3	0	0	1	33.3	0	0
Menemsha	1	50.0	0	0	1	50.0	0	0	0	0
Nantucket	2	66.7	1	33.3	0	0	0	0	0	0
New Bedford	0	0	0	0	0	0	0	0	0	0
N. Falmouth	0	0	1	100	0	0	0	0	0	0
Oak Bluffs	0	0	0	0	0	0	0	0	0	0
Onset	0	0	1	50.0	0	0	0	0	1	50.0
Osterville	2	40.0	2	40.0	0	0	0	0	1	20.0
Somerset	1	25.0	2	50.0	1	25.0	0	0	0	0
S. Dartmouth	1	25.0	1	25.0	1	25.0	1	25.0	0	0
S. Dennis	0	0	0	0	0	0	0	0	0	0
S. Yarmouth	1	100.0	0	0	0	0	0	0	0	0
Swansea	0	0	0	0	0	0	0	0	0	0
Vineyard Haven	2	100.0	0	0	0	0	0	0	0	0
Wareham	0	0	0	0	0	0	0	0	0	0
Waquoit	0	0	1	100	0	0	0	0	0	0
W. Dennis	0	0	1	100	0	0	0	0	0	0
W. Falmouth	0	0	0	0	0	0	0	0	0	0

Table 4-19. MA - Volume of Future Dredging Activity 1985-1995. (in cubic yards)

TOWNSHIP	
Barnstable	35,000
Bourne	610,470
Buzz. Bay	
Cape Cod Canal	100,000
Cataumet	200
Chatham	325,350
Chilmark	
Cotuit	
Cuttyhunk	200,000
Dartmouth	50,000
Dennis	15,000
Dighton	5,000
E. Falmouth	5,000
E. Sandwich	
Edgartown	200
Fairhaven	9,000
Fall River	4,000,000
Harwich	25,500
Hyannis	38,960
Marion	10,080
Marstons Mills	
Mashpee	30,200
Mattapoisett	200
Menemsha	25,000
Nantuckett	16,000
New Bedford	200,000
N. Falmouth	400
Oak Bluffs	
Onset	1,000
Osterville	11,000
Somerset	225
S. Dartmouth	2,200
S. Dennis	
S. Yarmouth	10,000

TOWNSHIP	
Swansea	
Vineyard Haven	600
Wareham	6,000
Waquoit	
W. Dennis	200
W. Falmouth	
Westport	
Woods Hole	
Falmouth	102,150

Table 4-20. MA - Tests on Sediments Completed

TOWNSHIP	Yes		NO		UNSURE	
	#	%	#	%	#	%
Barnstable	1	50	0	0	1	50
Bourne	2	100	0	0	0	0
Buzz. Bay	1	33.7	0	0	2	66.7
Cape Cod Canal	0	0	0	0	0	0
Cataumet	0	0	1	50	1	50
Chatham	5	100	0	0	0	0
Chilmark	0	0	0	0	1	100
Cotuit	1	50	1	50	0	100
Cuttyhunk	1	100	0	0	0	0
Dartmouth	1	50	1	50	0	0
Dennis	1	50	1	50	0	0
Dighton	1	50	1	50	0	0
E. Falmouth	1	100	0	0	0	0
E. Sandwich	0	0	1	100	0	0
Edgartown	1	100	0	0	0	0
Fairhaven	2	40	3	60	0	0
Fall River	1	50	1	50	0	0
Harwich	4	100	0	0	0	0
Hyannis	6	75	2	25	0	0
Marion	1	33.3	1	33.3	1	33.3
Marstons Mills	0	0	0	0	0	0
Mashpee	3	75	1	25	0	0
Mattapoisett	1	33.3	1	33.3	1	33.3
Menemsha	1	50	0	0	1	50
Nantuckett	0	0	2	66.7	1	33.3
New Bedford	0	0	2	66.7	1	33.3
N. Falmouth	0	0	0	0	1	100
Oak Bluffs	0	0	0	0	1	100
Onset	2	100	0	0	0	0
Osterville	2	28.6	3	42.9	2	28.6
Somerset	2	50	2	50	0	0
S. Dartmouth	3	75	1	25	0	0

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Table 4-20. Cont.

