NEW HAMPSHIRE C.Z.M. PROGRAM

W.P.

N.H. Coastal Resources
Management Program
First Year Report
Attachment B - 12

07158

PERFORMANCE STANDARDS
BASED ON CARRYING CAPACITY LIMITATIONS FOR

LAND USES: PUBLIC WATER SUPPLY LANDS
RESIDENTIAL

WATER USES: WASTE DISPOSAL
RECREATION

by

Strafford-Rockingham Regional Council
99 Water Street
Exeter, N.H.

August 15, 1975

This report was prepared under a grant provided by the Coastal Zone Management Act of 1972, administered by the Office of Coastal Zone Management and the New Hampshire Office of Comprehensive Planning.

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1. Introduction

In fulfillment of the Section 2B FY '76 Coastal Zone Management contract, the staff of the Strafford-Rockingham Regional Council has attempted to develop a set of "performance standards" based on carrying capacity. The following uses were considered here:

<u>Land Uses</u>

Public Water Supply Lands
Residential

<u>Water Uses</u>

Waste Disposal
Recreation

Where possible the discussions of standards were differentiated according to the primary, secondary, teriary sub-zones of the New Hampshire Coastal Zone.

The staff has pursued the process set out in the memorandum of understanding which accompanies the contract for services and presents the following tables. The text is followed by tables which amplifies the entries in the final column of the tables, the <u>Performance Standards to Avoid Adverse Impacts</u>.

The Coastal Zone Management Act calls for the regulation of those uses which have a direct and significant impact on coastal waters. It is clear that those land uses which have such an impact should be regulated on the basis of their environmental, economic, and social impacts. In order to assess these impacts in the abstract, there must exist an enormous quantity of the right kind of data.

From an analysis of these potential impacts, it is theoretically possible to develop a management process to regulate the amount and type of growth in the Coastal Zone. The management process could employ a set of "performance standards" for every appropriate land use based upon its impact on coastal waters.

At the present time the "state of the art" in planning is just beginning to grapple with the problems of controlling growth with legally supportable "performance standards". Several planning studies have used this concept.

Reviewed here are some of these studies. This review reveals that, within the time frames of the Coastal Zone Management Act, the formulation of rational, defensible, performance standards is not only physically impossible, but also inappropriate because of the lack of relevant, scientific data for the Coastal Zone of New Hampshire.

Before a discussion of the relevant planning literature, two general comments will be made concerning the difficulty of applying performance standards in the Coastal Zone.

(1) Lack of Uniformity of Receiving Waters - Waters under the jurisdiction of the State of New Hampshire's Coastal Zone Management regulatory agencies are not uniform bodies of water. Waters considered estuarine are characterized by a mixture of salt and fresh water; these waters are one of the most productive natural ecosystems, yet are extremely sensitive to perturbation (disturbance). Unlike freshwater lakes with a more predictable response to a particular impact, an estuary's ability to assimilate (or tolerate)

pollutants is a direct function of dilution or removal rates, as effected by tidal currents. Shoreline and bathymetric configurations, freshwater inputs, and distance from open ocean are some of the factors specifically determining water turnover rates (retention time) within an estuary. As an example, for Great Bay, water turnover rates are low for the inner reaches of the bay, but near the Piscataqua River, turnover rates are relatively high. Also, physical and chemical water parameters (egs. salinity, temperature, phosphorous, and nitrogen), water circulation patterns (causing a possible translocation of a pollutant to a more ecologically sensitive area), and location of areas of "particular concern" (egs. clam flats, oyster beds, fish breeding grounds) are information needed to understand the effects of an impact. Therefore, land-based Performance Standards must be directly sensitive to the receiving water's localized characteristics. Furthermore all of these factors change with the time of year, and are difficult in different years due to changes in rainfall.

(2) Lack of Uniformity of Land-Based Subzones - The Primary (20 feet vertical or 1000 feet horizontal from mean high tide), Secondary (areas enclosed in all towns adjacent to coastal waters), and Tertiary (all remaining land within the coastal watershed). Subzones are defined by boundaries not sensitive to the micro-features (topography, hydrology, soil types, depth to bedrock, vegetation, and areas of "particular concern") of the land comprising the subzones.

For example, septic systems located near water supply aquifers or in areas with soil percolation characteristics unsuitable for proper filtration result in groundwater or surface water contamination. Construction on slopes greater than 25% develop serious erosion and sedimentation problems. Proximity to areas of "particular concern" intensifies the the impact from a particular land or water use. Overuse of groundwater reserves might allow salt water intrusion, contaminating all nearby wells. Therefore, Performance Standards cannot be universally applied to each subzone, as land-use suitability analyses dictate a more site-specific approach in determining the set of environmental impacts resulting from a particular land use.

It should therefore, be noted at the outset that the performance standards the staff was able to derive, or find, for these four uses, are not enough in the abstract, to constitute a sound basis for decision-making for New Hampshire's coastal zone. There are four basic reasons for this:

1) Most "direct and significant" impacts from most uses are site specific: i.e. the same use in different locations has different impacts;
2) Most uses can be constructed or operated in a variety of fashions, thus altering the impact;
3) the consequences of many impacts are as yet unknown - i.e. the amount of lead being dumped into an estuary from a given number of gasoline powered outboard motors can be estimated, but the effect of that lead on the ecosystem,

as yet, cannot be calculated.

4) much basic data about the New Hampshire coastal zone is as yet unknown -- such as the assimilative capacity of Great Bay for any of a variety of substances.

In the tables, column four - Performance Standards, the term "use specific" means that there are many possible variations in the use, consequently a performance standard cannot be stated absolutely. Likewise, "site specific" means that given a single well-defined use, the impacts vary according to site and so cannot be cast into absolute performance standards with any specificity.

Finally, one cannot determine the carrying capacity of an area of land or water without determining first the sociatal goal for that area -- i.e. wilderness state, maximum use of expendable resources, or something in between.

2. Land Uses

Of the two land uses analyzed in depth, Residential was probably the most difficult for which to apply performance standards. Since residential developments are one of the largest users of land adjoining bodies of water, various research studies have attempted to develop predictive models, or recommendations, on how much development can be allowed before the water quality of the lake, river or estuary is unacceptably degraded.

2A. Residential

For Residential Land Uses, seven major impacts were identified as having a direct and significant impact on coastal waters:

1. Increased Area of Impervious Surface (Reduced Ground-

water Recharge, Increased Runoff)

2. Sewage Contamination of Groundwater or Surface Water
3. Lowering Groundwater Table from Overuse of Private Wells (Saltwater Intrusion)
4. Pre-emption of Land from Other Uses
5. Aesthetic Degradation
6. Flood and Erosion Prevention Structures (Altered Water Circulation Patterns)
7. Construction Impacts (Erosion and Sedimentation)

Each one of the impacts is a separate issue in itself. Only the first two impacts were anlyzed in greater depth. Both are discussed below.

An increase in impermeable surface from natural ground cover to (as an example) 35-50% paved or roof area increases runoff by 300% and decreases groundwater infiltration to 70% of normal recharge (Tourbier, 1973). The results of increased runoff are increased erosion and increased flood volume, with a concomitant increase in the size of floodplain. Reduced infiltration causes a reduction in dry weather stream flow and a reduction in groundwater reserves for water supply. The impacts on the coastal zone waters are sedimentation, turbidity, increased dilution of seawater, introduction of nutrients and road contaminants, and salt water intrusion into groundwater.

Rahenkamp and Sachs in their "impact zoning" method analyzed slope, hydrological soil type, and vegetation on a grid map, and calculated the amount of runoff generated at each site under natural conditions (Stimson, 1972). By setting a standard as the amount of runoff allowed, one can calculate the percentage of each grid area that can be used for impermeable surface, without resorting to man-made runoff controls. However, from our literature search, there is no universal methodology for applying a particular impermeable surface area restriction on developments. The degree of severity of the impacts on coastal waters is determined by the local characteristics of the receiving waters and the site-specific land characteristics of the area being developed, as described in the section citing particular difficulties preventing adequate application of the Performance Standards.

There are four recent well known studies. They stand as examples of how unadvanced the "state of the art" really is, regarding the process of determining performance standards. A review of each of the four is given below:

I. Atkins, 1972.

This regional planning study was an analysis of Huntington township along the north shore of Long Island. The area's natural features and land uses were surveyed, and impacts from the particular uses were recorded. Recommendations were made to ameliorate or rectify impacts in a wide range of categories - eg. water quality, air quality, energy consumption, safety of human life and property, aesthetics. Recommendations relating to residential uses and their impacts on coastal waters were as follows:

(1) Around bays, create a buffer area of "no development" of 300 feet horizontally or 20 feet vertically from mean sea level. Around marshes, streams and ephemeral

streams, the buffer zone is to be 300 feet.

(2) Prohibit construction or or immediately above slopes of 25% or greater.

(3) Prohibit development on natural groundwater recharge areas.

(4) Limit development in valley bottoms.

(5) Develop and enforce standards on amount of impervious surface allowable for new development.

(6) Site construction should minimize tree cutting. No tree removal if dripline is 10 feet or more from building.

(7) Use available technology for minimizing energy consumption in buildings.

(8) Where dwelling unit density is greater than 1/1.22 acres, sewers are required.

(9) Dwelling units are to be designed so as not to detract from the landscape.

<u>Comments</u>: Obviously, many of the standards are subjective and difficult to quantify into an enforceable regulation. The study's applicability to New Hampshire is marginal, although the general concepts discussed are all subjects needing consideration in developing performance standards for residential land uses. No particular distinction to land use suitability is made in the Huntington plan. However, the need for a buffer zone (or green belt) at the water's edge is effectively stressed. The major problem is that the suggested standards appear to be reasoned judgements, <u>not</u> the inevitable end result of various scientifically derived carrying capacity analyses.

II. Dillon, 1974.

This study analyzes the amount of phosphorus loading that a lake can receive to effect certain water quality conditions. From land use and geological data, the amount of phosphorus imput from natural runoff can be calculated. From the lakeshore development, artificial phosphorus loading from septic systems can be calculated. With the addition of the phosphorus from direct rainfall and dry fallout, the total phosphorus load to the lake is derived. Combined with information of the lake's morphometry, flushing rate, and phosphorus retention coefficient (the amount of phosphorus not lost throughout the outflow), a springtime total phosphorus concentration in the lake can be predicted. This value can predict two water quality parameters, summer chlorophyll a concentration and secchi dish transparancy. Therefore, an increase in development can be converted to a change in water quality, or conversely, desired water quality conditions can determine the permissable phosphorus loading, which in turn can determine the amount of allowable lake development. If the water quality conditions are already degraded past allowable limits, an estimation of the decrease in phosphorus load can be calculated from conversion of septic to sewer systems.

Four main problems are inherent in the application of this type of model to coastal waters:

(1) The complexity of the shoreline, freshwater inputs, tidal flushing, and land uses would make the prediction of the phosphorus loading extremely difficult and would require a major research effort by a trained team of scientists.

(2) The flushing rate data for New Hampshire's estuaries are not available, and would again be the product of a sophisticated research effort.

(3) The model is only applicable to a lake where water quality conditions are relatively uniform throughout the surface area of the lake. Coastal estuaries are extremely diverse because of circulation patterns induced by tidal and freshwater currents.

(4) Most importantly, the model applies to phosphorus only. Phosphorus is generally the "limiting factor" to biological growth in lakes. In estuaries, the "limiting factor" is nitrogen. Phosphorus can be considered a conservative element in the sense that it is not lost to the atmosphere, once having entered the aquatic system. Nitrogen, though, is continuously entering and leaving the aquatic system to the atmosphere in the form of gaseous nitrogen. Modeling of nitrogen to predict water quality is therefore extremely difficult.

III. Juneja, 1974.

The planning study for Medford was aimed at formulating ordinances based on the suitability of the land for various uses. Since the ordinances were likely to be subjected to legal scutiny, it was imperative that such regulation be based on data and interpretations provided by competent scientists and planners. However, to avoid the problem of "taking" where it might oc cur, the study included performance requirements to overcome site limitations where possible.

Medford Township is located in south central New Jersey and comprises a total land area of about 40 square miles. The study took three years to complete and required the participation of numerous expert natural scientists, experienced planners, and lawyers, and a large number of graduate students. The cost ($150,000) and magnitude of this study is indicative of the commitment necessary to achieve valid planning regulations based on performance standards.

The study investigated the natural environment within the township from two perspectives: 1. based on protection of the town's resources because of their value to society, and 2. based on the suitability and desirability of the land for various uses because of potential "cost savings". Suitability maps were created for the following uses:

1. agriculture
2. forestry
3. recreation
4. urbanization (residential)

The suitability maps were snythesized from a number of natural factor maps that had been interpreted for "cost", "amenity" (site desirability), and "value to society". Rules were established to define the classes or levels of suitability. These rules were based on the rating of relevant natural factors as acceptable or unacceptable. The varying levels of suitability were determined by a concurrence of a given number of acceptable factors. In certain instances the suitability class was modified if certain relevant resource categories also occurred at a given site. These additional categories usually indicated high costs due to a specific problem. The criteria for suitability for suburban development in Medford (4 houses per acre to 6 houses per care) follow:

Cost Savings

Concurrence of	5 acceptable factors = Prime Suitability	(1)
Concurrence of	4 acceptable factors = Secondary "	(2)
Concurrence of	3 acceptable factors - Tertiary "	(3)
Concurrence of less than	3 acceptable factors = Unsuitable	

The lmits of acceptability for each factor for this land use are:

Factor	Acceptable Limit
Foundations: Light Structures	Fair Subsoil shear strength
Maintenance Site Drainage	Somewhat poorly drained soils
Maintenance Site Drainage and Lawns, Playgrounds, etc.	Min. 1-3' depth to seasonal high water table
Maintenance: Lawns, Playgrounds, etc.	Concurrence of at least two of the following: a. Moderate available soil moistur b. Fair nutrient retention c. Moderate shrink-well potential
Maintenance: Lawns Playgrounds, etc.	Max. 100 tons/acre/year potential soils loss

However, suitability classes derived from above have been modified by the following site factors:

Factor	Location	Suitability Mod.
Lack of gradient (Site Drainage cost)	Inner Lowland: Plain; Outer Lowland: Plain	1 becomes 2 2 becomes 3 3 becomes 4
Excessive Run-off (Site Drainage cost)	see Footnote below	1 becomes 2 3 becomes 4 4 becomes 4 4 becomes 5

Site desirability has also been added.

Presence of 1 desirable factor = Tertiary suitability (A)

Factor	Desirable Element
Vegetation and Wildlife interest	Vegetation Associations of Low Value/High Tolerance High Value/Low and High Tolerance

Once the suitability classes were identified a set of performance requirements were established to mitigate the impact of certain kinds of development in the more vulnerable sites. These requirements were generally aimed at proper management of water resources. For instance a water runoff management chart and map were developed to calculate and regulate the amount of runoff created when an existing condition is changed to another type of condition. (This chart which in effect contained the requirements necessary for maintaining the water resources of Medford requires a number of maps (Soil Infiltration Rate, Hydrologic Soil Groups) and a hydrolgic analysis (Rainfall and Run-off calculation) that New Hampshire has not yet developed. This is just one example of why the creation of valid performance requirements for the New Hampshire coastal zone is difficult without the spending of much additional time and money in a limited time period.

The Medford study represents a landmark in the field of planning. It provides the means by which a town can base land use regulation on natural limitations and opportunities. At present the town is using this study as a basis for guiding growth. However, it is clear that the amount of time and money required by such a study is not within the means of the Office of State Planning and the Strafford-Rockingham Regional Council as stipulated in the F.Y. '76 Coastal Zone Management contract.

IV. Tourbier, 1973.

This study developed performance standards for residential uses to protect the water quality and water supply of the Christina River Basin watershed. The study area was 103 square miles, located near Wilmington, Delaware. The report took three years to complete and required the assistance of dozens of highly specialized personnel - hydrologists, city planners, civil engineers, economists, landscape architects, systems analysts, ecologists, and lawyers. The study was not a land-use study in the traditional sense of locating areas suitable for development. Rather, the approach was to allow development on most sites, but with appropriate protection measures required to preserve the area's water resources.

The first stage of the study was a natural resources inventory determining land categories having a relationship to the water regime. Areas of Aquifer Recharge, Surface Water, Marshlands, Woods, Floodplains, Slopes over 12% and Critical Soil Types classified as Erodible and Poor Internal Drainage were the major land categories used in the final analysis. These categories were believed to be the most important for that particular region. Site Classes were defined by the number of possible combinations of occurrence or nonoccurrence of the above categories on a series of grid blocks of approximately 1000 feet on a side for each block. The number of possible site classes generated was 192. The entire study had approximately 4,400 grid blocks. A computer sorted the natural resource inventory information, and assigned Site Class numbers to a grid map.

Three residential characteristics having an impact on water uses were considered: (1) area of site disturbed during construction, (2) area of impermeable surfaces and (3) sewage generation. A Land Use Code from 1 to 8 was assigned to varying intensities, or degrees of each characteristic. (For example, a code of "7,7,7" for the three respective categories would indicate 75-100% of the site was disturb during construction, 50-75% of the area was impermeable surface, and the sewage generation was 3,200-6,400 gal/acre/day. These characteristics were generally indicative of 1/16 - 1/8 acre for a single family residential lot size). All the information was sorted and mapped by computer.

Finally, costs for protection measures of suitable design were determined for the three basic development characteristics. Cost ranges were scaled from 1 to 9, depending on the amount of protection measures required, and were assigned to each set of Land Use Codes for each particular Site Class. This information again was sorted and mapped by computer.

The information generated from the study determined the particular natural land features having a direct relationship to the area's water resources, and the particular development type juxtaposed to the natural features. Protection measures for past and future development were therefore recommended to preserve these water resources. In the case of future development, a developer could assess each area of consideration, and determine the cost and design of the protection measures required for a particular type of housing to be permitted on the site.

A condensed example of the protection measures related to septic tanks and sewer lines is given to illustrate the regulatory recommendations of the study:

1. Ban on septic tanks on sites less than 1 acre.
2. Ban on septic tanks on areas of water, marsh, or floodplain.
3. Percolation test with a minimum rate of 40 inches per minute required on residential sites greater than 1 acre, and on areas of aquifer recharge, woodland, erodible soils, and slopes greater than 12%.
4. Single home aerobic sewage treatment units required on aquifer recharge sites, if percolation test and lot size specifications are met.
5. Increased costs can be expected from septic tile field construction in wooded areas and on steep slopes where soil depth to bedrock is shallow.
6. Extended aeration "package" sewage treatment may be installed by a developer when septic tanks are not allowed and when public sewage is not planned for several years.
7. On all lots less than 1 acre, municipal sewage treatment is required.
8. Sewer lines located in unstable soils (marsh, floodplain, and poorly drained soils) and steep slopes require adequate foundations.
9. Sewer lines located in unstable soils, river crossings, or in aquifer recharge areas shall be constructed as to have a maximum exfiltration rate of no more than 10 gal/diam inch/mi/hr.

10. Other sewer lines are to have a maximum allowable exfiltration of no more than 20 gal/diam inch/mi/hr.

The same type of regulatory approach was used for protection measures for both construction erosion, and runoff from impermeable surfaces.

Comments:

The Christina Basin study is an excellent example of a site-specific approach to land use planning. The time needed to complete the project, the number of people of various expertise involved, and the relatively small size of the study area are indicative of the amount of work involved in such an approach. The results of the project, though, are readily applicable to the planning decisions regarding housing in the Delaware area. For New Hampshire, the information generated is not directly utilizable because of the site-specific correlation of land uses to natural areas. The general methodology is applicable to the New Hampshire coastal zone, although the study area would be much larger. Also, many land and water uses, not just residential, would have to be analyzed to develop a complete set of performance standards for the coastal zone. This would necessitate a reasonable amount of time and money to the apportioned to the planning commissions to complete such a project.

Sewage Contimination of Ground Water or Surface Water

Septic tanks should be located in areas of suitable lot size, slope, soil type, depth of soil to bedrock, and filtration distance before encountering the water table. Recommendations for the design and location of septic systems are adequately discussed in a New Hampshire Water Supply and Pollution Control Commission report (Shephard, 1974). Recommendations for lot sizes for new subdivisions,

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based on soil type and slope are included in an appendix table of the Handbook of Subdivision Practice, Office of State Planning, State of New Hampshire. The problem arises from the application of this method for determining septic tank location suitability, because soil types that are suitable for adequate percolation might also be areas of aquifer recharge. A more detailed site specific analysis is therefore needed.

Federal water quality standards are indicators of sewage pollution, but these standards should not be adopted as the regulatory mechanisms for septic systems. The pollution of ground or surface water often is only detected at great distances from the source of contamination. Hence, detection of the pollution does not lead to immediate regulatory control of the contamination, because the source is often difficult to locate. Performance standards based on water quality are enacted after the contamination has occurred, but effective regulation of septic systems requires that site analyses be made to determine potential problems that might prohibit septic tank use. On unsuitable septic system sites, if sewer hook-up or other sewage disposal methods are not available, then residential development should be prohibited.

The standards of the New Hampshire Water Supply and Pollution Control Commission report (Shephard, 1974) presumably will result in a non-discharge of pollutants condition for surface water, or ground water beyond 75 feet. Those standards are offered here.

2B. Water Supply Lands

These lands include only the municipally or privately owned sites that supply water for community or inter-community water systems. These sites may be for both ground and surface water supplies. Although desalination may be technically possible in New Hampshire, it is not a likely reality because of the expense.

Ground and surface water supplies are typically found in the secondary zone of the Coastal Zone, although all these subzones can potentially supply potable water. The problem of salt water intrusion is a distinct possibility in certain areas of the primary zone if there is over pumping of wells, evidence for this already exists. (Wilson, 1969). Favorable deposits for groundwater reservoirs (aquifers) have generally been mapped and identified, particularly in the primary and secondary subzones. Relative potential yields from individual aquifers and some community pumping records from various sources are known. In order to measure the impact of the use of water supply lands on coastal waters, numerous other data would be essential (amount of fresh water lost to estuarine waters, for example). To determine performance criteria or standards for these areas much more must be known about the capacity and characteristics of the individual sources of water. Such things as aquifer size, recharge rates, depth of saturated layer, etc. must be known before valid performance standards can be established.

The most probable impacts on coastal waters would occur from over pumping of aquifers and over-extraction from reservoirs. Whether in all instances over pumping would have a direct and significant impact on coastal waters is debatable. Because of distance from coastal waters and inherent physiographic differences from place to place, standards would have to vary according to potential impact. Assuming there is a direct and significant impact on coastal waters, the criteria for determining when overpumping has occurred could be derived from measurements of water table depression and reduced hydrostatic pressure (reduced water yields). Not only are such data unavailable, there is no comprehensive scientific data on just how much total ground and surface water is available for future use in the Coastal Zone of New Hampshire. If a performance standard was to be established it would have to be based on known data for water availability.

In the Seacoast Region, which for purposes of the discussion is defined as the former Region 16 and Region 17 planning regions, the present daily consumption of water is 16 million gallons per day (MGD). Of this 10.5 MGD are from groundwater and 5.5 MGD are from surface water (Hall, 1974). The most recent figures put the potential sustained yield for total water supply at between 23-25 MGD (Hall, 1974; Anderson-Nichols, 1969-72).

Recent investigations (Anderson-Nichols, 1969-72; Hall, 1974; Reed, SENHRPC, 1972) have concluded that by the early to middle 1980's the Seacoast Region will run out of water for any expansion if the above statistics and present practices of water extraction are used. However, none of these investigations have performed a detailed hydrogeologic analysis of the Seacoast. Until this type of work is done, it is difficult to establish a valid performance standard of the carrying capacity of either ground or surface waters. In addition, if innovative techniques for water management were implemented the water supply of the Seacoast Region could be increased.

Considering the above qualifications, one could theoretically posit a standard for the number of households that can safely be supplied in an individual town in the Coastal Zone or in the coast as a whole before there is no more additional water available. How much of an impact would be created by lowered water capacity up to this "end" point of water availability is difficult to determine without more investigation and relevant data.

By projecting population, we can determine water demand (such as 100 gallons per day per capita projected population) the water demand figure to water capacity or availability, the amount of pumping or extraction of water can be achieved.

For this discussion, data already generated by Hall (1974) will be used. Although his work includes Planning Regions #16 and #17, the implication can be applied to the defined Coastal Zone. In Table 1, average seacoast water pumpage values are displayed. Hall (1974) stresses the following points:

1. Surface-water consumption increased 40 percent.
2. Ground water consumption increased 33 percent.
3. Total consumption increased 35 percent.
4. Ground water accounts for some 65 percent of total consumption.
5. Some communities such as Portsmouth and Hampton have greatly increased water needs in the summer which means summer consumption is on the order of 18 MGD or even higher.

In Table II, projected water disposal and estimated capacity are displayed. Hall (1974) makes the following points:

1. Water usage since 1965 has been increasing at about the projected rate, and although not shown herein some communities such as Durahm have already reac hed 1980 levels.

2. The capacity figures whow additional capacity will have to be developed by the early 1980's either from local or outside sources.

By subtracting the present 16 MGD consumption from an estimated 23 MGD, there is, a 7 MGD capacity to be consumed in the seacoast, before going to other areas for increased supply. If one assumes that the per capita <u>residential</u> use of water is 100 GPD, then the equivalent pumpage of only 70,000 additional people can be accomodated in the seacoast region. Theoretically, this figure might be greater if only the primary and secondary subzones are considered. By placing an appropriate standard on pumpage per day per community than the resource bearing capacity of ground and surface water will be sustained. This would mean allowable capacity for Exeter of approximately 350,000 gallons. This figure is based on calculating Exeter's projected population of 1985 (11,500) as a percentage the Region 16 and the Region 17 total population (210,000)

applied to the available water supply for the region. In terms of additional population, Exeter could accomodate 3,500 more people. This reasoning assumes each town will be allowed a percentage increase of water based on present population projection. Such a value does not take into account:

1. Other appropriate data
2. Future commercial and industrial demands
3. Possible importation of water
4. Innovative techniques for aquifer recharge, etc.

Translating a pumpage standard into a standard for such things as the lowering of water table, etc. depends on so many variables, that is essentially impossible to establish values as required to complete the carrying capacity tables for public water supply.

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TABLE 1

AVERAGE SEACOAST WATER PUMPAGE (ALL VALUES IN MGD)

	1965 1/	1969 2/	1973 3/ Ave.	Peak Daily	Summer Daily	Source
Surface Water						
Durham	.358	.800 9/	.800	1.000 9/	–	Oyster Rive
Exeter	4/	5/	5/	–	–	Dearborn Brk
Newmarket	.215	.275	.300	–	–	Follets Brk
Portsmouth	1.500	1.900	2.000	5.500 8/	5.000 8/	Bellamy Rive
Rochester	1.650	1.500	2.100	–	2.500	Berry's Broo (Rochester)
Sub total	3.723	4.475	5.200	–	–	
Groundwater						
Dover	2.050	3.000	2.300	3.000	–	
Epping	6/	.083	.100	–	–	
Exeter	.548	.662	.662	–	1.000 9/	
Farmington	6/	.165	.200 9/	–	–	
Hampton	1.050	1.254	1.327	–	2.677	
Milton	6/	.082	.100 9/	–	–	
Newfields	.015 9/	.070	.100 9/	–	–	
Newmarket	.129	7/	7/	–	–	
Portsmouth	1.505	1.900	2.000	–	–	
Raymond	6/	.190	.200 9/	–	–	
Rollinsford	.075	.076	.100 9/	–	–	
Seabrook	.289	.306	.300 9/	–	–	
Somersworth	.968	.950	1.400	–	1.900	
Sub total	6.629	8.738	8.789	–	–	
TOTAL	10.352	13.213	13.989	–	–	

1/ Wilson, 1969.

2/ NHWSPCC, 1970.

3/ Communication from NHWSPCC and telehpone survey by UNH. Because of discrepencies in the reported data, the groundwater total may be low.

4/ None pumped.

5/ Small amount may be included in groundwater.

6/ None pumped or not available.

7/ Small amount may be included in surface water.

8/ Includes considerable groundwater.

9/ Estimates by present author.

10/ Wells

TABLE 2

PROJECTED WATER NEEDS AND ESTIMATED CAPACITY (ALL VALUES IN MGD)

	1965	1967	1969	1974	1980	1990	2000	2010	2020	Adjusted Capacity 1967	Estimated Capacity 1970
Region No. 16 1/	–	6.1	–	–	9.18	14.5	22.1	34.8	50.6	–	13.2
Region No. 16 2/	–	6.1	–	–	9.1	14.3	22.4	34.9	51.9	14.2	–
Region No. 17 3/	–	5.3	–	–	10.4	15.8	24.5	37.8	56.0	8.8	–
Total 2/	–	11.4	–	–	19.5	30.1	46.9	72.7	106.9	23.0	–
Total 3/	10.4	–	13.2	14.0	–	–	–	–	–	–	–
Total 4/	–	–	–	16.0	–	–	–	–	–	–	–

1/ Southeastern Regional Planning Commission (1972).

2/ Anderson-Nichols (1969-1972)

3/ This report, Table 2.

4/ This report, estimated maximum.

SOURCE: Hall, 1974.

3. WATER USES

3A. Waste Disposal

1. Dredge Spoil

The Army Corps of Engineers is presently conducting a 5 year Dredge Material Research Program to determine the impacts of dumping dredge spoil, but the data has not yet been analyzed. No other detailed studies on the impacts of dredge spoil have been located. Until such information is made available, only generalized predictions of impacts can be made. Any particular proposal would have impacts specific to the site, the material being dumped, and the method of dumping.

2. Sewage

The New Hampshire Water Supply and Pollution Control Commission is in the process of establishing performance standards for the disposal of sewage into coastal waters which, in the short run, will assure that all coastal waters achieve the legal class B quality (essentially suitable for body contact). The long run goal of both the federal government and the New Hampshire Water Supply and Pollution Control Commission is to totally eliminate discharges of sewage into coastal waters. The current performance standards would require that all sewage receive the Best Available Technology available before being discharged into coastal waters. Again, as in the dumping of dredge spoil, only generalized comments can be made.

3. Solid Wastes

The dumping of solid wastes generates impacts such as the leaching of toxic materials and nutrients, oxygen depletion of the surrounding waters, increased turbidity and floating debris. Extensive review of the studies done on the impacts of solid waste disposal in coastal waters lead to the conclusion that very little hard data to support such determinations is available. The University of New Hampshire, University of Rhode Island, M.I.T. and Woods Hole Oceanographic Institute have all conducted small scale studies on the biological and economic impacts of ocean dumping (see references). However, additional research must be conducted, expanding upon the results of these studies before they will be useful in evaluating potential large scale ocean dumping activities.

As a first step in evaluating the impacts of ocean dumping solid wastes, it will be helpful to consider the maximum acceptable levels for most serious toxic substances which are established by the EPA. The EPA standards for the most common toxic metals likely to be found in solid wastes include:

Compound	Maximum Acceptable Level
Aluminum	1.5 mg/1
Antimony	0.2 mg/1
Arsenic	.05 mg/1
Cadmium	.01 mg/1
Lead	.05 mg/1
Mercury	1.0 mg/1
Selenium	.01 mg/1

Any ocean dumping of solid wastes should be controlled so that none of the maximum acceptable levels for these toxic metals are exceeded. However, it is impossible at this time to determine how much solid waste can be dumped in a specific area before any of these levels is exceeded. In fact, according to Ketchum, "increases in the abundance of trace metals in the marine environment are difficult to assess, because so little is known of the natural variations and behavior of the elements."[1] In addition, leaching and concentration of toxic metals will vary by site depending upon characteristics such as water temperature, depth, ocean currents, vertical diffusion, etc.

Nutrients are another problem associated with solid waste disposal at sea. According to Ketchum, the maximum acceptable discharges of nutrients into a water body are extremely difficult to estimate. He states that "the problem of heavy nutrient loads is greatly complicated in the coastal waters by other wastes that may compete for the assimilative capacity of receiving waters, or reduce the capacity through toxic inhibition of metobolic processes and physical interference, particularly through turbidity and silting of benthic habitats."[2] Clearly then, nutrient release from solid wastes can pose significant problems. However, the extent of the impact depends upon the type solid wastes and the characteristics of the disposal site, and these are variables which have not been evaluated as they apply to waters off of New Hampshire.

Oxygen depletion of waters around the disposal site is another significant impact of solid wastes dumping. The University of Rhode Island, in their report, analyzed the relationship between baled solid wastes and oxygen consumption. Although the information was rather sketchy, one conclusion that was reached was that at "cold bottom temperature and with massive waste bales, the period of oxygen consumption at any actal dump site will be prolonged over years."[3]

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1 Bostwick H. Ketchum, The Water's Edge: Critical Problems of the Coastal Zone, M.I.T. press, Cambridge 1972, p. 155.

2 Ibid, p. 158

3 B.D. Pratt, et. al. "Biological Effects on Ocean Disposal of Solid Wastes, URI 1973, p. 37.

The extent of the oxygen depletion and ultimate impacts again depend on the content of the solid wastes and the specific site characteristics. Pratt suggested that an estimate of oxygen depletion in the basins of the Gulf of Maine could be made by using minimal initial oxygen content, minimal vertical diffusion rates, maximal oxygen consumption rates, and maximal areas of waste coverage. Levels of oxygen under 2mg/l could be considered as potentially harmful.

Other potential impacts of ocean dumped solid wastes include turbidity and floating debris. According to EPA standards for recreational water quality, clarity of the waters should be such that a secchi disk is visible at a minimum depth of four feet, although temporary disturbances causing higher turbidity are permissible. Little or no floating debris is acceptable in waters used for recreational activities. Thus regulations on ocean dumping of solid wastes should be developed to insure that only a minimum level of disturbance to benthic sediment occurs and should require that solid wastes packaged to prevent any significant release of free floating debris. It should be noted that the 4 foot depth for water clarity while appropriate for surface swimming is too turbid for skin diving and perhaps for many marine organisms.

In light of the numerous potential negative impacts of solid wastes disposal at sea, and the vast amount of information still to be compiled, it appears impossible to establish performance standards at this time. The EPA does presently regulate all ocean disposal of solid wastes. Before any new dumping site is authorized an Environmental Impact Statement on the proposed site must be completed. At that time, data on potential leaching of toxic materials, nutrient releases, oxygen depletion, turbidity, etc. can be analyzed in light of the particular site characteristics. This case by case evaluation of solid waste disposal at sea seems to be the most prudent approach, at least until more information becomes available to thoroughly assess the potential impacts in a more general sense.

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1. Devanney, J.W., Economic Aspects of Solid Waste Disposal At Sea, Mass Institute of Technology, Cambridge Nov. 20, 1970.
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3. Loder, Theodore C., Sea Monitoring of Emplaced Baled Solid Wastes, University of New Hampshire, Durham, Aug 1973.
4. Pratt, S.D., Biological Effects of Ocean Disposal of Solid Wastes, University of Rhode Island, Kingston, 1973.
5. Proposed Criteria for Water Quality Vols. I and II, U.S. Environmental Protection Agency, Washington, D.C., Oct 1973.
6. Report on Solid Waste Disposal, S.E.N.H.R.P.C., Jan 1974.

3B. Recreation

1. Beach Activity, Including Swimming

Chapter VI of the 1975 New Hampshire Outdoor Recreation Plan (NHORP) contains figures which gauge the carrying capacity of the state's beaches in reference to recreational activity. "Beach" refers to the land on shore and also the waters used for swimming. The recreational uses that characterize beach activity are largely "passive" in nature, although swimming is considered "active-expressive" by some (pp VI 31-32). Despite these differing categorizations, beach activities such as sunbathing, building of sandcastles, and swimming could be expected to all be of minimal environmental impact when practiced in limited numbers at properly designated recreational beaches.

For information pertinent to the development of the 1975 NHORP recreational use criteria the entire sixth chapter should be consulted, while pages VI 34 through VI 39 deal specifically with capacity. Although the NHORP provides useful and necessary information, it should be remembered that "this development of capacity for recreation facilities for New Hampshire represents an initial effort and all capacity figures should be considered in general terms until extensive review and evaluation has taken place in the field."

Specific definitions have been used in the NHORP to distinguish between "instant" and "daily" capacities. Instant capacity is the number of persons that can be accommodated by a particular facility at any one time. Daily capacity is the number that can use said facility during one day. The daily capacity is the product of the instant capacity times the "turnover rate," the number of times a particular facility can be used by different individuals during one day.

While these definitions and operations are clear the NHORP does not clarify the methodology used to obtain the initial figures for New Hampshire beach areas. These figures are the following:

minimum instant capacity	= 100 square feet of water per person or 440 person per acre
optimum instant capacity	= 200 square feet of water per person or 220 person per acre
turnover rate	= 1.5
minimum daily capacity	= 65 square feet of beach per person or 660 persons per acre
optimum daily capacity	= 130 square feet of beach per person or 330 persons per acre

Translating these into numbers that are more easily visualized, the least amount of water per swimming should be a square with sides of 10 feet and the optimum space a square of about 14 feet on each side. These are also the same for the actual beach area, as the daily capacities, when divided by the 1.5 turnover rate, yield 100 square feet minimum and 200 square feet optimum.