TOWNSHIP	Yes #	Yes %	No #	No %	Unsure #	Unsure %
S. Dennis	0	0	0	0	0	0
S. Yarmouth	0	0	1	100	0	0
Swansea	0	0	0	0	0	0
Vineyard Haven	1	25	2	50	1	25
Wareham	1	50	1	50	0	0
Waquoit	0	0	0	0	1	100
W. Dennis	0	0	1	100	0	0
W. Falmouth	0	0	0	0	0	0
Westport	1	50	1	50	0	0
Woods Hole	0	0	1	100	0	0
Falmouth	5	62.5	2	25	1	12.5

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Table 4-21. MA - Sediment Types

TOWNSHIP	Mud		Silt		Sand		Gravel		Rock		Combination	
	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	0	0	0	0	0	0	1	100.0
Bourne	0	0	0	0	2	100.0	0	0	0	0	0	0
Buzz. Bay	0	0	0	0	1	100.0	0	0	0	0	0	0
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	0	0
Cataumet	0	0	0	0	0	0	0	0	0	0	0	0
Chatham	0	0	0	0	2	66.7	0	0	0	0	1	33.3
Chilmark	0	0	0	0	1	100.0	0	0	0	0	0	0
Cotuit	0	0	0	0	0	0	0	0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	0	0	0	0	0	0
Dartmouth	0	0	0	0	0	0	0	0	0	0	0	0
Dennis	0	0	0	0	0	0	0	0	0	0	1	100.0
Dighton	0	0	0	0	0	0	0	0	0	0	1	100.0
E. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100.0
E. Sandwich	0	0	0	0	1	100.0	0	0	0	0	0	0
Edgartown	0	0	1	100.0	0	0	0	0	0	0	0	0
Fairhaven	0	0	0	0	1	50.0	0	0	0	0	1	50.0
Fall River	0	0	1	100.0	0	0	0	0	0	0	0	0
Harwich	0	0	0	0	4	100.0	0	0	0	0	0	0
Hyannis	0	0	0	0	3	60.0	0	0	0	0	2	40.0
Marion	0	0	0	0	0	0	0	0	0	0	0	0
Marstons Mills	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-21. Cont.