In addition, DeChiara and Koppelman provide corresponding but not identical figures in Urban Planning and Design Criteria. Table I provides this additional information.

These figures appear to be based upon a "crowding" value, most probably based on aesthetic rather than ecological criteria. This is because the ecological effects of beach activities are difficult to determine, as they are often long-term or secondary rather than immediate and direct. Swimming itself may not have any effect on the ocean, but a side effect of swimming, such as urination, could

Facility	Standard
shoreline—ocean, lake, reservoir, or stream	25 effective feet of shoreline for each 1000 population, accommodates 150 persons per day, and 50 persons at one time. 25 effective feet include: **a.** 5000 sq. ft. for sunbathing. **b.** 2500 sq. ft. for buffer and picnic area. **c.** 1000 sq. ft. for water area for swimming. An effective foot consists of one lineal foot of shore with 100 footwide band of water suitable for swimming; 200 foot-wide strip of beach for sunbathing; 100 foot-wide buffer zone for utilities and picnicking.
beach	A shoreline swimming unit should have a length of 600 ft. and a width of 665 ft. (565 ft. of width is land and 100 ft. is water). Maximum shoreline length should not exceed 3600 ft. A minimum unit of 9.2 acres (1.4 acres of water and 7.8 acres of land) has a 200 foot wide beach or play area and a 100 foot wide buffer zone for installation of utilities, tables, etc. The balance, 265 ft., accommodates 300 cars at a time. Minimum facilities are a change house, and sanitary facilities. At any one time an optimum capacity of 1200 persons may use the minimum shoreline facility. A turnover rate of 3 is expected. This allows 3600 persons to use the area on an average summer Sunday or 461.5 user days per.
beach, rural area	3 supporting areas for each acre of beach. The acre of beach accommodates 185 swimmers, over 12 years old, at any given time. This provides 200 sq. ft. of beach per swimmer. With an average daily turnover of 3, the acre of beach and its 3 supporting acres accommodate 555 swimmers per day.
beach, urban area	4 supporting acres for each acre of beach. The acre of beach accommodates 370 swimmers at a time. This provides 100 sq. ft. of beach per swimmer. With an average daily turnover rate of 3, the beach area accommodates 1110 swimmers per day.
beaches	150 sq. ft. of water for each swimmer in the water. 300 sq. ft. of land for each swimmer not in the water.
beach	100 to 200 sq. ft. of swimmable water per swimmer. 50 to 100 sq. ft. of beach per swimmer. Between 15% to 30% of swimmers are in the water at one time.
beach	Most of the time there are more persons on the beach sunning than in the water. Since the amount of usable water space per person ranges from 50 to 100 sq. ft. the available site will determine the capacity of a particular bathing beach

Table 1 Source: Dechiara and Koppelman

forseeably have a long range and subtle effect, no matter how far-fetched it seems. Sunbathing itself does not appear harmful, but the trash left on the beach as a consequence of such passive activity accumulates with negative impact on the natural and aesthetic environment.

As many ecological truths have proven to be counter-intuitive it is wise to guess at possible effects or to assume the system's parameters according to a "logical" pattern. In other words, we cannot be sure that the "crowding" capacity of a beach will be exceeded before we reach the natural carrying capacity, especially as the former could ery well be a matter of personal opinion. 400 persons per square acre might be considered crowded by a rural person, but not so to an urban dweller.

Similiarly, the natural carrying capacities of beaches cannot be considered uniform either. In an area where there are dunes and delicate grasses the natural carrying capacity would allow far fewer persons than a crowding capacity based on non-ecological values. However, at a duneless, rocky, sea-walled beach like Hampton, the natural capacity might be expected to match or exceed the aesthetic limit. Moreover, the natural carrying capacity is likely to vary not only between different beaches, but also at the same beach under different conditions.

2. Finfishing

Data on approximate numbers of finfish of various species inhabiting New Hampshire coastal waters and on the impacts of commercial and sport fishing on these various populations is extremely limited. It is known that blue fin tuna are presently approaching endangered status and that haddock and halibut have been virtually eliminated as a result of intensive commercial fishing. Many fear that other species are also experiencing population declines due to over exploitation and interferences with the reproductive processes resulting from pollution and other human activities. However, no data exists to fully indicate the extent or specific causes of these population declines.

In light of the obvious lack of base line data, it appears impossible at present to establish realistic performance standards based on natural resource factors. However, other criteria such as aesthetics and demand levels have been used to determine optimal levels of use. For example, in the 1975 New Hampshire Outdoor Recreation Plan, a review of existing state and federal standards on recreational fishing, yielded the figure of 1-3 fishermen per acre as a desirable management standard for fishing. Whether or not this figure is applicable to New Hampshire's particular situation can not be determined at present.

In the interim, however, some form of controls over marine recreational finfishing seems warranted. The Fish and Game Department has recommended that a license be required for all salt water sports fishing and that all sport and commercial fishermen be required to report their catches. With these regulations it would be possible to compile a valuable data source on numbers of fishermen, average yields, and yearly variations in yields, as well as provide funds to support research on various marine, fish populations. Once this information has been gathered and analyzed it should be possible to establish figures in maximum sustainable yields for the various fish populations and to develop the means for insuring that these yields are not exceeded.

The Fish and Game Department presently requires a license to fish for coho salmon, salt water trout and shad and also sets a limit on the daily catch for these species. In view of the uncertain future for many commercial ocean finfish species if sport fishing is not strictly regulated, it may be desirable to establish interim conservative limits on all fish species. These limits can be changed as additional information dictates. The Fish and Game Department appears to be most qualified to make this decision.

3. Clamming and Oystering

A "carrying capacity" for the number of shellfish that can be harvested before the breeding population declines was difficult to assess because of the numerous variables that may simultaneously limit the population. Exposure to pollutants, predation intensity, climatic fluctuations, spawning success and food supply as well as overharvesting may contribute to the reduction of shellfish in an area. A number of sources were consulted for pertinent information on these variables but specific carrying capacities for clam and oyster harvest could not be established.

First, an attempt to establish existing quantities of harvestable clams and oysters in New Hampshire waters was made. The first quantitative survey of clam density estimated 96,000 pecks of harvestable clams existed in Hampton-Seabrook Estuary (Ayer, 1968). Considerable evidence (Belding, 1931; Turner, 1948; Dow and Wallace, 1957) indicated that heavy harvesting pressure has been responsible for population reduction.

In order to investigate the matter further, an economic study was conducted by a consultant for the Fish and Game Department of New Hampshire (1971). An estimated 13,273 license holders, spending 111,834 days clamming were assumed to have harvested 100,000 pecks of clams annually. These figures, presented in the Coastal Zone Management - Fisheries Report are based on Hampton-Seabrook Estuary estimates. Approximately 95% of New Hampshire's clamming activity is concentrated in Hampton-Seabrook Estuary. The clam flats in Great Bay and Little Harbor are significant, but receive little harvesting pressure at present.

The Fish and Game Department predicted a decline in harvest of 20,000 pecks annually, and attributed the decline to overexploitation. There was no data given to support this contention, however. According to their figures, a harvest of 60,000 pecks was expected in 1973.

Studies on the standing crop of legal size *Mya arenaria* in Hampton-Seabrook Estuary (Normandeau Associates, 1974) estimated that only 23,000 pecks of harvestable clams was available in 1973. This approximation did not include three minor clam flats of the estuary, but nonetheless the discrepancy with the Fish and Game data is considerably large. The population may be declining at a much higher rate than was expected, or one or both sets of figures may be inaccurate. Normandeau Associates reported that the standing crop of harvestable clams declined by 33% from 1972 to 1973, and suggested that the increase in mortality could be attributed to clam digging.

The figures obtained in the literature are extremely variable, but the reduction in clam density is apparent. Perhaps the variability of the study conditions (methodology, climate, tides, etc.) are responsible for the discrepancy. Shellfish populations fluctuate naturally from year to year regardless of harvesting pressures, so baseline data on natural growth rates should be determined. It is difficult to isolate any one factor as influencing clam growth. Presently, about 15,000 people are licensed clammers. With the legal harvesting limit of one peck per day, and about 150 clamming days/year in Hampton-Seabrook Estuary, it is conceivable that the clam population is being overexploited. The increase in clamming licenses issued and the decrease in clam density annually raises some serious problems.

No conclusive data has been presented to determine the actual causal factor in the population reduction. Thus, carrying capacity for recreational clamming cannot be developed. Absent from the field study, more information is needed on seasonal harvesting rates, pollutant concentrations in the estuary and natural rejuvination rates in order to determine the number of clams that can be harvested before exceeding the capacity. The actual number of pecks that are harvested must be known to develop acceptable standards. Until such information is available, conservative limits are recommended for regulation of recreational clamming activities.

Oystering in New Hampshire is confined to the Great Bay Estuary. There is substantial oyster resource in Great Bay which is lightly harvested at present. For the past five years about 1,300 oystering licenses have been issued annually, according to the Fish and Game Department of New Hampshire. In 1971, an estimated 7,238 bushels of oysters were harvested, which comprised 20% of the marketable standing crop. A maximum sustainable yield was developed, recommending that no more than 10,000 bushels be harvested per year.

In percentage terms, this means that a harvesting capacity of 25% of the total population is the acceptable limit established for oystering.

The methodology employed was not based on all of the scientific information normally necessary in developing carrying capacity. It may be possible, however, that the oystering situation is not as complex as more intense shellfishing activities. The exploitation of oysters is so minimal that the population density, which is relatively stable, can be monitored annually. Instead of utilizing contributing factors to determine carrying capacity, the Fish and Game Department established a limit on oystering based on the information that 20% of the population harvested yielded a constant growth rate. It was assumed that a slight increase in harvest would not significantly reduce the population, but that a 5% increase might, and therefore, should be considered the maximum limit. Until that limit is approached, it will not be known whether or not the rather arbitrary estimate is a good one.

The environmental conditions may also determine population density. Limited information is available on the environmental parameters of Great Bay. Until this information is available it seems unwise to determine a carrying capacity based only on harvesting rates.

4. Recreational Lobstering

The New Hampshire Fish and Game Department, in a report of March 1, 1975, states that "there is excellent evidence, collected primarily in Maine, that the inshore lobster population in the Gulf of Maine is being exploited to its maximum sustained yield level and perhaps beyond." This report does not supply statistics on the carrying capacity of lobstering in New Hampshire, because as it states "there is a severe lack of accurate statistical information available concerning commercial and recreational fisheries in New Hampshire's coastal zone."

This lack of information is due to both the inadequacy of reporting requirements that do exist, not to mention the inherent difficulty of gauging the size of an ocean lobster population. While lobster fishing is restricted to licensed residents and requires catch and effort reporting, these "requirements are completely inadequate" and according to fishermen's admissions, "the data they submit is inaccurate."

As lobster has already become prohibitively expensive after seeing a dramatic price increase during the past five years, determining the carrying capacity of lobster population appears imperative, for ecological as well as economic reasons. The current lobster situation is indicative of the fact that an economic enterprise cannot prosper without taking biological laws into account. The more lobsters that are currently harvested, the higher the resource cost in terms of time and effort. Unfortunately there is not guarantee that the point of diminishing economic returns will be reached before the lobster population is diminished to a point of exhaustion. It must be remembered that while one pound lobster may yield $2.50 today, its potential profitability would multiply each time it is allowed to reproduce.

E. Boating

Carrying capacity for boating areas could not be determined because the data available at this time is insufficient. Establishing acceptable standards and numerical capacities is theoretically appealing, but requires extensive knowledge of a variety of contributing factors. Intensive research is essential in order to determine accurate data. At present only estimates, which are extremely limited and misleading are available. An attempt to gather pertinent information was made utilizing these sources:

General

<u>New Hampshire Outdoor Recreation Plan - 1975</u>

<u>Urban Planning and Design Criteria</u>

<u>Proposed Criteria for Water Quality</u>

Specific Freshwater Studies

A preliminary study for evaluating the capacity of waters for recreational boating

Impact of Outboard Motor Operation on Water Quality

Specific Saltwater Studies

Analysis of pollution from marine engines and effects on the environment

Marina del Rey: A study of environmental variables in a semi-enclosed coastal water

(See references for complete citation)

A major problem in determining carrying capacity is a lack of appropriate methodology. At present, limits and tolerance levels are set somewhat arbitrarily, according to aesthetic or economic, rather than scientific, indicators. In addition to being arbitrary, these limits are also approximate, and must be considered estimate instead of accurate statistics. Despite these shortcomings, the available information concerning the carrying capacity for certain recreational activites will be presented here. In doing so, it must be realized that this information will more likely illustrate the inadequacy of the present methods and knowledge than indicate the carrying capacities themselves.

The <u>1975 New Hampshire Outdoor Recreation Plan</u> estimates carrying capacities for boating, and distinguishes between "instant" and "daily" carrying capacities. Instant carrying capacity is the number of persons a particular facility can accommodate at any one time, while daily capacity is the number that can be accomodated during one day. The daily capacity is the product of the instant capacity and the turnover rate, which is the number of times the facility can be used by different individuals in one day. While this operation is clear, the <u>NHORP</u> did not clarify how the initial figure for instant capacities or turnover rates were specifically determined. The figures for boating and sailing were obtained through an extensive review of standards set forth by other states and agencies, although New Hampshire devised its own standards for other recreational activities. As "it was difficult to determine if the environmental conditions in New Hampshire and some other locale were similar" (XI, 8) the following figures, expressed in person-acre ratios, are not necessarily appropriate:

	Maximum	Optimum
Boating	.5 persons/acre or 2 acres/person	.25 persons/acre or 4 acres/person
Sailing	2.25 persons/acre or .4 acres/person	1 acre/person

Unfortunately, these comprise only one set of the many and divergent figures contrived in the NHORP. While some are general Northeastern estimates, and others supposedly specific to New Hampshire, none are site specific. Nor is there any evidence that these estimates are based on scientific information. Due to the inadequacy of information and arbitrary nature of standards, these figures should be considered in general terms until entensive review and evaluation has taken place in the field." (VI, p36)

Another reference source is Urban Planning and Design Criteria (DeChiara and Koppelman), which provides general standards for boating uses (See Table 2). These standards are not specific as they are intended to guide planners rather than dictate plans. Before constructing a marina, it is recommended that experts determine the number, types and sizes of both the existing boats and berthing facilities in the area, and also the condition of those facilities. The authors attribute the difficulty in determining marina standards to the variability of marina design, function, location and capacity, which make it "virtually impossible to arrive at standard conclusions and judgements."

The environmental impacts of boating are very important factors when determining carrying capacity. Petroleum discharge from outboard engines can have a significant adverse effect on the environment, lowering the carry capacity. Standards for oil pollution can be a valuable tool in determining the limits of recreational boating. Existing standards are contained in Proposed Water Quality Information (US EPA 1973):

a) No visible oil on water surface
b) Concentration of emulsified oils not to exceed .05 of the 96-hr. LC 50 value determined using the receiving

Table 1.

Facility	Standard
jor boating ivities	100 acres for every 50.000 population. Ideal size of 100 acres and over. May be located within a district park, regional park or reservation.
boating and ᴡeng	1 lake or lagoon for every 25,000 people. Ideal size of 20 acres of water area. May be located in a community park or special regional reservations.
trip inoeing	Average number of canoes a day is 6, with 2 men per canoe. Average daily trip distance is 15 miles.
	Streams must have an average flow of 100 cubic feet a second in order to be generally suitable for canoeing.
canoe area	Estimating 2 persons per canoe per ½ mile of stream. Larger streams could probably handle one canoe per ¼ mile of stream.
water skiing area	One ski boat requires 40 acres of water, therefore, 13 ski boats would require 520 acres of water to support one ski boat ramp.
boating	¼ acre of water for every 1000 persons. Boating area located in a county park that allows 12 acres for every 1000 population.

Facility	Standard
motor boat area	It takes 20 acres of water to support one power boat. 13 boats in the water would require 260 surface acres of open water to support a ramp.
boat access unit	1 boat access unit capable of launching one boat at one time, serving 125 trailered boats or storage facilities berthing, mooring and the like for 100 non-trailered boats. 75 boats will operate from one access unit on the season's peak day and 50 boats on an optimum day.
	Service radius of 25 miles for day-use boaters; 75 to 175 miles for weekend-users; 135 to 250 miles for vacation boaters.
boating	1 ramp on 1-½ acres for every 125 boat owners if boaters average 8 trips a year.
	21,000 sq. ft. of parking space per ramp, assuming a parking lot capacity equal to maximum ramp capacity.
boat ramp	A boat ramp occupies one acre of ground space and can accommodate launching and retrieving of about 40 boats per day per launching lane. 60 cars with boat trailers can be parked in area.
	Ramps generally service 160 surface acres of water available for boating. Each ramp has at least one 75-foot vehicular turn-around.

Table 2: Source: DeChiara and Koppelman

water in question and the most sensitive species in area.

c) The concentration of hexane extractable substances in air dried sediments are not to exceed 1,000 mg/kg on a dry weight basis.

Extensive research on the effects of oil on the plant and animal communities of the marine environment has determined the following threshold levels for petroleum concentrations in sea water:

Species	Effect	Concentration
phytoplankton	productivity inhibited	.0001 ppm.
clams and oysters	mortality	.01 to 1.0 ml/l
zooplankton	mortality	.1 ml/l for
starfish, barnecles	mortality	3 - 72 hrs.
fish eggs	mortality	.01 to .001 ml/l
lobster	timing & behavior	.009 ml/l
lobster larvae	mortality	.1 ml/l.

Oily odors were evident in shellfish at .0015 to .0017 ml/l. Petroleum concentrations in the water and sediment should be maintained below tolerance levels for acceptable environmental standards.

Research on the impacts of boating has been limited, yet is needed in order to determine limitations on boating. Ashton and Chubb (1972) condensed a preliminary study evaluating the number of boats that lakes in Southeastern Michigan can accomodate without reducing user satisfaction. Although the study specifically deals with freshwater, the methodology is potentially applicable to New Hampshire areas. The relationship between the area used by boats and the levels of use was determined and the carrying capacity of surface waters for recreational boating was predicted. The user's satisfaction defined in terms of an index, was determined by survey. The index was calculated by dividing the number of unfavorable responses by the total number of responses for a given time and place. The area used by boaters was quantified as a 'space consumption index', determined by dividing the total area consumed by all activities by the total water surface area. The user satisfaction index was related to the space consumption index, and the number of acres per boat was inversely related to space consumption.