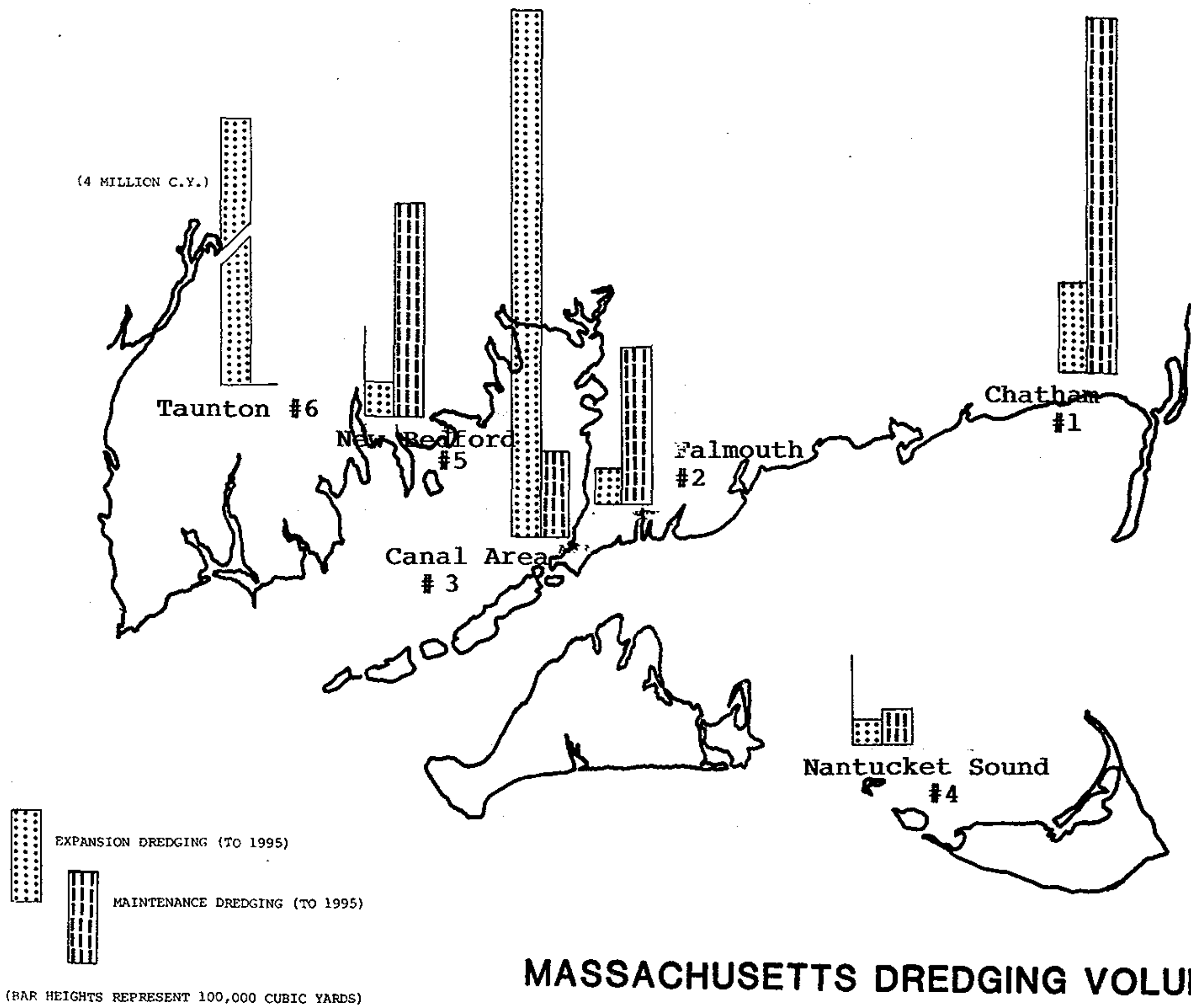
TOWNSHIP	Mud		Silt		Sand		Gravel		Rock		Combination	
	#	%	#	%	#	%	#	%	#	%	#	%
Mashpee	0	0	0	0	3	100.0	0	0	0	0	0	0
Mattapoisett	0	0	0	0	0	0	0	0	0	0	0	0
Menemsha	0	0	0	0	2	100.0	0	0	0	0	0	0
Nantucket	0	0	1	100.0	0	0	0	0	0	0	0	0
New Bedford	0	0	0	0	0	0	0	0	0	0	0	0
N. Falmouth	0	0	0	0	1	100.0	0	0	0	0	0	0
Oak Bluffs	0	0	0	0	0	0	0	0	0	0	0	0
Onset	0	0	0	0	1	100.0	0	0	0	0	0	0
Osterville	1	0	0	0	0	0	0	0	1	50.0	1	50.0
Somerset	0	0	0	0	0	0	1	100.0	0	0	0	0
S. Dartmouth	1	50.0	1	50.0	0	0	0	0	0	0	0	0
S. Dennis	0	0	0	0	0	0	0	0	0	0	0	0
S. Yarmouth	0	0	0	0	0	0	0	0	0	0	0	0
Swansea	0	0	0	0	0	0	0	0	0	0	0	0
Vineyard Haven	0	0	0	0	0	0	0	0	0	0	1	100.0
Wareham	0	0	0	0	0	0	0	0	0	0	0	0
Waquoit	0	0	0	0	0	0	0	0	0	0	0	0
W. Dennis	0	0	0	0	0	0	0	0	0	0	0	0
W. Falmouth	0	0	0	0	0	0	0	0	0	0	0	0
Westport	0	0	0	0	1	100.0	0	0	0	0	0	0
Woods Hole	0	0	0	0	0	0	0	0	0	0	0	0
Falmouth	0	0	0	0	2	66.7	0	0	0	0	1	33.3

Table 4-22. MA - How Frequently Do You Need To Dredge?

TOWNSHIP	<5 Yrs.		5.1 - 10 Yrs		10.1-15 Yrs.		15.1-20 Yrs.		> 20 Yrs.		Unsure	
	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	1	50	0	0	0	0	0	0	0	0	1	50
Bourne	1	33.3	0	0	0	0	1	33.3	0	0	1	33.3
Buzz. Bay	0	0	1	16.7	0	0	0	0	0	0	5	83.3
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	1	100
Cataumet	1	50	0	0	0	0	1	50	0	0	0	0
Chatham	3	50	2	33.3	0	0	0	0	0	0	1	16.7
Chilmark	0	0	0	0	0	0	0	0	0	0	1	100
Cotuit	1	50	0	0	0	0	0	0	0	0	1	50
Cuttyhunk	0	0	0	0	1	100	0	0	0	0	0	0
Dartmouth	0	0	2	100	0	0	0	0	0	0	0	0
Dennis	2	66.7	0	0	0	0	0	0	0	0	1	33.3
Dighton	1	33.3	0	0	0	0	0	0	0	0	2	66.7
E. Falmouth	1	33.3	0	0	0	0	0	0	0	0	2	66.7
E. Sandwich	1	100	0	0	0	0	0	0	0	0	0	0
Edgartown	0	0	0	0	0	0	0	0	0	0	5	100
Fairhaven	1	16.7	1	16.7	1	16.7	0	0	1	16.7	2	33.3
Fall River	0	0	0	0	0	0	0	0	0	0	3	100
Harwich	2	40	0	0	1	20	0	0	0	0	2	40
Hyannis	5	50	3	30	0	0	0	0	0	0	2	20
Marion	0	0	1	33.3	1	33.3	0	0	0	0	1	33.3
Marstons Mills	0	0	0	0	0	0	0	0	0	0	1	100

Table 4-22. Cont.