The impact of outboard motor discharge on Houghton Lake in Michican was investigated by the Michigan Water Resources Commission. Bureau of Water Quality Appraisal in 1973. Of the 246,469 gallons of fuel consumed, 12,000 to 25,000 gallons, or between 5 and 10%, were discharged into the lake (based on a % discharge rate). These investigations involved studies on lead, phytoplankton, nutrients, zooplankton, benthic organisms, fish, dissolved oxygen, phosphorus, inorganic nitrogen, PH, chlorides, iron and toxic material. The point at which outboard motor discharge creates adverse biological and chemical condition might be considered the environmental carrying capacity for the particular use.

The conditions of a marine environment are more complex and difficult to monitor than are freshwater systems. Mercury Marine, Inc. (1973) conducted a pollution study of outboard motor's effect on the marine environment. Stress rates, or tolerance levels, established by determining the number of motor boats that could reasonably be expected to occupy a given surface area of water under optimum (saturation) conditions. The average stress level for the water system was one gallon of fuel per million gallons of water per day.

This type of methodology can be utilized knowing the volume of water in a given area and the consumption rate of gasoline. Variations in circulation, currents, flushing rate and other characteristics of non-uniform bodies of water must be accounted for. Complete information on such characteristics is not currently available for New Hampshire.

The "environmental variables of a marina in a semi-enclosed water body" were studied on the California coast (Bowerman and Chen, 1971). The physical, chemical and biological properties of the water and sediment of the Marina del Rey boat harbor were examined in order to determine if the berthing capacity of the marina had exceeded the environmental carrying capacity. This report illustrates a suitable scientific method for determining carrying capacity based on extensive knowledge of the environmental conditions.

The preceeding review of literature concerning carrying capacity for recreational water uses should illustrate that while some information is available at present, a great deal of specific data still remains to be gathered. It is suggested that in order to determine viable carrying capacity standards for boating in New Hampshire, the following measures be taken:

1) The specific location of the facility and the properties of that region must be known

2) The criteria for determining carrying capacity must be defined, i.e. what single factor or combination of factors will be the basis for judgement

3) Natural carrying capacity (in itself variable) must be determined (in every experient there must be a control)

4) The environmental conditions of the facility under

investigation must be relatively static in order to arrive at absolute numbers.

5) The socio-economic, psychological and institutional factors of the region must be determined

Although the collection of this essential data will require additional time and expense, it is hoped that the results will enable the state to develop meaningful performance standards.

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DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

WATER USES

ethodology / esource Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
Waste Disposal (Dredge spoil)	1. Re-introduction of nutrients into water column causing high BOD and eutrophication	1. Resource bearing capacity	1. (Composition of dredge material) Use and site specific and no establis standards
	2. Re-introduction of toxic and persistant compounds into the water column	2. Resource bearing capacity	2. Use and site specific and no establis standards
	3. Increased turbidity	3. Resource bearing capacity	3. Site specific - secchi disk should be visible at 4 feet
	4. Sedimentation smothering bottom habitat	4. Resource bearing capacity	4. Site specific and no established standards
	5. Alteration of substate composition preventing reproduction and recolonization by shellfish and other benthic organisms	5. Resource bearing capacity	5. Site specific and no established standards
	6. Aethetic degradation	6. Social capacity	6. No established standards
	7. Alteration of bathymetry a. Change in water circulation b. Change in salinity and temperature regimes c. Change in effect of littoral erosion	7. Resource bearing capacity	7. Site specific and no established standards * Recreational use standard may not be adequate for many life forms.

WATER

DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

thodology / source Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
Waste Disposal (Sewage)	No treatment		
	1. Introduction of pathogenic bacteria a. Public health hazard 1) contamination of shellfish 2) contamination of humans ingesting H_2O b. Destruction of aquatic biota	1. Resource bearing capacity	1. At least secondary treatment by 1977 Best Available techology by 1982- site specific
	2. Introduction of nutrients - eutrophication	2. Resource bearing capacity	2. " "
	3. Suspended solid	3. Resource bearing capacity	3. " "
	4. Increased BOD	4. Resource bearing capacity	4. " "
	5. Persistant and toxic non-nutritive compound	5. Resource bearing capacity	5. " "
	6. Loss of recreation use of water	6. Social capacity	6. " "
	7. Aesthetic degradation	7. Social capacity	7. " "
	8. Dilution of sea water	8. Resource bearing capacity	8. " "

DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

WATER

ethodology / esource Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
Waste Disposal (Sewage)	Primary Treatment		
	1. Loss of recreation uses	1. Social capacity	1. At least secondary treatment by 1977 Best Available technology by 1983 - s
	2. Offensive odors	2. Social capacity	2. specific "
	3. Increased fresh water flows	3. Resource bearing capacity	3. " "
	4. Increased BOD	4. Resource bearing capacity	4. " "
	5. Pathogenic substances to humans	5. Resource bearing capacity	5. " "
	6. Plant nutrients - Eutrophication	6. Resource bearing capacity	6. " "
	7. Non-nutritive organic compounds	7. Resource bearing capacity	7. " "
	Secondary Treatment		
	1. Plant nutrients - Eutrophication	1. Resource bearing capacity	1. " "
	2. Non-nutritive organic compounds	2. Resource bearing capacity	2. " "
	Tertiary Treatment		
	Exotic chemicals	1. Resource bearing capacity	

DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

WATER

·thodology / ·source Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
Waste Disposal (Solid waste dumping)	1. Introduction and accumulation of toxic persistent compounds (short term and long term effects)	1. Resource bearing capacity	1. Not to exceed EPA standards*, use and site specific
	2. Introduction of nutrients-increase BOD	2. Resource bearing capacity	2. Use and site specific and no establish standards
	3. Debris and residue carried to shore by offshore currents a. Aesthetically displeasing b. Inhibitory to recreation c. Public health hazard d. Interference with fishing and boating	3. Social capacity/resource bearing capacity	3. No debris permissable
	4. Breakdown of material extremely slow due to limited bottom microbial activity (long term effects)	4. Resource bearing capacity	4. Use and site specific and no establish standards
	5. Suspended solids-increased turbidity	5. Resource bearing capacity Social capacity	5. Secchi disk should be visible at 4 ft. Use and site specific * Recreational use standard - may not be adequate for several of many life forms

WATER

DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

ethodology / esource Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
<u>Recreation</u>			
Swimming	1. Localized increase in turbidity and human waste nutrients	1. Social capacity - crowding	1. Optimum daily capacity - N.H. Recreation Plan 330 persons/acre - site specific
	2. Localized disturbance of feeding and for spawning areas	2. Resource bearing capacity	2. Site specific and no established standards
Marina and boating	1. Introduction of petroluem and anti-fouling contaminants	1. Resource bearing capacity	1. 1 Gallon of fuel per million gallons of water/day
	2. Navigational hazard to commercial shipping and fishing	2. Social capacity	2. Optimal level - 4 acres per person Use and site specific
	3. Introduction of raw sewage	3. Social capacity	3. Use and site specific and no establishe standards
	4. Localized dredging around marina	4. Resource bearing capacity	4. Use and site specific and no establishe standards
	5. Interferes with swimming	5. Social capacity	5. Use and site specific and no establishe standards
	6. Dumping of litter overboard	6. Social capacity / Resource bearing capacity	6. No litter acceptable
Shell and fin fishing (Recreational & sport)	1. Over-exploitation of species reducing population	1. Resource bearing capacity	1. Oystering - exploitation shall not exceed 25% of population
	2. Littering-aesthetic degradation	2. Social capacity /Resource bearing capacity	2. No litter acceptable
	3. Disturbance of benthic habitat applicable to shellfishing	3. Resource bearing capacity	3. Use and site specific and no establishe standards

DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

Methodology / Resource Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
Residential			
Low Density — Primary Zone	1. Increased area of impermeable surface a. Increased runoff b. Restricts groundwater recharge	Resource bearing capacity	No construction on slopes greater than 25% 4,6/ No measurable increased runoff from area (from natural conditions) 2/
	2. Sewage contamination of groundwater or surface water	Resource bearing capacity	No septic systems allowed in Resource Protection Areas 8/ No septic systems allowed under 1 D.U./acre 1,8/ Minimum percolation rate 40 min/in 8/ Sewer leakage no more than 10 gal/diam inch/mi/hr
	3. Lower water table (private wells) a. Saltwater intrusion	Resource bearing capacity	No overpumping of freshwater reserves Maintain sailinity in test wells under 500mg/l total dissolved solids 9/
	4. Preemption of land from other uses a. Loss of wildlife habitat	Resource bearing capacity	No loss of prime wildlife nesting or feeding grounds 3,6/
	b. Loss of vegetative cover necessary for nutrient and sedimentation removal	Resource bearing capacity	Main vegetative buffer area of 300 feet from mean high tide 1/
	c. Restriction of public access	Social capacity	Provide adequate public access facilities 10/
	5. Aesthetic degradation	Social capacity	Determined by people who use Coastal Zone 10/
	6. Construction of flood and erosion preventive structures	Resource bearing, capacity	No construction where flood and erosion structur must be built 3/
High Density	7. Site construction a. Erosion and sedimentation	Resource bearing capacity Social capacity	Provide sediment traps during construction 1,2, Mulch bare ground 1,2,4,5,8/ Replace vegetative cover 1,2,4,5,8/
Secondary Zone	Same as 1, 2, 3, and 7 of Primary Zone if located near groundwater recharge areas, lakes, and streams		

Increased intensity of impact

DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

Methodology / Resource Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
Residential (cont)			
Tertiary Zone	Same as Secondary Zone		

References:

1/ Atkins, 1972
2/ Caputo et al., 1974
3/ Clark, 1974
4/ DeChiara and Koppelman, 1975
5/ Juneja, 1974
6/ McHarg, 1974
7/ Stimson, 1972
8/ Tourbier, 1973
9/ U.S. EPA, 1973
10/ No standard available

DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

Methodology / Resource Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
Public Water Supply Lands			
Primary Zone			
Groundwater	1. Lower water table. a. Saltwater intrusion	Resource bearing capacity	
	2. Reduced hydrostatic pressure a. Saltwater intrusion b. Reduced pump yields	Resource beacing capacity	
Desalinization treatment facilities	1. Thermal brine discharge	System constraint capacity Resource bearing capacity	
Secondary Zone			
Groundwater	Same as Primary Zone for groundwater		
Reservoirs (Impounded streams and rivers)	1. Disruption of natural freshwater flow a. Loss of water b. Increased concentrations of pollutants	Resource bearing capacity	
	2. Interference of anadromous fish migration	Resource bearing capacity	
	3. Restriction of navigation	Social capacity	
Natural Surface Waters (Lakes & Rivers)	1. Reduced freshwater volume a. Increased concentration of pollutants	Resource bearing capacity	

DEVELOPMENT OF CARRYING CAPACITY BASED PERFORMANCE STANDARDS

ethodology / esource Uses	Criteria For Determining Adverse Direct and Significant Impacts Upon Coastal Waters Which Affect Uses	Type of Carrying Capacity Limitation	Performance Standards To Avoid Adverse Impacts
ublic Water Supply ands (cont)			
econdary Zone (cont)			
esalinization	1. Thermal brine discharge	System constraint capacity	
tiary Zone	Same as Secondary Zone	Resource bearing capacity	

W. P-

N.H. Coastal Resources
Management Program
First Year Report
Attachment B - 13

07158

CURRENT DATA ON COASTAL ZONE PLANNING AREA

Prepared by

Strafford Rockingham Regional Council

The preparation of this report was supported in part by a grant provided by the Coastal Zone Management Act of 1972, administered by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

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Preface

The information contained in this paper has been collected by the staffs of the Strafford and Southeastern New Hampshire Regional Planning Commissions under the auspices of the Strafford Rockingham Regional Council as an aid to the Office of Comprehensive Planning of the State of New Hampshire. The individual items of concern are those required by the contract between the Strafford Rockingham Regional Council and the Office of Comprehensive Planning dated May 5, 1975.

Primary staff responsibility for the report was borne by Otis E. Perry, Assistant Planning Director, Southeastern New Hampshire Regional Planning Commission.

I. Present and Future Population Trends

Each of the regional planning commissions with jurisdiction over the coastal zone planning area have adopted population projections for the towns in their region. The purpose of this section is to use those projections as a basis in making projections for the two divisions (primary and secondary*) in the coastal zone planning area. Table I, Population in the Coastal Zone Planning Area, shows the population estimated for 1974 and projections for 1980 and 2000. With three exceptions the individual town totals are those in the existing projections. The exceptions are Exeter, Hampton and Portsmouth. In these cases the 1980 projections previously made have been equalled or surpassed by the 1974 estimates. In the case of Exeter and Hampton the projections were adjusted by using projections made using simple regression analysis on past decennial census figures. In the case of Portsmouth the projections were raised using the experience of the past five years and an analysis of the city's zoning ordinance.

The allocation of the town's population to primary and secondary areas was done by using a straight ratio between the population and land area. The ratio used is as follows:

$$\frac{\text{total population}}{\text{total land area of town}} = \frac{\text{population of primary zone}}{\text{area of primary zone}}$$

The necessary assumption, that the density of population is uniform throughout a town, is probably not true for every town. Many of these towns were initially settled from the sea and their population centers are totally or partially within the primary zone. The figure, while it is probably not completely accurate for individual towns is a reasonable one to use for the entire primary or secondary zone.

None of the figures presented in Table I include the summer population increase which is experienced at the New Hampshire coast. The volume entitled Economic Impact

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* See Figure I, Transportation Systems in the Coastal Zone Planning Area for a map of the primary and secondary zones, page 17.

Table 1. Population in Coastal Zone Planning Area

Town	1974 Primary	1974 Secondary	1974 Total*	1980 Primary	1980 Secondary	1980 Total**	2000 Primary	2000 Secondary	2000 Total**
Dover	3088	20145	23233	3722	24278	28000	4652	30348	35000
Durham	544	5014	5558	1369	12631	14000	2445	22555	25000
Exeter	779	9121	9900	866	10134	11000	1141	13359	14500
Greenland	381	1549	1930	553	2247	2800	1816	7384	9200
Hampton	1920	7344	9264	2902	11098	14000	5183	19817	25000
Hampton Falls	144	1308	1452	159	1441	1600	476	4324	4800
Madbury	---	769	769	---	300	800	7	1893	1900
New Castle	907	---	907	1300	---	1300	2000	---	2000
Newfields	79	752	831	95	905	1000	143	1357	1500
Newington	239	461	700	682	1318	2000	1706	3294	5000
Newmarket	485	3130	3615	510	3290	3800	698	4502	5200
North Hampton	257	3243	3500	588	7412	8000	1250	15750	17000
Portsmouth	4070	18581	22651	4493	20507	25000	5391	24609	30000
Rollinsford	251	1847	2098	323	2377	2700	454	3346	3800
Rye	1349	3006	4355	1797	4003	5800	3873	8627	12500
Seabrook	773	2917	3690	1152	4348	5500	2095	7905	10000
Stratham	143	1207	1350	264	2236	2500	739	6261	7000
TOTAL	15409	80394	95803	20775	109025	129800	34069	175331	209400

* Estimates made by New Hampshire Office of Comprehensive Planning

** Projections made by Southeastern New Hampshire Regional Planning Commission and Anderson Nichols Company of Beach Use on the New Hampshire Coastal Zone, submitted to the Office of Comprehensive Planning in June 1975, has in it some estimates of the number of coastal visitors. Table X and the explanation of that table on pages 21 and 22 of that report indicate that there are about 3,252,400 user days in the New Hampshire coastal season. This season is taken to be 119 days long as defined in that report. Thus at any one day the average estimated number of users on New Hampshire's coast is about 27,300 of whom about 3,300 (based upon the data in that report) are already residents of the coastal zone planning area. Of the 24,000 visitors, approximately 10,800 are there for the day only. The other 13,200 stayed at least one night.

It is quite difficult to project the number of visitors who might be coming to the coast in the future. However, if all of the institutional constraints on the number of people are ignored, such as present parking, roads and housing, then the sand area could be expected to provide a guide to the number of people who could use the coastal beaches.* This area would allow the number of users to double. The lower limit on the expansion of beach use would probably be best approximated by the national annual population increase, now about 2.5%. Using this figure the overnight visitor population at the beaches will be 15,300 in 1980 and 24,400 in 2000, which is less than the calculated beach capacity.

II. Industrial Needs

According to the 1970 Census there were 33,961 people in the Coastal Zone planning area's labor force. About 22% of those people were employed outside the county in which they lived. The remaining 78% were employed in their county of residence. It is impossible to refine the data further to show employment percentages in the coastal planning area. The major non-coastal zone employment center was York County, Maine. The employer here is the nval shipyard in Kittery. Barring the outbreak of

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* See report The Economic Impact of Beach Users on the N.H. Coastal Zone, Strafford Rockingham Regional Council, 1975.

a major war it is not expected that the number of jobs available at the yard will grow substantially. Thus new jobs for the projected population will have to come through increased opportunity within the region or in the Boston Metropolitan area, the other major employment area.

In order to estimate the industrial space needed it is necessary to determine how many jobs will be required. This is possible using the population projections. The 1970 labor force in the Coastal Zone planning area was 33,961, the population was 90,258. Thus in 1970 the labor force in the Coastal Zone planning area was 38% of the population. If this figure may be taken as normal for the region then some projections of the size of the labor force in 1980 and 2000 may be made. Once the size of the labor force is known it is possible to project the additional acres of commercial/industrial development land necessary to accommodate them. Table II-1 demonstrates the method of calculation and the number of acres required for 1980 and 2000.

Table II

Industrial/Commercial Development Land Needed - 1980-2000

	1980	2000
Population[1]	129,800	209,400
Labor Force[2]	49,324	79,572
Increase from 1970	15,363	45,611
Employed in region[3]	11,983	35,577
Additional Acres Industrial/ Commercial land needed[4]	400	1,186

[1] from table I

[2] 38% of population

[3] .78% of increase

[4] typically industrial and commercial operations require 1 acre per 30 employees

The projected increase in industrial/commercial acreage of 400 acres for 1980 and 1186 acres for 2000 is of course subject to limiting assumptions. These are: that the ratio of labor force to population remains constant, that the proportion of people who commute outside the planning area remains constant, and that the population projections are accurate. The figures are not precise because of the assumptions, but they provide some guidelines for determining the amount of land necessary to provide work for the planning area's increased population.

Part of the work done for the Coastal Zone planning area was to class land by its development suitability. The primary and secondary coastal area has 11,258 acres of land classed excellent for development. This is more than enough land to accommodate the projected industrial/commercial needs to the year 2000.