TOWNSHIP	<5 Yrs #	<5 Yrs %	5.1 - 10 Yrs #	5.1 - 10 Yrs %	10.1-15 Yrs #	10.1-15 Yrs %	15.1-20 Yrs #	15.1-20 Yrs %	> 20 Yrs #	> 20 Yrs %	Unsure #	Unsure %
Mashpee	0	0	3	75	0	0	0	0	0	0	1	25
Mattapoisett	2	66.7	1	33.3	0	0	0	0	0	0	0	0
Menemsha	1	33.3	1	33.3	0	0	0	0	0	0	1	33.3
Nantucket	1	16.7	1	16.7	0	0	0	0	1	16.7	3	50
New Bedford	0	0	0	0	0	0	0	0	0	0	7	100
N. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100
Oak Bluffs	0	0	1	50	0	0	0	0	0	0	1	50
Onset	1	33.3	1	33.3	0	0	0	0	0	0	1	33.3
Osterville	3	33.3	3	33.3	1	11.1	0	0	0	0	2	22.2
Somerset	1	20.0	0	0	1	20.0	0	0	0	0	3	60.0
S. Darthmouth	2	40.0	2	40.0	0	0	0	0	0	0	1	20.0
S. Dennis	0	0	0	0	0	0	0	0	0	0	1	100
S. Yarmouth	0	0	1	50	0	0	0	0	0	0	1	50
Swansea	0	0	0	0	0	0	0	0	0	0	1	100
Vineyard Haven	3	50	0	0	0	0	0	0	0	0	3	50
Wareham	0	0	2	66.7	0	0	0	0	0	0	1	33.3
Waquoit	1	100	0	0	0	0	0	0	0	0	0	0
W. Dennis	1	50	0	0	0	0	0	0	0	0	1	50
W. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100
Westport	0	0	2	50	0	0	0	0	0	0	2	50
Woods Hole	0	0	0	0	0	0	0	0	0	0	4	100
Falmouth	1	06.7	3	20	1	06.7	1	06.7	0	0	9	60



MASSACHUSETTS DREDGING VOLUME

Figure 4-2

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Yarmouth, Hyannis and Barnstable. In this area can be found numerous commercial marinas and boatyards serving the Cape Cod tourist industry. Also, the towns mentioned above repair and maintain several channels, ramps and municipal docks in the waterways and rivers in their jurisdiction.

Area 2 extends from Woods Hole in the southwest corner of Cape Cod to Cataumet several miles to the northeast. This area includes the towns of Woods Hole, Falmouth, North Falmouth, East Falmouth, West Falmouth, Mashpee and Cataumet. This area also includes many marinas and yacht clubs as well as the continually developing high technology oceanographic industry surrounding Woods Hole and Falmouth.

Area 3 covers the mid-Cape as well as the northwestern portion which extends to the Cape Cod Canal at Sandwich. This area includes the townships of Marstons Mills, Osterville, East Sandwich, Contuit, Bourne, Buzzards Bay and Onset, as well as the canal itself. This area is especially rich in coastal and estuary facilities, specifically in the Osterville, Oyster Harbor area which caters to recreational as well as commercial boaters. In addition, this area includes the Cape Cod Canal, which is maintained and operated by the U.S. Army Corps of Engineers and could be the approximate site of several federally planned and sponsored dredging operations.

Area 4 includes the three major island groups located to the south of Cape Cod in Nantucket Sound and Buzzards Bay. These islands include the tourist meccas of Martha's Vineyard and Nantucket as well as the Elizabethan Islands of Cuttyhunk, Nashawena and Naushon. The towns which are on these islands include: Vineyard Haven, Chilmark, Oak Bluffs, Edgartown, and Menemsha on Martha's Vineyard.