III. Housing Requirements

The Strafford Rockingham Regional Council under the name of Substate Six Coordinating Committee published in 1973 a regional housing adequacy report, Regional Housing Survey. This report was an analysis of the 1970 census. Table III in the appendix to that report lists for each town in the region the size of its housing deficiency. This deficiency is calculated by subtracting the current housing stock from estimated demand. The current housing stock does not include substandard units already occupied. Unfortunately there is no way to break this housing deficiency into two components corresponding to the primary and secondary coastal zone planning areas. Table III shows this deficiency for each town. The larger towns and cities have constructed some subsidized housing since 1970. Portsmouth and Dover have gone a long way to eliminate these deficiencies. The small towns have not done this.

Table IV shows the new housing required in 1980 and 2000 if the population projections are reached. These projected housing requirements are based upon Table I, Population Projections and the average occupants per dwelling unit from Table III. Each of the figures uses the 1974 estimates as a base and represents the additional dwelling units needed for the population projected from that base.

Table III

Housing Adequacy and Population
Coastal Zone Towns: 1970

Town	1970 Population	Dwelling Units	Average Occupants/D.U.	Housing Deficiency**
Dover	20,850	6,889	3.03	173
Exeter	8,892	3,086	2.88	82
Durham#	8,869	1,485	3.29	60
Greenland	1,784	542	3.29	12
Hampton	8,011	2,734	2.93	+84
Hampton Falls	1,254	367	3.42	+11
Madbury	704	234	3.01	13
New Castle	975	300	3.25	+19
Newfields	843	225	3.75	20
Newington*H	798	153	5.22	+2
Newmarket	3,361	1,164	2.89	81
North Hampton	3,259	1,031	3.16	+8
Portsmouth	19,737	8,461	2.33	256
Rollinsford	2,273	717	3.17	3
Rye	4,083	1,466	2.79	+67
Seabrook	3,053	963	3.17	75
Stratham	1,512	443	3.41	32
TOTAL	90,258	30,260	2.98	616

* Source: Regional Housing Survey, Appendix Table II-C
** Source: Ibid, Appendix Table III
\# Durham's population and housing stock figures are badly skewed by the large student population.
*H Average occupants per dwelling is incorrect because of inclusion of occupants of barracks at Pease A.F.B.

Table IV

Projected Housing Requirements
for the Coastal Zone Planning Area

Town	1980 Primary	1980 Secondary	2000 Primary	2000 Secondary
Dover	209	1,364	516	3,367
Durham*	277	2,256	638	5,886
Exeter	30	352	126	1,472
Greenland	120	488	504	2,049
Hampton	335	1,281	1,114	4,257
Hampton Falls	4	39	97	882
Madbury		10	2	373
New Castle	121	---	336	----
Newfields		41	17	161
Newington*	149	288	492	951
Newmarket	9	55	74	475
North Hampton	105	1,319	314	3,958
Portsmouth	182	827	567	2,587
Rollinsford	23	167	64	473
Rye	161	357	905	2,015
Seabrook	120	451	417	1,574
Stratham	35	302	175	1,482
TOTAL	1,876	9,913	6,337	32,162

* Use planning area average occupants per dwelling for these towns as the one calculated in Table II are badly skewed.

None of these calculations takes account of the summer visitors. In Part I of this paper an estimate of the projected number of summer visitors who stay overnight was made. That figure was 15,300 and 24,400 per night for 1980 and 2,000 respectively. From the report, The Economic Impact of Beach Use on the New Hampshire Coastal Zone (Table III, p. 16 and the number of parties interviewed, 314), the average number of people per vacationing party can be established. If it is assumed that each party occupies one dwelling unit then a projection for the number of vacation dwelling units needed may be made. The average number of individuals per party is 6.49. These figures lead to the conclusion that 324 new vacation dwelling units will be needed by 1980 and 1726 additional units by 2000.

IV. Mineral Resource Requirements

The only mineral resource of significance in the coastal zone planning area is sand and gravel. This mineral resource is of great importance to the construction industry. The planning area is well endowed with this resource, the result of a geologically "recent" glacial intrusion. Potential for the mining of sand and gravel exists both on and off shore. Table V lists the potential mining areas and an estimate of the amount available.

Table V

Sand and Gravel Resource
New Hampshire Coastal Zone Planning Area
(cubic yards)

Location	Estimated Amount Good Potential	Fair Potential
Primary Zone[1]	18.8 million	
Secondary Zone[1]	122.6 million	
Territorial Sea[2]	25.4 million	12.7 million
Contiguous Zone[2]	23.2 million	37.9 million

[1] Calculated from data supplied by state geologist and estimating 25 foot average depth of deposit
[2] Calculated from data in Offshore Sand and Gravel, SSRC 1975, and estimating 10 foot average depth of deposit recommended by that report.

The locations in Table V refer to the divisions of the planning area on land and the legal jurisdictions in coastal waters. The responsibility for controlling offshore mining in the territorial sea is the State of New Hampshire's. The federal government has that responsibility in the Contiguous Zone. The potential mining in the Contiguous zone is mentioned because it is close enough to New Hampshire's coast that support facilities associated with such mining would be likely to be located on that coast. The area's of "good potential" are defined as bottom areas of high surficial sand and gravel content where there is no indication of bedrock. Areas of "fair potential" are defined as area where sand and gravel is likely to exist but where no investigations have been made to determine the extent of the deposits. Areas of good and fair potential lie outside the contiguous zone but are not counted as part of New Hampshire's resource as the mining activity could be based in neighboring states.

In 1972, producers in New Hampshire produced 5,757,000* short tons of sand and gravel. As there are 1.4 short tons to the cubic yard,** the state produced 4,112,142 cubic yards in 1972. Ninety percent of this material was used in the construction industry. A great deal of it was shipped out of the state, mainly to the Boston metropolitan area. Using only the areas of good potential and excluding the contiguous zone, the total estimate of 166.8 million cubic yards of sand and gravel would satisfy the state of New Hampshire's local and export needs for 40 years. This kind of pressure will not of course be brought on the coastal area. Considerations of distance and availability dictate that New Hampshire's need be filled by mining throughout the state.

The mining of sand and gravel on land is controlled by the municipalities. In the coastal zone planning area one town (Seabrook) prohibits commercial extraction of sand and gravel, four towns have no regulations concerning sand and gravel extraction, and the other towns all require a permit and place certain restrictions on sand

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* "Sand and Gravel", U.S. Bureau of Mines Yearbook 1972. USGPO
** Standard conversion measure.

and gravel extraction. Offshore the Governor and Council of the State of New Hampshire have permit authority in the territorial sea. The Bureau of Land Management controls mining in the contiguous zone and seaward.

V. Transportation and Navigation Needs

The Coastal Zone planning area utilizes nearly every mode of transportation in use in this country today except those involving passenger traffic on rails (which it used to have as well).

Almost all passenger trips are by private automobile, the remainder are by taxi, interstate bus, or airport limousine. A very few are by private aircraft or boat (one carrier operates a passenger boat service to the Isle of Shoals).

Freight generally travels by truck, although significant amounts enter by freighter through the Piscataqua port facilities in Portsmouth and Newington, and, a significant amount of rail freight passes through the region enroute.

The planning area does not have any major transportation problems of its own making. Traffic jams are limited to through traffic on I-95 and Lafayette Road (Route 1). Very slow traffic is common along Route 1A along the coast during the summer, but, it is clear that those who are poking along at 15 miles per hour are quite willing to do so. There are there to enjoy the salt air and the view.

The highway system in the planning area includes two major east west routes (U.S. Route 4 and Route 101) and two major north south routes (Interstate 95/Spaulding Turnpike and Route 125). The location of the routes is shown on the map Figure One. Table VI shows the traffic volume and design life of these routes and selected other routes.

These capacities are the maximum number of vehicles per hour that a road will handle -- not necessarily conveniently or safely. Highway traffic is reported in vehicles per day. The design capacity may be reached or surpassed at any hour of the day, while there may be little or no traffic at other times. For example, capacity may be reached at prime commuter hours of 4-6 p.m. but at no other time of day.

Table VI

Comparison of Traffic With Capacities for Major Routes In Region

Recorder[1] Location	Estimated[2] Daily Capacity	1974[1] Av. Day	% Aver. Annual Incr. 1970-1974	Date[4] est. daily Cap. Reach.
N.H. Turnpike (Toll)	96,000[3]	25,860	2.2	2020+
No. Hampton U.S. 1	24,000	9,762	1.5	2020+
No. Hampton N.H. 1-A	14,400	3,657	2.3	2020+
Hampton Harbor 1-A	14,400	7,234	.3	2020+
Newington Route 16	64,000	22,616	4.3	1985
Stratham Route 101	14,400	10,675	5.2	1980
Exeter (E & H)	14,400	5,930	3.3	2018
Lee Route 125	14,400	4,667	3.7	2020
Somersworth N.H. 16A	14,400	5,707	3.8	2020+
Dover N.H. 16	14,400	7,852	1.1	2020+
Spaulding Turnpike Dover	64,000	9,196	5.8	2020+
Spaulding Turnpike Rochester	64,000	5,726	4.4	2020+
Route 4 Northwood	14,400	3,787	2.0	2020+

1. Source: Automatic Traffic Recorder Report, State of New Hampshire Department of Public Works and Highways.

2. Source: Calculated from information in Appendix E, 1990 Fuctional Systems Characteristics, National Highway Functional Classification and Needs Study Manual (1970 to 1990), Manual B of National Transportation Planning Study, U.S. Department of Transportation, February, 1970.

3. Capacity based upon 6 lanes of traffic.

4. Date 2020+ indicates that capacity is not expected to be reached before year 2020 if trends of 1970-74 continue.

All of the traffic figures are averages - that is average Sunday or average weekday. The hourly range of traffic between peak hours and minimum hours is no known. This means that multiplying the capacity (in VPH) of a stretch of road by 24 to get the daily capacity is unrealistic. In this region, at all of the traffic counter locations, over 90% of the daily traffic occurs between 5 a.m. and 9 p.m. For this reason the daily capacity of a road was calculated to be the hourly capacity of that style of road times 16 (the number of hours between 5 a.m. and 9 p.m.)

The expected date that capacity will be reached is purely an estimate based upon trends of the last four years. The figures do not take account of seasonal variation. They are to be used as guides only. It is not expected that traffic on the roads will behave in exactly this manner.

The planning area is well served by motor transport companies. There are over thirty-five (35) local trucking firms based in the area. There are six (6) long distance trucking firms. Twenty-four (24) large long distance firms serve the region but do not have terminals in the region. Truck service is demand elastic, that is, companies can vary the level of service very readily in responses to market conditions.

The planning area has taxi service in all of its major municipalities. Most of the non-private car east-west passenger movement is by taxi. There are a few buses which take specialized users on east-west routes specifically. These are work buses to the Portsmouth Naval Shipyard from Exeter and federally funded disadvantaged citizen transportation.

The major passenger movers in the planning area, outside of private cars, are buses. There are three interstate carriers operating regular routes in the region; Continental Trailways, Michaud, and Greyhoud Lines.

Table VII Bus Routes, shows the information for the major scheduled carriers. In addition there are four (4) charter lines in the area. Also the University of New Hampshire runs a bus line to Newmarket, Lee, Portsmouth and Dover. Only students and employees of the University are allowed to ride. There is also a limousine service from Dover to Boston with stops in Durham and Hampton which runs five times a day, except Saturday.

Table VII

Bus Routes

Round Trips Per Day	Carrier	Regional Stops	Origin/Destination
5	Michaud	Dover, Durham, Newmarket, Exeter	Springvale, Me./Boston
1	Trailways	Dover, Portsmouth, Hampton	Rochester, N.H./Boston
7	Trailways	Portsmouth, Hampton	Portland, Me./Boston
2	Trailways	Portsmouth, Hampton	Berlin, N.H./Boston
4	Greyhound	Portsmouth, Hampton	Portland, Me./Boston
7	Greyhound	Portsmouth	Portland, Me./Boston

SOURCE: local bus terminals

The Boston and Maine provides rail service in the planning area by two through lines and one regional line. Major service is provided by the trunk line which runs north-south between Portland and Boston, passing through Dover, Newmarket, Newfields and Exeter. There is no passenger service provided, either through or local. The New Hampshire segment of the coastal line, formerly through the Boston to South Portland, Maine, is cut at the southerly end by an inoperative bridge - the Merrimack River between Newburyport and Salisbury. Freight for the coastal towns must go through Portsmouth and Rockingham Junction in Newfields. Table VIII summarizes the rail freight traffic in the region. Table IX shows the time lapse between freight on board and delivery to major markets.

Table VIII

Rail Freight Traffic in Coastal Zone Plan/Area

Portsmouth to Rockingham Junction	one round trip per day	15-20 cars
Portsmouth, Newington, Hampton Line	one round trip on Wednesday, Friday	2-15 cars

Portland, Me to Mechanicsville, N.Y.	two round trips a day through	approx. 100 cars
Portland, Me. to Worcester	1 round trip through	20-60 cars
Portland, Me. to Boston, Ma.	one round trip a day through	15-40 cars
Dover-Farmington-Gonic	1 round trip per day	5-15 cars
Dover-Ossippee	1 round trip	25-30 cars

SOURCE: Boston and Maine Railroad

Table IX

Time Lapse Between Pickup and Delivery

Portsmouth/Dover and:	Time Lapse
Boston	next day
New York	2 days
Chicago	4 days
Detroit	4 days

Source: Economic Area Profile, New Hampshire Department DRED 1969

There is only one civilian airport of any consequence in the region. That is the Hampton Airport, a privately operated general aviation facility. Most air travelers go either to Logan International Airport (50 miles south of the planning area) or Manchester Municipal Airport (40 miles west). A few go to Portland Municipal Airport (40 miles northeast). There is no commercial air carrier service available closer than those three places. Pease Air Force Base which has the equipment to handle large commercial aircraft currently does not permit such use but has said that they would allow commercial use of their control tower if a new runway parallel to and one mile west of the present one and a new terminal building were constructed. The required location for the runway would be in Great Bay. It seems likely, therefore, that for the immediate future air travelers will continue to rely on Logan and Manchester.

General aviation fields serve mostly sport flyers and businesses. Fields offering this kind of service cannot be too far away from their customers. Besides Hampton and Manchester there are three general avaiation airports which, though outside the planning area, serve the sport and business flyers of the area. They are Sky Haven in Rochester, Concord Municipal in Concord, and Boire Field in Nashua. The New Hampshire Aeronautics Commission has been attempting to get funds for a general aviation field in Stratham or Exeter; so far these efforts have not been successful.

Airport size is determined in large part by the number of individual operations which take place in a year. One operation (op) is a take-off or landing. Ops are classified as to local (those performed by planes based at the airport) and intinerant. The Federal Aviation Agency (FAA) requires 50,000 itinerant ops a year before they will build and operate an air control tower.

Hampton is a privately owned general aviation airport* located east of U.S. Route 1 at Fogg Corner in North Hampton. It has a 300 by 2050 foot turf runway, no navaids; it is partially lit with homemade equipment. There are twenty-one (21) aircraft based there with 2600 itinerant and 3600 local ops in 1970. Part time repairs and 80 octane fuel are available.

Concord Airport is a publicly owned general aviation airport located southeast of the center of the city off U.S. Route 3. It has three lighted bituminous runways. Navigation aids include VORTAC and ADF.** Major power train and airfoil repairs are available as are both 80 and 100 octane fuel. There are thirty-three aircraft based at the airport, with 6930 civilian and 3000 military itinerant ops and 12,315 local ops in 1970.

Manchester Airport has both general aviation and air carrier service. The airport has two lighted paved runways and offers major airfoil and power train repairs, 80 and 100 octane and jet fuel.

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* Data on individual airports is from the N.H. Airport Directory 1970-71, the New Hampshire Aeronautics Commission, and Paul J. Dwyer, Aviation Analyst, New Hampshire Aeronautics Commission.

** VORTAC-stationary instrument approach facility available at Manchester, Nashua and Concord. ADF-low frequency radio homing beacon for locating aircraft and airports.

The airport has a control tower and navigation aids include VORTAC and ADF. There are 40 general aviation aircraft based there with 55,266 civilian and 1613 military itinerant ops and 63,564 civilian and 3632 military local ops.

Sky Haven airport is a publicly owned general aviation airport with one lighted paved runway located on Route 16 south of the city of Rochester. Major airfoil and power train repairs are available. There are thirty-one aircraft based at the facility. In 1970 there were 6510 itinerant ops and 11,625 local ops.

Boire Field is owned by the city of Nashua. It has one paved lighted runway approximately one mile long. Navigation aids include the VORTAC and ADF. Major power train and airfoil repairs are available as are 80 and 100 octane and jet fuel. Boire had 36,000 itinerant and 91,200 local ops in 1970.

There are two specialized transportation networkds in the planning area. These are the gas distribution lines and the electric transmission lines. The map Figure One shows the location of these facilities. Any expansion of these facilities would depend upon market demand as perceived by the companies involved. Gas company officials contacted did not feel that expansion was likely in the near future. This is especially true considering the L.P. gas facility recently constructed in Newington which depends upon ship, truck, and rail transport. Public Service Company, the sole generator of electric power in the planning area has plans to greatly expand their generation and transmission capacity. Precise location of transmission routes is still not certain. Company officials may be contacted for latest revisions.

The New Hampshire Coastal Zone planning region has one major port, Portsmouth/Newington and several smaller ones. The port of Portsmouth/Newington is a general cargo port handling mainly petroleum products. Table X shows the cargo handled at Portsmouth for 1973.