Area 5 begins just west of the canal at Wareham and extends in a southwesterly direction along the coast to South Dartmouth. This area includes Wareham, Marion, Mattapoisett, and Fairhaven as well as New Bedford and Dartmouth. Historically, this area has been the home of a very large fishing fleet and related coastal industries. In addition, the area has seen a tremendous growth in both public and private recreational oriented facilities including the large pleasure craft harbor at Padanaram in South Dartmouth.

Area 6 is the westernmost portion of the survey area extending from Westport Point in the south, to Dighton in the north along the banks of the Taunton River. The city of Fall River is included in this area as well as the towns of Westport, Somerset, Swansea and Dighton. Because of the traditional industrial base in this area, waterways and dredging are important factors in the future economic viability of the area. The state pier in Fall River along with Shell Oil, Montaup Electric, and New England Power Systems may all require that channels be maintained and improved.

4.2.2 Dredged Material Quantities

This section examines, by geographical area, the relative need (Table 4-23) and the amount (Table 4-24) of dredged material requiring disposal during the ten year period 1985-1995. By looking at each area specifically, one will be able to see not only the quantity expected to be dredged, but also where this material will be coming from. By looking at the geographical assessment, policymakers will be better able to determine the optimal location of a dredged materials disposal site.

Area 1 (Barnstable, Chatham, Dennis, Harwich, Hyannis, S. Dennis, S. Yarmouth and W. Dennis). Respondents from this geographical cluster estimate that approximately 450,000 cubic yards of dredged material will be removed during the next ten years. The maximum amount to be removed in any one municipality was 250,000 yd^3 in Chatham involving two dredging projects. The minimum amount to be removed is 200 yd^3 in Dennis in a single project.

Because of the extensive economic importance of the tourist industry in this area, the maintenance and expansion of boating facilities is of special importance. In order to maintain their operations, facility owners and operators feel the need to dredge in order to accomodate different types and sizes of pleasure craft. Geographically, this area has been a shoaling troublespot, requiring frequent dredging operations to maintain its tourist attraction.

Area 2 (Cataumet, Falmouth, North Falmouth, East Falmouth, West Falmouth, Falmouth, Mashpee, Waquoit and Woods Hole). Within this geographical cluster, it was found that dredging activity would generate approximately 250,000yd^3 of dredged material. The largest project, however, in this area is planned in the Falmouth area with 100,00 yd^3 being dredged in a single project. The smallest project, with a projected 200 yd^3 of dredged material is scheduled to take place in Cataumet.

The oceanographic industry has attracted many high technology firms to this area of Cape Cod over the last ten years. Federal, state and private institutions in and around Woods Hole and Falmouth require that coastal boating resources be maintained and expanded to sustain the economic growth that has taken place and to attract more industry in the future. Waterways must be maintained at current levels and in some cases deepened so that the potential for economic development is unhindered.

Area 3 (Bourne, Buzzards Bay, Cape Cod Canal, Conuit, East Sandwich, Marston Mills, Onset and Osterville). In this Upper and Mid-Cape area, survey respondents estimated that approximately 721,470 yd^3 of dredged material would be generated during the next ten year period. By a substantial margin, the largest single project in the area is planned for the east boat basin in Sandwich, with 534,470 yd^3 to be removed. Even though this project is just outside the study area, there is the potential for its disposal at a regional disposal site within

Table 4-23

Planned Dredging Over The Next Ten Years
By Geographical Cluster-Massachusetts

	TOTAL RESPONDENTS	%	WILL DREDGE	%	WILL NOT DREDGE	%	UNSURE	%
AREA 1	31	19.0	22	70.9	8	25.8	1	3.2
AREA 2	30	18.4	17	56.7	11	36.7	2	6.7
AREA 3	26	15.9	17	65.4	9	34.6	0	0.0
AREA 4	24	14.7	14	58.3	9	37.5	1	4.2
AREA 5	29	17.8	21	72.4	8	27.6	0	0.0
AREA 6	16	9.8	8	50.0	8	50.0	0	0.0

Table 4-24

DREDGED MATERIAL QUANTIFIED BY GEOGRAPHICAL CLUSTER-MASSACHUSETTS

	Total Material (Cubic Yards)	Maximum Project	Minimum Project
Area 1:	450,010	250,000	200
Area 2:	250,000	100,000	200
Area 3:	721,470	534,470	1,000
Area 4:	241,800	200,000	200
Area 5:	277,480	200,000	200
Area 6:	4,005,225	4,000,000	225
Total:	5,945,985		

Total in Southeastern Massachusetts: 5,945,985 cubic yards of dredged material.