Other ports along the coast are Rye Harbor, Hampton Harbor and Seabrook Harbor. These other harbors are used mainly to land the local lobster catch and for recreational boating. Each one has its share of commercial sport fishing boats. Table XI lists

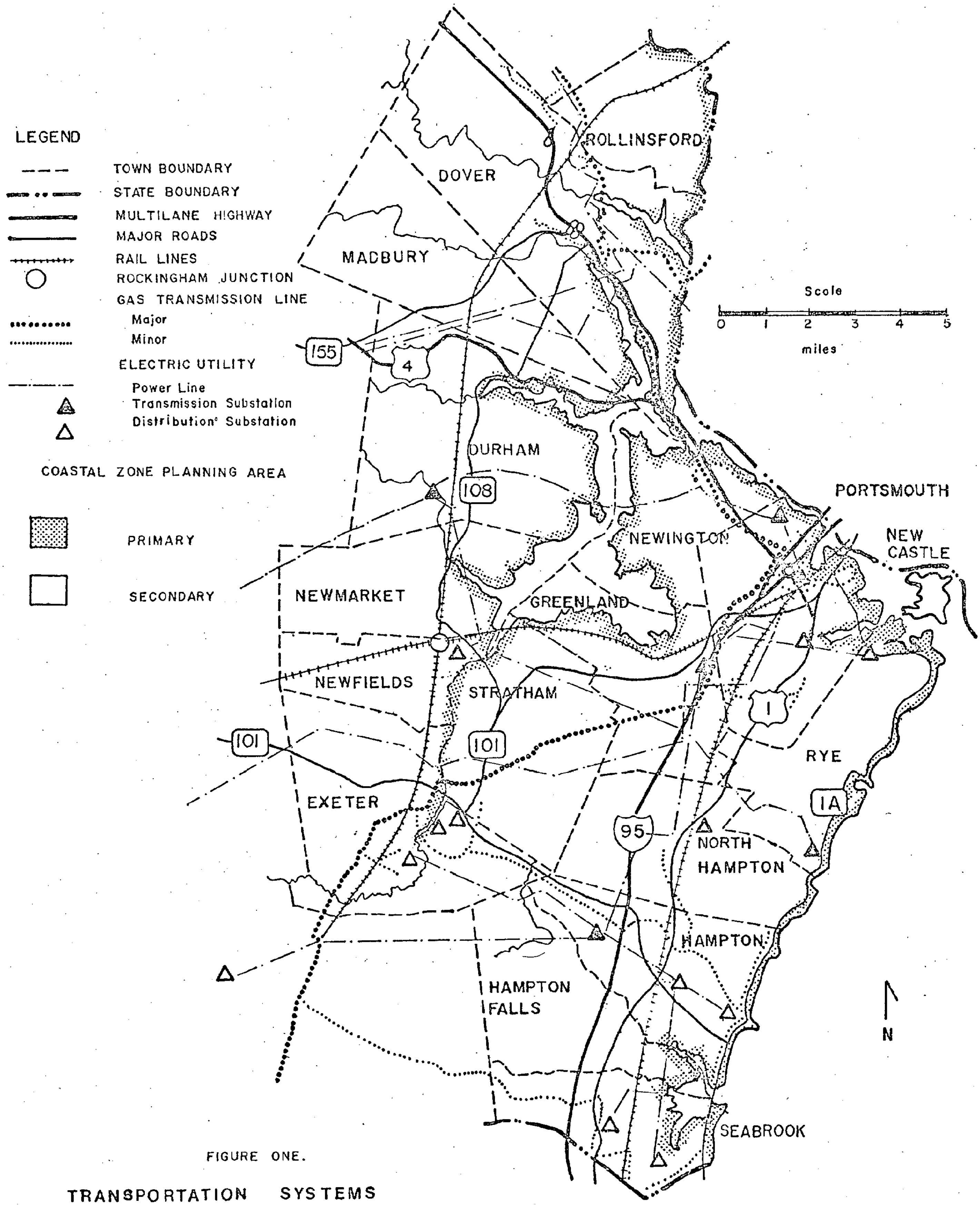

FIGURE ONE.

TRANSPORTATION SYSTEMS IN COASTAL ZONE PLANNING AREA

Table X: Principal Commodities Flowing Through the Port of Portsmouth, N.H. 1973
(Short Tons)

Commodity	Total	Foreign		Domestic		
		Imports	Exports	Coastal		Internal
				Receipts	Shipments	Receipts
Crude rubber	582	582				
Fresh fish	139				136	3
Shellfish	3					3
Limestone	115,706	115,706				
Salt	84,277	84,277				
Meat and products	483	483				
Lumber	5,408	5,408				
Veneer, plywood	128	128				
Synthetic rubber	11		11			
Gasoline	208,242			184,798	23,444	
Jet fuel	78,615			65,626	12,989	
Kerosene	141,640	71,988		62,769	6,883	
Distillate fuel oil	747,137	223,209		504,996	18,932	
Residual fuel oil	839,102	792,412		46,690		
Lubricating oils	23,358			23,358		
Petroleum and coal products	56,025			56,025		
Iron and steel plates, sheets	2,766		2,766			
Machinery except elec.	618		18		600	
Electrical machinery	110		110			
Iron and steel scrap	10,546		10,546			
Commodities	2		2			
TOTAL	2,314,900	1,294,195	13,453	944,262	62,984	6

SOURCE: Waterborne Commerce of United States, 1973.

the harbors and their moorings. The data was collected from the harbormaster of each facility. All of the harbormasters queried said that they could fill any new mooring facility that they could find. In all cases dredging of various amounts would be needed before new moorings could be made.

Table XI

Moorings in New Hampshire Harbors

	No. of Moorings			
Harbor	Recreational	Lobster/Finfishing	Sport Fishing	Total
Seabrook	12	38	6	56
Hampton	67	15	7	89
Rye	106	25	4	35
Gosport	@15			15
Portsmouth	320	80		400
	520	158	17	695

SOURCE: Harbor masters of the various harbors.

Each one of the harbors has been the site of a Corps of Engineers navigation project in the past. The following descriptions of these projections were obtained from the Corps. As of the present time there are no new projects contemplated or underway.

Portsmouth:

The project was adopted 3 September 1954, modified 23 October 1962, and 23 December 1965 by the Chief of Engineers under Section 107 of the River and Harbor Act of 1960, amended 1965.

Provides for a 35-foot channel, 400 feet wide with additional width at the bends by removal of ledge rock at Henderson Point, Gangway Rock, Badger's Island, the Maine-New Hampshire Interstate Bridge, and Boiling Rock, from deep water in

Portsmouth Harbor to a point about 1,700 feet above the Atlantic Terminal Sales dock in Newington, with a 950-foot turning basin above Boiling Rock and an 850-foot turning basin at the head of the project; and a 6-foot channel, 100-feet wide from Little Harbor through the Rye-New Castle drawbridge and then northerly between the mainland and Leach's Island to deep water near Shapleigh Island, and a 6-foot channel, 75-feet up Sagamore Creek with an anchorage strip of the same depth, 75-feet wide and totaling 3 acres, in Sagamore Creek.

The 35-foot channel was completed in Febrary 1969. Construction of the small boat channels in the Rye-New Castle area completed in February 1971. The project cost: $5,353,357.

Rye Harbor:

The existing project authorized by the River and Harbor Act of 1960 provides for a 10-foot deep entrance channel, an access channel 8 feet deep to the head of the harbor, an anchorage 8 feet deep over a 5 acre area at the south side of the harbor, an anchorage 6 feet deep over a 5 acre area at the north side of the harbor, and for maintenance of existing breakwaters at either side of the harbor entrance.

The waterway was dredged in 1962 and the spoil material placed on the state-owned land at the head of the harbor to provide a fill area for construction of a public landing and for future expansion of shore facilities. Supplemental work was undertaken in 1964 for removal of two small ledge areas encountered during the dredging work. Local interests contributed 32 percent of the project cost and, in addition, made anchorage and shore improvements. The harbor is used by lobstering and fishing boats, as well as by recreation craft.

Hampton Harbor:

Hampton Harbor is a rectangular lagoon behind the barrier beach villages of Hampton Beach and Seabrook Beach. It is located at the mouth of the Hampton River, about 1.5 miles north of the Massachusetts state line. A small lobstering fleet and numerous recreational craft base at the harbor.

A project was approved in 1964, under Section 107 authority of the 1960 River and Harbor Act, providing for a channel 8 feet deep and 150 feet wide across the entrance bar, and for extension of existing state-built stone jetties at the harbor entrance. Work on the federal project was accomplished under two contracts during 1965. Local interests contributed 49 percent of the project cost.

A third contract was accomplished in 1965, as part of the authorized nourishment of the existing Hampton Beach project, in which dredged material from channel and anchorage areas within Hampton Harbor was placed at the northern end of the Hampton State Beach.

Local interests are required to maintain at least 22 acres of anchorage and access channels 6 feet deep within the harbor and maintain two public landings. A safe walking surface was provided along the top surface of the north jetty extension for use by sport fishermen.

The Corps has no plans for expansion of the navigational facilities in any of the harbors. Any more work would have to be requested locally and directly authorized by the U.S. Congress.

VI. Floods and Flood Damage Prevention

Floods are a reasonably common occurrance in the Coastal Zone planning area. The most common type are coastal floods triggered by a storm at sea coupled with high tides. The most recent floods of this type were in February, 1972 and December 1974. Areas in Seabrook, Hampton, Rye and New Castle were flooded at those times. Plaice Cove and North Beach in Hampton and Route 1A in Rye were the worst hit areas.

Annually in the spring certain low lands of the planning area are flooded by stream overflow due to spring rains and snow melt run-off. Due to the localized nature of the flooding and its relatively small scale, records of its extent have not been systematically kept.

A check of the records of the Corps of Engineers and the Soil Conservation Service reveal no major flood prevention works in the planning area. There were, however, two major beach erosion projects done by the Corps. One at Hampton Beach in 1955 and 1965 and one at Wallis Sands in Rye in 1963. Both of these projects involved the placing of sand fill on the beach and the construction of sea walls and other works to prevent the loss of sand. The Soil Conservation Service has constructed many drainage facilities for individual co-operators which serve to control locally the impact of the spring run-off floods.

All of the towns in the Coastal Zone planning area have been declared flood prone for the purposes of the National Flood Insurance program. North Hampton has not yet received its maps showing the flood hazard boundaries. New Castle, Newmarket, Exeter, Hampton, Portsmouth and Dover are eligible communitities. Participation in this program requires that communities regulate construction in the special flood hazard area so as to minimize the loss due to flood. All of the towns in the region have either adopted or proposed to adopt such regulations.

VII. Communications Needs

Communications in the Coastal Zone Planning Area are handled in the same way as throughout the rest of the country. They major means of communications is by telephone. Service is available in the entire planning area. There are twelve telephone exchanges serving the region. The main serving offices are in Dover and Portsmouth. One telephone directory covers the entire region with the exception of Seabrook and part of Hampton Falls.

Postal service is next most commonly used communication means in the planning area. All of the municipalities with the exception of Madbury and Newington have their own post office and zip code. They are all serviced out of the Portsmouth main post office and have 038 zip code prefix. Table XII lists the towns and zip codes.

In addition to the individual communications media listed above there are three forms of mass communications available in the Coastal Zone Planning area. These are radio, television, and newspapers. The newspapers circulated in the Coastal Zone planning area are listed in Table XIII. Table XIV lists the radio and television stations.

All of these communications media are capable of expansion to meet the needs of an expanding population.

Table XII

Towns in Coastal Zone Planning Area and Zip Codes

Town	Zip	Town	Zip
Dover	03820	Newington (from Portsmouth)	
Durham	03824	Newmarket	03857
Exeter	03833	North Hampton	03862
Greenland	03840	Portsmouth	03801
Hampton	03842	Rollinsford	03869
Hampton Falls	03844	Rye*	03870
Madbury (from Durham or Dover)		Rye Beach*	03871
New Castle	03854	Seabrook	03874
Newfields	03856	Stratham	03885

* Both located in township of Rye.

Table XIII

Newspapers in the Coastal Zone Planning Area

Local

Name	Town Published	Frequency Published	Area Covered
Foster's Daily Democrat	Dover	Daily	Dover, Durham, Exeter
Portsmouth Herald	Portsmouth	Daily	Portsmouth, Exeter, Rye
Exeter News-Letter	Exeter	Weekly	Exeter, Hampton, Newmarket
Hampton Union	Hampton	Weekly	Hampton, Seabrook
Rockingham County Gazette	Hampton	Weekly	All Rockingham County
The New Hampshire	U.N.H.	Semi Weekly	U.N.H.

Published Outside Area

Manchester Union Leader	Manchester	Daily & Sunday	All
New Hampshire Times	Concord	Weekly	All
Bordertown News	Newburyport, Ma.	Weekly	Hampton, Seabrook, Exeter
Boston Globe	Boston, Ma.	Daily & Sun.	All
Boston Record American and Herald Traveler	Boston, Ma.	Daily & Sun.	All
New York Times	New York City	Daily & Sun.	All

Table XIV

Radio and Television Stations
in the Coastal Zone Planning Area

Radio Located in Planning Area

Call Letters	Town	Area Served
WTSN-AM	Dover	Dover, Durham
WDNH-FM	Dover	Dover, Durham
WVNH-FM	Durham	Dover, Durham, Newmarket
WBBX-AM	Portsmouth	Portsmouth, Rye, Hampton
WHEB-AM/FM	Portsmouth	Portsmouth, Rye, Hampton
WKXR-AM	Exeter	Exeter, Stratham, Newfields

Radio Located Outside Planning Area

WWNH-AM	Rochester	Dover, Durham
	Various Boston and Haverhill AM and FM stations	

Television Located in Planning Area

WENH-TV	Durham	All
CATV*	Dover	Dover
CATV*	Portsmouth	Portsmouth

Television Located Outside the Planning Area

WBZ-VHF	Boston, Ma.	All
WHDH	Boston, Ma.	All
WCVB	Boston, Ma.	All
WGBH	Boston, Ma.	All
WCSH	Portland, Me.	All
WGAN	Portland, Me.	All
WMTW	Poland Spring, Me.	All
WMUR-VHF	Manchester, N.H.	All
WSBK-VHF	Boston, Ma.	All
WGBX-UHF	Boston, Ma.	All
WLVI-UHF	Boston, Ma.	All
SWMW-VHF	Worcester, Ma.	All

* These are cable stations licensed in those towns only.

VIII. Requirements for Achieving Water Quality

The quality of New Hampshire's coastal waters has improved over the past five years, though some areas still fall far below the legal Class B quality standards. According to the Federal Water Pollution Control Amendments of 1972, all state waters must meet the adopted legal classification standards possible by 1985. There is a real possibility that the state could achieve these water quality standards by the proposed deadlines, but only if stringent controls over all potential point, and non point, sources are implemented.

A survey of all coastal waters indicates that certain areas of the coastal zone presently meet or exceed the legal Class B standards. Most of the waters along the immediate coast from Seabrook to New Castle are identified as Class A. In addition, waters in Hampton Harbor and Great Bay are generally Class B or better. However, other areas, particularly along the inland rivers, present serious water quality problems.

The major point sources of pollution along these rivers are the result of both industrial and municipal outfalls. A few point sources have discharges large enough to be significant in and of themselves. However, the majority become significant because of the marginal impact they produce on an already polluted river. The New Hampshire Water Supply and Pollution Control Commission (WSPCC) has identified all major point sources, including type and quantify of discharge, and has initiated plans to reduce these effluents.*

According to the plan, there are 20 industrial point source polluters in the entire coastal basin area. One industry, Clemson Automotive of Exeter, is responsible for nearly 50 percent of the total Biological Oxygen Demand and Suspended Solids produced by all industrial sources. Clemson has begun construction of a waste treatment facility which should be in operation by 1976, thus eliminating a major source of industrial pollution. Two other major polluters, Spaulding Fiber Company and Milton Leather Board Company, have initiated plans to install pollution control equipment by 1977.

If all the industrial polluters comply with the implementation schedule proposed by the commission - and it is expected they will - then one major source of existing water pollution should be virtually eliminated by 1977. In addition, all new industries locating in this area will be required to install the best applicable pollution control equipment available to insure that no future deterioration of water quality will occur.

Municipal sewage outfalls represent a more serious threat to water quality. Total discharges from all sources approximates 12 million gallons per day (MGD) of which only 3.2 MGD receives secondary treatment prior to discharge. Although all municipalities are required by the Federal Water Pollution Control Act to adopt

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* Piscataqua River and Coastal New Hampshire Basins Water Quality Management Plan, New Hampshire Water Supply and Pollution Control Commission, 1975.

secondary sewage treatment technology by 1977, it is already apparent that some extensions will be required.

The most significant municipal polluter is the city of Rochester. A secondary treatment system planned to handle the sewage of Rochester, East Rochester and Gonic failed shortly after construction was completed late in 1971. Since then, raw sewage amounting to 2-3 MGD has been discharged directly into the Cocheco River. Political haggling and litigation have impeded efforts to repair the malfunctioning system, or to take any other course of action to alleviate the problem. Recently however, pressure from the EPA and the New Hampshire Water Supply and Pollution Control Commission has forced the city to begin planning for a new secondary treatment facility, but it is not scheduled for completion until 1978. Obviously this is one case where the 1977 deadline will not be met.

Other municipalities (Dover, Exeter, Portsmouth) with outdated or inadequate treatment facilities have plans to upgrade their systems by 1978. Those municipalities which have no treatment facilities at present are scheduled to "come on line" by 1978 at the latest. However, it is highly conceivable that political and/or financial constraints, similar to those experienced in Rochester, could delay implementation of the proposed schedule in other communities as well.

Apparently, adequate federal funding is available (under section 301 of the 1972 Federal Water Pollution Control Amendments) to help finance actual construction of municipal sewage treatment facilities. However, construction is only the last phase in what can often be a lengthy planning process to determine the most appropriate system for a specific town. Not until this year (1975) was most of the federal money previously allocated for area-wide waste treatment management planning, actually released. As a result, many municipalities are behind schedule in the planning phase of the management program.

Subsequent delays in the design and construction phases can also be anticipated. The extent of the delay may depend upon how quickly a section 208 waste treatment planning program can be initiated in the coastal region. It is already apparent that not all municipal wastes will be recieving secondary treatment by the proposed 1977 deadline. However, it is still possible that with an adequate planning program the 1983 deadline for Best Applicable Technology on all municipal sewage treatment facilities can be met.

Non-point sources of pollution present another definite threat to water quality in the New Hampshire coastal area. Thus far, however, the Waster Supply and Pollution Control Commission has not been able to determine the extent of these impacts, because they are presently masked by the more obvious point source discharges. A limited investigation of non-point sources such as agricultural runoff, erosion due to construction and logging, sewage seepage from private systems and storm water runoff, is being conducted by the Water Supply and Pollution Control Commission. However, their resources are limited and the major portion of their time and energies are necessarily devoted to regulating point sources.

The WSPCC has tentatively identified certain areas where non-point sources may be causing significant deterioration of the water quality. One such area is a segment of the Lamprey River between Raymond and Newmarket which is presently categorized as Class C water. No point source polluters have been identified along this river segment and therefore, the WSPCC believes that non-point sources, particularly agricultural runoff and sewage seepage, are the primary causes of the poor water quality.

Although the WSPCC may be able to regulate certain non-point sources such as agricultural runoff, once they have been identified, other non-point sources may be extremely difficult to control. One source in particular, urban runoff, will become an increasingly significant source of pollution unless measures are taken now to mitigate the potential impacts. Increased urbanization of the coastal area is inevitable, and under present development practices, increases in urban runoff are an unfortunate consequence. Unless storm water runoff is treated prior to discharge, we can expect periodic, significant increases in quantities of oil, chemicals, sediments and other pollutants entering the water table. The long term effects of these pollutants on the water quality can not yet be determined.

Another impact associated with urbanization is an increased strain in the existing water supplies of the area. Overuse of the water supply by an increasing population could reduce hydrostatic pressure enough to cause salt water intrusion, or at the least reduce output.

The WSPCC is confident that the legal classific ation for New Hampshire coastal waters can be achieved by 1983 if all recommendations in the Piscataqua River Basin Plan are followed. However, as was indicated earlier in this report, political, financial or time contraints may reduce chances of meeting the implementation schedule, particularly in the case of municipal sewage treatment facilities. In addition, the extent of pollution attributable to non-point sources can not yet be accurately determined, though it is suspected to be significant in some areas. Failure to identify and regulate significant non-point sources could further delay efforts to achieve Class B water quality in all coastal waters by 1983.

The abatement measures outlined in the Basin Plan are a good general summary of the actions necessary to achieve acceptable water quality. However, the specifics of implementation are not clearly defined. It is obvisous that adequate funding is one important factor determining the success of the plan. Equally important is the development of specific controls over all land and water uses which have a potentially adverse impact on water quality.

The New Hampshire Water Supply and Pollution Control Commission has some regulartory authority over activities with obvious impacts, (i.e. point source polluters). However, indirect controls, exercised through careful land use planning, are equally important, particularly in eliminating non-point sources. At this point, it seems imperative that an area wide waste treatment management program (Section 208, 1972 Federal Water Pollution Control Amendments), be implemented for the entire coastal area. Such a program could ensure that adequate advanced planning for sewage treatment facilities is initiated by all municipalities, hopefully in time to meet the 1983 deadline. In addition, "208" planning can accomodate related water quality problems such as non-point sources and population increases leading to urbanization.

Clearly then, a waste treatment management program with sufficient implementation powers represents the most effective way to achieve and maintain the highest water quality possible in the New Hampshire coastal region.

W. P.

N.H. Coastal Resources
Management Program
First Year Report
Attachment B - 14

07158

ECONOMIC BASE DATA

PREFACE

Seventeen municipalities make up the New Hampshire Primary and Secondary Coastal Zone as defined in this report. Four towns are in Strafford County and thirteen are in Rockingham County.

The municipalities overlap two planning regions; the Strafford and Southeastern Regional Planning Commission, which are part of the Strafford Rockingham Regional Council.

The task of gathering information for this report was complicated by the fact that this area overlaps two Department of Employment Security local offices. Six municipalities studied are served by the Dover office, constituting 33% of the eighteen towns that are served by that office. Eleven municipalities are served by the Portsmouth office, constituting 48% of the twenty-three that are served by that office.

Because data that is available at the State Employment office is not broken down below the regional office level, and because the studied municipalities comprise less than 50% in either the Dover or Portsmouth office areas, the data is not as precise as might be desired.

The only source of individual town information is the 1970 U.S. Census. Because the information for the Census was co-lected in 1969 and it is now 1975, the utility of that information is also restricted.

Sections of this report are based on information and uses techniques from the Economic Report and Projections Study by the Southeastern New Hampshire Regional Planning Commission.

Introduction

The purpose of this report is to provide an economic overview of the New Hampshire secondary coastal zone through an analysis of available information on the labor force.

This report assesses the size, composition and health of the labor force; predicts trends by relating the regional labor force to trends in the state and national labor force; identifies objectives and general areas for future industrial growth.

This report is a general overview, presenting a partial picture of the complete economic base of the coastal zone. For specific planning, an analysis of the entire economic base should be made. Work to aid in that end is now underway at the University of New Hampshire under a Sea Grant funded project.

Labor Force - Employment Distribution and Trends

This section examines primary and secondary coastal zone employment trends and the implications of national trends for this region. Since New Hampshire Department of Employment Security published figures over a larger area than just the coastal zone, the 1970 Census employment figures are the most recent and accurate for the region. Table 1 gives percentage employment distributions derived for the 1970 Census figures for this region, the state and national levels.

As an employment area the nonmanufacturing sector is more than twice as important as the manufacturing sector in the coastal zone, being slightly larger than on the state level and slightly less than the national level. Within the nonmanufacturing sector the subsectors of Trade and Services are the largest employment areas, being significantly larger than the state percentages. This is as expected, because the coastal zone is more densely populated than the state as a whole, thus requiring more wholesale and retail trade facilities and more personal and professional services. Nationally, a slightly larger percentage of the labor force are employed in the Trade subsector and significantly has in the Services subsector.

In the coastal zone the manufacturing sector employs a significantly smaller proportion of the labor force than on the state level, entirely due to the smaller nondurables subsector. This is due to the decline of the textile and leather industries in the coastal zone and the general transferrance of the primarily semi-skilled and unskilled workers to employment requiring low skill levels in the nonmanufacturing sector.

Coastal zone employment trends cannot be accurately identified because the only available information that spans more than one year, Dover-Portsmouth Office area Employment Security information, covers more than twice the towns within the coastal zone. However, a look at this information and the implications of national trends combined with known characteristics of the region will indicate general trends for the region.

To establish projected national employment trends a simple linear regression analysis of the data in Appendix I was done. The technique is based on the assumption that the employment trends experienced over the past three decades will continue into the future. The formula used was:

$$Y = A + BX$$

where Y = the employment figure for year X, A = the intercept on the Y axis, B = the estimator used in the projections, and X = the year. Data for 1939-1970 was used to calculate the estimator B because before that year the data was incomplete (see Table 3). In all cases the estimators (B) calculated were judged to be significant, i.e., they were statistically shown to be non-zero 95% of the time.

Table 5 was generated by solving the formula Y = A + BX for Y where A and B were provided by the regression analysis and X is the year for which the projection is desired. Y was then converted into percents in an effort to show expected trends in the importance of different employment sectors. In analyzing the data presented in Table 2 it is important to note that nationally the employment impact of manufacturing (both durable and non-durable) and transportation and public utilities will decline steadily, while services and local governments incre ase, and trade and finance increase slightly. The results in the mining sector illustrate a major defect of regression analysis. Mathematically a negative contribution of a single variable in a system is possible whether or not such is possible in the real world. A reasonable interpretation of the projections for mining would be that the rate of decline of the past thirty years will be much reduced, but that mining will continue to be a less and less important employer in the nation. In this region, of course, mining presently has almost no significance.

All of the above analysis is based on the initial assumption that the trends of the past thirty years will continue for the next fifty.

Table 3 gives the percentage employment distributions in 1972 and 1973 for the Dover-Portsmouth area and the state. On both levels, the percentage of the total labor force employed in the manufacturing sector has declined while the nonmanufacturing sector has expanded. National trends indicate that this relationship will continue.

Within the manufacturing sector, durables manufacturing increased 0.3% while nondurables decreased 1% in the Dover-Portsmouth area and by similar amounts on the state level. Nationals trends indicate that both durables and nondurables employment percentages will steadily decrease. In the Dover-Portsmouth area, it is predicted that the durables manufacturing subsector will maintain its relative share of total employment for at least the next decade.

Within the nonmanufacturing sector, Trade and Services (and other) experienced significant gains in the Dover-Portsmouth area and the state. Nationally, it is indicated that these sectors will continue to increase slightly. If the Dover-Portsmouth area continues its rapid rate of population growth, it is likely that these subsectors will continue to expand at least the national rate.

Labor Force - Size

The last accurate compilation of the size of the primary and secondary labor force was in the 1970 Census. There were 35,349 persons employed, of which 10,297 were employed in the manufacturing sector, 22,210 in the nonmanufacturing sector and 2,842 not reporting any industry.

Statistics on population usually translate directly into statistics on labor force size. According to data developed by the Portsmouth Economic Commission, for each 1,000 residents there are approximately 400 persons in the local labor force.

Table 4 gives the 1974 and projected, through the year 2000, populations. Note that there are presently two urban centers, Portsmouth and Dover, that account for 45,884 persons or 47.9% of the total population of 95,803. However, by the year 2000, the Commission predicts that this percentage will decline to 30.4% as the secondary urban areas of Exeter Hampton-Seabrook and Durham develop and the remaining towns experience extensive population growth.

Based on the projected population estimates and the estimate of 400 persons out of every 1,000 persons participating in the labor force, the following labor force projections were made:

Table 4: Population Projections* (000's)

	1974	1980	1990	2000
Dover	23,233	28.0	29.0	35.0
Durham	5,558	14.0	20.0	25.0
Exeter	9,900	10.0	11.5	14.5
Greenland	1,980	2.8	5.4	9.2
Hampton	9,264	9.6	10.5	12.0
Hampton Falls	1,452	1.6	2.6	4.8
Madbury	769	.8	1.2	1.9
New Castle	907	1.3	1.7	2.0
Newfields	831	1.0	1.2	1.5
Newington	700	2.0	3.5	5.0
Newmarket	3,615	3.8	4.3	5.2
North Hampton	3,500	8.0	13.0	17.0
Portsmouth	22,651	21.0**	21.5**	22.5**
Rollinsford	2,098	2.7	3.2	3.8
Rye	4,355	5.8	8.5	12.5
Seabrook	3,690	5.5	7.2	10.0
Stratham	1,350	2.5	4.2	7.0
Totals	95,803	119.4	148.5	188.9

* As prepared by the Southeastern New Hampshire Regional Planning Commission, Jan. '72 not including Pease Air Force Base

** These projections are recognized as being too low (as of 1975). No new projections have been made as yet.

TABLE 5

PROJECTED LABOR FORCE - PRIMARY AND SECONDARY COASTAL ZONE

Year	Total Population	Labor Force
1974	95,803	38,321
1980	119,400	47,760
1990	148,500	59,400
2000	188,900	75,560

The 38,321 workers are divided into 10,536 workers (see Table 3) employed in manufacturing and 27,785 either employed in nonmanufacturing or potentially employable in an undefined employment sector. Note, in Table 6, that Dover, Seabrook and Portsmouth combined employ 75.7% of the total manufacturing labor force, with Dover employing 39.6% by itself.

The available labor force is reduced somewhat by residents commuting to out-of-state jobs. A 1970 Census examination of commuting patterns (see Commuting Patterns section in this report) reveals that 3,491 residents commuted to out-of-state jobs, primarily at the naval shipyard in Kittery and to a variety of locations in Massachusetts. The number of persons commuting to jobs in Massachusetts is expected to increase.

Average Earnings by Category

An examination of the average weekly wage scales of the various employment cateogires is instrumental in determining the relative impact of various industries on the local economy. Table 7 gives the average weekly earnings in the Dover-Portsmouth Department of Employment Security Office areas and in New Hampshire as

Table 6

MANUFACTURING EMPLOYMENT BY MUNICIPALITY,
PRIMARY & SECONDARY COASTAL ZONE*

Dover	4,176
Durham	2
Exeter	827
Greenland	74
Hampton	140
Hampton Falls	6
Madbury	0
New Castle	0
Newfields	400
Newington	320
Newmarket	729
No. Hampton	7
Portsmouth	1,749
Seabrook	2,050
Stratham	0
Rollinsford	54
Rye	2
Total	10,536

*N.H. Office of Industrial Development, Made in New Hampshire, 1975.

Table 7: Average Weekly Wages - Dover-Portsmouth Office Area and New Hampshire for 1973.*

Industry	Dover-Ports.	N.H.
Average - all industries	128.62	137.40
Manufacturing	144.56	152.81
Durable goods	168.89	163.06
Lumber and wood products	133.99	138.13
Furniture and fixtures	123.79	128.69
Stone and clay products	177.46	182.23
Primary & fab. metal pds.	169.17	168.00
Electrical products	150.31	163.29
Machinery	180.92	180.56
Miscellaneous and other	151.35	152.21
Non-durable goods	127.81	141.67
Food and kindred products	142.09	161.69
Textile mill pds. & apparel	130.14	121.32
Paper & allied products	152.22	189.65
Printing & publish. - allied	130.20	157.85
Leather and leather products	106.69	113.77
Other non-durable	152.14	168.38
Non-manufacturing	112.79	127.56
Construction (inc. mining)	157.40	177.31
Trans., comm., utilities	161.80	188.88
Trade	102.12	111.27
Fin., ins., real estate	129.91	144.46
Services and other	99.25	109.42

* Based on data published by the New Hampshire Department of Employment Security.

a whole for 1973. Bear in mind that the primary and secondary coastal zone comprise only @ 50% of the Dover-Portsmouth Office areas.

Manufacturing paid higher average weekly wages, $144.56, than non-manufacturing, $112.79, with durables manufacturing, paying more, $168.89, than non-durables, $127.81.

The highest average weekly wage paid was in machinery, $180.72, under durables manufacturing, as were the next two highest. The next two highest average wages paid were under the non-manufacturing sector in Transportation, Communication and utilities, $161.80, and in construction and mining, $157.40.

The average for all industries, $128.62, was less than the average for the state, $137.40, as were the wages paid in all sectors except durables manufacturing.

It is these statistical comparisons that have promoted the belief that heavy industry is the best industry a region, or town, can attract - plus the higher taxable property often present in heavy manufacturing installations.

When the average local citizen thinks of industry, therefore, he thinks of manufacturing, and when thinking of attracting industry, of attracting new manufacturers. As demonstrated above, however, although there are decided advantages to some manufacturing categories in terms of wage scales and multiplier effects, the non-manufacturing industries are the growth employers of the future. It is important that the region also work actively to maintain existing manufacturers. As a result of technological change local plants will become outdated. Replacements will be needed. Other sections of the country are exerting attracting influences on employers now located here. This region must offset these outside influences by trying to keep what it has, to help it modernize, and to point out why this is a good place to stay.

As shown by the rates employers are charged for participation in the unemployment compensation program, non-manufacturers are for more stable in their employment patterns. Further advantages of non-manufacturing employers are, unlike heavy manufacturers, a generally lesser cost to the municipality for utilities such as sewage dispotal, water supply, highways and other transportation facilities, and overall a general benefit for the community because such industry generally does not pollute the air or water, generate truck traffic or make much noise.

Commuting Patterns

Data for Table 8 was obtained from the 1970 U.S. Census, Journey to Work charts. Although the information is five years old, the employer situation has not changed dramatically.

In 1970, of the 32,634 person labor force, 79% were employed within their respective county of residence. However, fewer workers were employed in their home county of Strafford (72%) than were in Rockingham (81%).

Of the 7,357 persons working outside their county of residence, 63% were employed in York County, Maine, the principal employer there being the Portsmouth Navy Yard, 25% were employed in Massachusetts and 12% in other regions of New Hampshire. Although the 1970 Census data does not identify specific employer concentration areas in Strafford County, Dover is known to be a concentrated manufacturer employer area.

The trend for the future is for a continuance of the existing commuting pattern. The Portsmouth Naval Shipyard has work scheduled for the next several years. Although efforts are being made to attract industry to other towns in the region, Portsmouth and Dover are by far the most concentrated employer areas. Migration to the southern towns from Massachusetts is expected to continue resulting in an increase in the commuting to Massachusetts to work.

Table 8: Commuting Patterns from U.S. Census, 1970

	Mass.	N.H. Other Areas	Strafford	Ports.	Rock.	York, Me.
Dover	5	87	5960	539	326	628
Durham	7	108	2377	74	199	32
Exeter	170	65	118	129	2499	43
Greenland	23	0	19	197	275	79
Hampton	251	19	96	320	1446	92
Hampton Falls	36	8	10	22	284	5
Madbury	0	20	227	0	14	0
New Castle	0	0	29	117	112	15
Newfields	10	5	0	44	138	0
Newington	0	0	29	50	41	0
Newmarket	16	22	264	147	733	7
North Hampton	32	21	35	201	619	74
Portsmouth	62	74	351	4664	2803	1208
Rollinsford	0	0	478	38	0	112
Rye	37	28	66	649	370	177
Seabrook	326	6	0	36	510	12
Stratham	22	0	48	63	370	12
	995	463	10,107	7290	10,739	2496

Inside County of Residence:

Rockingham	15,744	81%
Strafford	9,533	72%

Outside County of Residence:

Rockingham	3,655	19%
Strafford	3,702	28%

Per Cent of Other Than in County Employed:

York, Maine	63%
Massachusetts	25%
Other N.H.	12%

April 1975 Employment and Unemployment

Employment and unemployment information by category is available at the Department of Employment Security State Office level only. Category breakdowns at the regional office level will not be available until the middle of 1976. At mid-April 1975, the Dover office, with a labor force of 38,300, had 3,700 persons, or 9.7% unemployed. During April, 1974 the Dover office reported 1,500 persons (4%) unemployed. For April 1975, the Portsmouth office with a labor force of 34,450 persons, had a 2,550 persons, or 7.4% unemployed. For the same period in 1974, Portsmouth reported 1,350 persons (4%) unemployed. The average unemployment rate in the Dover-Portsmouth area is 8.6%. Comparison of the Dover-Portsmouth rate with the state and national rates is given in Table 9.

Table 9

Employment and Unemployment Dover-Portsmouth Office Area, State, National.

	Dover-Portsmouth	N.H.	National
Persons in Labor Force	72,750	369,100	91,369,000
Unemployed	6,250	29,100	7,820,000
% Unemployed	8.6	7.9	8.6
Employed	66,500	339,900	83,549,000

Table 10 provides employment breakdowns by categories on the state level for April 1975 and compares it with the employment in April 1974. While this information sheds little light on the employment situation in the coastal zone, it does indicate the health of various employment categories relative to each other during a recessionary period.

Table 10

New Hampshire Civilian Labor Force, Total Employment and Unemployment*
and Nonagricultural Wage and Salary Employment
as of the Middle of the Month

Industry	Number of Workers			Numerical change from	
	April 1975	March 1975	April 1974	Previous month	Previous year
1. Civilian labor force	369,100	363,700	357,200	5,400	11,900
2. Unemployment	29,100	29,600	12,500	-500	16,600
Percent of labor force	7.9	8.1	3.5	xxx	xxx
3. Employment total	339,900	333,900	344,600	6,000	-4,700
4. Persons involved in labor disputes	100	200	100	-100	0
Nonagr. wage & salary	294,600	289,000	298,750	5,600	-4,150
Manufacturing	84,750	83,750	94,900	1,000	-10,150
Durable goods	46,150	46,400	51,400	-250	-5,250
Lumber & wood prods.	4,700	4,750	5,200	-50	-500
Furniture & fixtures	1,800	1,850	2,150	-50	-350
Stone & clay prods.	1,450	1,500	1,650	-50	-200
Primary metal prods.	2,500	2,600	2,800	-100	-300
Fabricated metal prods.	3,850	3,850	4,100	0	-250
Machinery (exc. elec.)	11,150	11,150	11,800	0	-650
Electrical prods.	16,250	16,300	19,200	-50	-2,950
Miscellaneous prods.	1,500	1,500	1,650	0	-150
Other durable goods	2,950	2,900	2,850	50	100
Nondurable goods	38,600	37,350	43,500	1,250	-4,900
Food & kindred prods.	2,900	2,900	3,000	0	-100
Textile mill prods.	5,000	4,650	6,650	350	-1,650
Apparel	2,550	2,500	2,850	50	-300
Paper & allied prods.	6,550	6,550	7,300	0	-750
Print., pub. & allied	4,650	4,650	4,800	0	-150
Leather & lea. prods.	9,400	9,400	10,500	0	-1,100
Other nondurable goods	7,550	6,700	8,400	850	-850
Nonmanufacturing	209,850	205,250	203,850	4,600	6,000
Construction (inc. min.)	15,350	13,300	16,150	2,050	-800
Trans., comm. & util	12,400	12,650	12,450	-250	-50
Trade	62,800	61,050	61,300	1,750	1,500
Fin., ins. & real estate	15,150	14,850	14,150	300	1,000
Service industry & other	54,300	53,100	51,800	1,200	2,500
Government	49,850	50,300	48,000	-450	1,850
Federal	10,100	10,100	9,650	0	450
State	13,500	13,600	12,750	-100	750
Local	26,250	26,600	25,600	-350	650

* New Hampshire Department of Employment Security. Employment and Unemployment in N.H. Number 326, May 1975, p. 2.