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the study area and, therefore, is included in this survey. In contrast, the smallest project is planned to take place in Onset with a quantity of 1,000 yd^3 being removed.

The federal government, through the U.S. Army Corps of Engineers, has planned an expansion dredging project in the Buttermilk Bay area of Bourne. This planned dredging would open up additional watercourses for recreational, commercial and industrial development.

Area 4 (Chilmark, Cuttyhunk, Edgartown, Menemsha, Nantucket, Oak Bluffs, Vineyard Haven). In this, the island portion of our survey area, it is estimated that a total of 241,800 yd^3 would be dredged over the next ten years. On Cuttyhunk, in the Elizabethan Island chain, it is estimated that 200,000 yd^3 would be dredged in one project alone. On the other hand, a planned project in Edgartown on Martha's Vineyard was expected to produce only 200 yd^3 of dredged material.

Because this area consists totally of islands, waterway maintenance takes on a special importance. Marinas, docks, boatyards ramps and channels of these islands are indeed their lifeblood. Without adequately maintained coastal facilities, this area would lose a prime source of income from the lost tourist trade. Furthermore, many aspects of life taken for granted on the mainland are dependent on waterway transit on the islands. Continued economic prosperity requires the maintenance and improvement of these waterways. Historically, most island areas do not have the chronic shoaling problems that are seen on the south coast of Cape Cod, however, some dredging must be done in certain locations to maintain a minimum draft.

Area 5 (Dartmouth, Fairhaven, Marion, Mattapoisett, New Bedford, South Dartmouth, Wareham). The total amount of dredged material expected to be generated in this area is approximately 277,480 yd^3. The city of New Bedford has planned a project that will alone generate 200,000 yd^3 of material if undertaken as scheduled. Dredging estimates from New Bedford Harbor do not include any officially designated Superfund sites. The town of Mattapoisett, however, is expected to produce only 200 yd^3 of dredged material during the same time span.

This area is far more industrialized than areas on Cape Cod. Communities from Wareham to Dartmouth are heavily dependent upon coastal resources. They include boat building and repair facilities, fish, lobster and scallop fisheries, and pleasure craft sales, as well as the numerous other industries that supply and support them. The city of New Bedford has one of the nation's largest fishing fleets, as well as a well-developed fish processing and packaging industry.

Area 6 (Dighton, Fall River, Somerset, Swansea and Westport). This geographical area has a special significance in reference to quantities of dredged materials in Southeastern Massachusetts. The proposed Federal Project which would in effect deepen the Fall River Harbor Channel from 35 feet (mean low tide) to 40 feet could generate in excess of 4,000,000 yd^3 of dredged material. When coupled with several smaller projects which are slated for this area, one could expect a total of approximately 4,0005,225 yd^3 of dredged material. In contrast to the huge Fall River Harbor Project, the minimum to be dredged in any one location is 225 yd^3 in the town of Somerset.

In Southeastern Massachusetts as a whole, it is expected that nearly 6 million cubic yards of dredged material will be generated by dredging activities in the area during the next ten years. Much of this activity is necessary in order to maintain, improve and expand the coastal facilities, boatyards, marinas, yacht clubs, fishing ports and industries that rely upon accessibility to local and federal waterways. Historically, this area has prospered and developed because of the coastal resources that exist and the impact they have had on the area's economy.

5.0 SUMMARY

The results of the survey for the 1985-1995 period conducted in Rhode Island and Massachusetts were similar in several respects. First, the majority of respondents cited adverse impact due to the no dredging alternative during the 1981-85 time frame as a result of no available open water disposal site. Likewise, a majority of respondents cited a need to dredge in the next ten years, noting adverse impacts if no dredging occurs. The estimated volumes of projected material to be dredged for the ten year period are 3.8 million cubic yards in Rhode Island and 5.1 million cubic yards in Massachusetts. The Rhode Island projects are primarily for expansion while the Massachusetts projects are primarily for maintenance. The proposed Fall River Harbor improvement project with an estimated 4.0 million cubic yards is by far the largest project in the region, accounting for 42% of the total. Aside from the industries located in Fall River Harbor, the type of facilities most affected in both regions are the commercial marinas and boatyards, reflecting the large and prosperous recreational and fishing industries of the region.

A summary chart showing the overall distribution of future dredging requirements is enclosed as Plate #1. The study has pinpointed three major regions of potential dredging operations: upper Buzzards Bay, Fall River, and upper Narragansett Bay north of Davisville. These data will provide relevant information for the potential need and possible location of a dredged material disposal site for the region.