During the period from April 1974 to April 1975 manufacturing categories under durable goods and non-durable goods showed a 10% and 11% decline in employment respectively. During the same period non-manufacturing categories show a 3% increase in employment, despite losses in two categories: construction; transportation, communication and utilities. The continued growth of the non-manufacturing sector supports the idea that non-manufacturing industries, especially service, government and trade, remain relatively stable through fluctuations of the economy.

Overall, unemployment in New Hampshire declined by 500 persons from March 1975. This was the first decline since August 1974.

Location of Industry

The Preliminary Comprehensive Land Use Plan for Substate District #6, which the primary and secondary coastal zones are a part, establishes as one element of the plan, objectives and specific location areas for future industrial growth. The sections of the report concerning industry follow.

Objectives

B. EMPLOYMENT-INDUSTRY

To encourage industry which provides full employment for the region's populations with the minimum of social costs in terms of pollution, more particularly:

1. To encourage industry which has a stable rate of employment and is not not dependent on the whims of Congress or the state of the national economy, by:

a. Encouraging the kinds of employers which are becoming relatively more important in the national economy, such as services, government, and trade.

b. Discouraging industry which has a by-product air or water pollution, large amounts of solid wastes, or noise.

c. Insisting on strict controls over industry placed here by necessity and beyond our own powers to regulate, such as atomic power plants and oil terminals.

2. To reserve enough land of an appropriate character to accommodate anticipated industrial growth, by:

   a. Encouraging establishment of industrial areas in locations directly accessible to through highways; discouraging areas to which the access is through residential districts.

   b. Encouraging location of industry in areas where utilities, expecially water and sewer services, are available or can be extended at low cost.

   c. Discouraging the location of potentially dangerous industries, such as propane gas storage areas, near residential districts.

   d. Protecting such areas by establishing exclusive industrial zoning and maintaining such zoning in the face of immediately profitable but comparatively unimportant development.

<u>Locations of Sites</u>

B. INDUSTRY-EMPLOYMENT

The plan proposes several major industrial areas of regional importance. Industrial site locations were proposed on the basis of their: (1) easy access to the major transportation facilities, both rail and highway, (2) proximity to the labor forces of the region and to those in other parts of southern New Hampshire, Massachusetts and Maine, (3) availability of land readily developable for industrial uses, and (4) serviceability for water and sewer utilities. Considering all these locational factors, industrial sites were located near the interchanges of the Spaulding Turnpike between Dover and Rochester and along the eastern portion of the Concord Turnpike in the vicinity of Durham, and to a lesser extent the Spaulding interchanges in Rochester and in Dover. Other areas center on Portsmouth another is located primarily in Seabrook, a third located along Route 101 in Exeter, Brentwood, and Epping. Major industrial land reservations are also proposed in Salem and Plaistow. The plan recognizes that smaller industrial sites will continue to exist in other places but suggests that these should remain of secondary importance.

These objectives and recommendations are necessarily general in nature. Among other considerations, a detailed study of the economic base of designated areas should be made before recommending that specific acreages of land be zoned for what types of industry.

Recommendations

The First National Bank of Boston has pointed out the following categories of industry as New England's best potential growth industries for the next decade:*

Durable Manufacturing:

Electrical machinery: specialized, highly technical, commercial products.

Non-electrical machinery: precision tools and equipment.

Transportation equipment: aircraft engines (existing plants in Connecticut and Massachusetts).

*Prospects for the New England Economy (1972), First National Bank of Boston.

Non-durable manufacturing:

Specialty products, paper goods, printing and publishing, specialty rubber and plastic goods, high quality leather footwear.

Service-producing industries: particularly educational, medical, and where appropriate, recreational.

The region should seek and assist employers in the following fields as well as the traditional durable goods classifications since these appear to be the growth industries.

Recreation and leisure-time activities: The region should capitalize on its ocean front, the Great Bay, the Piscataqua, and lesser waterways, its woodlands, and its historic attractions which will bring in an increasing number of paying visitors as the standard of living rises and the workweek shortens. The current two month summer season should be extended to a year-round season. The market for Christmas at Williamsburg or on Nantucket is catching on and winter conventions in Atlantic City are old hat. It could just as well be Christmas at Strawbery Banke in Historic Portsmouth and conventions year round at the Beach.

Insurance, finance, and real estate: The region should seek the establishment here of major office-type industries, of which the insurance company is a typical example. They are growing in relative importance and are essentially non-polluting. Similarly, as the bureaucracy of government grows the region should attempt to attract some of those bureaucrats - who traditionally are never fired or laid off - as a stable employment base.

The region should also capitalize on the cultural and educational, and technical resource assets of the University of New Hampshire in Durham. Although the region is often panned for its lack of cultural facilities, the University offers much to the general public, certainly enough to satisfy most executive level personnel. Likewise, there are many relevant course offerings for part-time students and many technical resources available from the University's Whittemore School's Center for Industrial Development.

Other sectors of the services industry should also be attracted although many by their nature are directly related to the population size and must be located near the consumer of those services - such as automobile repairs and bakeries - and are really not amenable to being located any distance from the ultimate consumer.

In short, those who are engaged in attracting employers to the area should look beyond the durable goods manufacturers to those industries experiencing rapid expansion, which have stable employment patterns, and which do not result in social costs, such as pollution, which tend to reduce their overall benefit to the region.

Table 11: Employees on Nonagricultural Payrolls, by Industry, 1919-1973.

Year and month	Total	Goods-producing: Total	Goods-producing: Mining	Goods-producing: Contract construction	Manufacturing: Total	Manufacturing: Durable	Manufacturing: Nondurable	Service-producing: Total	Transportation and public utilities	Wholesale and retail trade: Total	Wholesale and retail trade: Wholesale	Wholesale and retail trade: Retail	Finance, insurance, and real estate	Services	Government: Total	Government: Federal	Government: State and local
1919	27,088	12,813	1,133	1,021	10,659	-------	-------	14,275	3,711	4,514	-------	-------	1,111	2,263	2,676	-------	-------
1920	27,350	12,745	1,239	848	10,658	-------	-------	14,605	3,998	4,467	-------	-------	1,175	2,362	2,603	-------	-------
1921	24,382	10,231	962	1,012	8,257	-------	-------	14,151	3,459	4,589	-------	-------	1,163	2,412	2,528	-------	-------
1922	25,827	11,234	929	1,185	9,120	-------	-------	14,593	3,505	4,903	-------	-------	1,144	2,503	2,538	-------	-------
1923	28,394	12,741	1,212	1,229	10,300	-------	-------	15,653	3,882	5,290	-------	-------	1,190	2,684	2,607	-------	-------
1924	28,040	12,093	1,101	1,321	9,671	-------	-------	15,947	3,807	5,407	-------	-------	1,231	2,782	2,720	-------	-------
1925	28,778	12,474	1,089	1,446	9,939	-------	-------	16,304	3,826	5,576	-------	-------	1,233	2,869	2,800	-------	-------
1926	29,819	12,896	1,185	1,555	10,156	-------	-------	16,923	3,942	5,784	-------	-------	1,305	3,046	2,846	-------	-------
1927	29,976	12,723	1,114	1,608	10,001	-------	-------	17,253	3,895	5,908	-------	-------	1,367	3,168	2,915	-------	-------
1928	30,000	12,603	1,050	1,606	9,947	-------	-------	17,397	3,828	5,874	-------	-------	1,435	3,265	2,995	-------	-------
1929	31,339	13,286	1,087	1,497	10,702	-------	-------	18,053	3,916	6,123	-------	-------	1,509	3,440	3,065	533	2,532
1930	29,424	11,943	1,009	1,372	9,562	-------	-------	17,481	3,685	5,797	-------	-------	1,475	3,376	3,148	526	2,622
1931	26,649	10,257	873	1,214	8,170	-------	-------	16,392	3,254	5,284	-------	-------	1,407	3,183	3,264	560	2,704
1932	23,628	8,632	731	970	6,931	-------	-------	14,996	2,816	4,683	-------	-------	1,341	2,931	3,225	559	2,666
1933	23,711	8,950	744	809	7,397	-------	-------	14,761	2,672	4,755	-------	-------	1,295	2,873	3,166	565	2,601
1934	25,953	10,246	883	862	8,501	-------	-------	15,707	2,750	5,281	-------	-------	1,319	3,058	3,299	652	2,647
1935	27,053	10,878	897	912	9,069	-------	-------	16,176	2,786	5,431	-------	-------	1,336	3,142	3,481	753	2,728
1936	29,082	11,918	946	1,145	9,827	-------	-------	17,164	2,973	5,809	-------	-------	1,388	3,323	3,668	826	2,842
1937	31,026	12,921	1,015	1,112	10,794	-------	-------	18,105	3,134	6,265	-------	-------	1,432	3,518	3,756	833	2,923
1938	29,209	11,386	891	1,055	9,440	-------	-------	17,823	2,862	6,179	-------	-------	1,425	3,473	3,883	829	3,054
1939	30,618	12,282	854	1,150	10,278	4,715	5,564	18,336	2,936	6,426	1,684	4,742	1,462	3,517	3,995	905	3,090
1940	32,376	13,204	925	1,234	10,985	5,363	5,622	19,173	3,038	6,750	1,754	4,996	1,502	3,681	4,202	996	3,206
1941	36,554	15,939	957	1,790	13,192	6,968	6,225	20,614	3,274	7,210	1,873	5,338	1,549	3,921	4,660	1,340	3,320
1942	40,125	18,442	992	2,170	15,280	8,823	6,458	21,683	3,460	7,118	1,821	5,297	1,538	4,084	5,483	2,213	3,270
1943	42,452	20,094	925	1,567	17,602	11,084	6,518	22,359	3,647	6,982	1,741	5,241	1,502	4,148	6,080	2,905	3,174
1944	41,883	19,314	892	1,094	17,328	10,856	6,472	22,569	3,829	7,058	1,762	5,296	1,476	4,163	6,043	2,928	3,116
1945	40,394	17,492	836	1,132	15,524	9,074	6,450	22,902	3,906	6,314	1,862	5,452	1,497	4,241	5,944	2,808	3,137
1946	41,674	17,225	862	1,661	14,703	7,742	6,962	24,448	4,061	8,376	2,190	6,186	1,697	4,719	5,595	2,254	3,341
1947	43,881	18,482	955	1,982	15,545	8,385	7,159	25,399	4,166	8,955	2,361	6,595	1,754	5,050	5,474	1,892	3,582
1948	44,891	18,745	994	2,169	15,582	8,326	7,256	26,146	4,189	9,272	2,489	6,783	1,829	5,206	5,650	1,863	3,787
1949	43,778	17,538	930	2,165	14,441	7,489	6,953	26,242	4,001	9,264	2,487	6,778	1,857	5,264	5,856	1,908	3,948
1950	45,222	18,475	901	2,333	15,241	8,094	7,147	26,747	4,034	9,386	2,518	6,868	1,919	5,382	6,026	1,928	4,098
1951	47,849	19,925	929	2,603	16,393	9,098	7,304	27,924	4,226	9,742	2,606	7,136	1,991	5,576	6,389	2,302	4,087
1952	48,825	20,164	898	2,634	16,632	9,349	7,284	28,660	4,248	10,004	2,687	7,317	2,069	5,730	6,609	2,420	4,188
1953	50,232	21,038	866	2,623	17,549	10,110	7,438	29,195	4,290	10,247	2,727	7,520	2,146	5,867	6,645	2,305	4,340
1954	49,022	19,717	791	2,612	16,314	9,129	7,185	29,306	4,084	10,235	2,739	7,496	2,234	6,002	6,751	2,188	4,567
1955	50,675	20,478	792	2,802	16,882	9,541	7,340	30,199	4,141	10,535	2,796	7,740	2,335	6,274	6,914	2,187	4,723
1956	52,408	21,064	822	2,999	17,243	9,834	7,409	31,344	4,244	10,858	2,884	7,974	2,429	6,536	7,277	2,209	5,069
1957	52,894	20,925	828	2,923	17,174	9,856	7,319	31,969	4,241	10,886	2,893	7,992	2,477	6,749	7,616	2,217	5,399
1958	51,363	19,474	751	2,778	15,945	8,830	7,116	31,890	3,976	10,750	2,848	7,902	2,519	6,806	7,839	2,191	5,648
1959	53,313	20,367	732	2,960	16,675	9,373	7,303	32,945	4,011	11,127	2,946	8,182	2,594	7,130	8,083	2,233	5,850
1960	54,234	20,393	712	2,885	16,696	9,459	7,336	33,840	4,004	11,391	3,004	8,388	2,669	7,423	8,353	2,270	6,083
1961	54,042	19,814	672	2,816	16,326	9,070	7,256	34,229	3,903	11,337	2,993	8,344	2,731	7,664	8,594	2,279	6,315
1962	55,596	20,405	650	2,902	16,853	9,480	7,373	35,190	3,906	11,566	3,056	8,511	2,800	8,028	8,890	2,340	6,550
1963	56,702	20,593	635	2,963	16,995	9,616	7,380	36,108	3,903	11,778	3,104	8,675	2,877	8,325	9,225	2,358	6,868
1964	58,331	20,958	634	3,050	17,274	9,816	7,458	37,373	3,951	12,160	3,189	8,971	2,957	8,709	9,596	2,348	7,248
1965	60,815	21,880	632	3,186	18,062	10,406	7,656	38,936	4,036	12,716	3,312	9,404	3,023	9,087	10,074	2,378	7,696
1966	63,955	23,116	627	3,275	19,214	11,284	7,930	40,839	4,151	13,245	3,437	9,808	3,100	9,551	10,792	2,564	8,227
1967	65,857	23,268	613	3,208	19,447	11,439	8,008	42,589	4,261	13,606	3,525	10,081	3,225	10,099	11,398	2,719	8,679
1968	67,915	23,672	606	3,285	19,781	11,626	8,155	44,244	4,310	14,084	3,611	10,473	3,382	10,623	11,845	2,737	9,109
1969	70,284	24,221	619	3,435	20,167	11,895	8,272	46,063	4,429	14,639	3,733	10,906	3,564	11,229	12,202	2,758	9,444
1970	70,593	23,352	623	3,381	19,349	11,195	8,154	47,242	4,493	14,914	3,812	11,102	3,688	11,612	12,535	2,705	9,830
1971	70,645	22,542	607	3,411	18,529	10,565	7,964	48,103	4,442	15,142	3,809	11,333	3,796	11,869	12,856	2,664	10,191
1972	72,764	23,061	621	3,521	18,933	10,884	8,049	49,704	4,495	15,683	3,918	11,765	3,927	12,309	13,290	2,650	10,640
1973	75,567	24,093	625	3,648	19,820	11,633	8,186	51,475	4,611	16,288	4,079	12,209	4,053	12,866	13,657	2,627	11,031
1972																	
January	70,642	22,142	612	3,174	18,365	10,505	7,860	48,500	4,393	15,237	3,822	11,415	3,828	11,864	13,178	2,654	10,524
February	70,775	22,151	607	3,096	18,457	10,570	7,887	48,624	4,367	15,120	3,817	11,303	3,839	11,967	13,331	2,656	10,675
March	71,393	22,384	612	3,210	18,573	10,651	7,922	49,009	4,442	15,248	3,844	11,404	3,862	12,066	13,391	2,656	10,735
April	71,979	22,613	612	3,374	18,639	10,717	7,922	49,366	4,445	15,436	3,851	11,585	3,880	12,218	13,387	2,664	10,723
May	72,612	22,884	618	3,528	18,751	10,797	7,954	49,728	4,481	15,570	3,875	11,695	3,909	12,338	13,430	2,662	10,768
June	73,463	23,401	632	3,717	19,070	10,953	8,117	50,062	4,549	15,749	3,946	11,803	3,966	12,487	13,311	2,659	10,652
July	72,469	23,057	629	3,740	18,703	10,713	7,990	49,412	4,531	15,653	3,956	11,697	3,990	12,489	12,749	2,645	10,104
August	72,975	23,601	632	3,838	19,147	10,930	8,217	49,374	4,527	15,691	3,974	11,717	3,995	12,481	12,680	2,644	10,036
September	73,519	23,696	630	3,785	19,298	11,076	8,222	49,823	4,548	15,774	3,962	11,812	3,957	12,391	13,153	2,627	10,526
October	74,118	23,750	626	3,782	19,359	11,165	8,194	50,368	4,549	15,887	3,982	11,905	3,957	12,463	13,512	2,627	10,885
November	74,449	23,651	624	3,630	19,414	11,241	8,173	50,798	4,554	16,162	3,987	12,175	3,965	12,472	13,645	2,631	11,014
December	74,778	23,399	621	3,373	19,423	11,289	8,134	51,379	4,558	16,669	3,998	12,671	3,971	12,474	13,707	2,671	11,036
1973																	
January	73,343	23,032	[illegible]	3,155	19,279	11,253	8,026	50,311	4,510	15,865	3,973	11,892	3,959	12,406	13,571	2,619	10,952
February	73,724	23,202	598	3,184	19,420	11,359	8,061	50,522	4,507	15,776	3,974	11,802	3,978	12,530	13,731	2,619	11,112
March	74,255	23,413	598	3,294	19,521	11,431	8,090	50,842	4,539	15,880	3,989	11,891	4,000	12,627	13,796	2,623	11,173
April	74,861	23,631	603	3,442	19,586	11,498	8,088	51,230	4,559	16,088	4,000	12,088	4,019	12,771	13,793	2,631	11,162
May	75,404	23,891	608	3,616	19,667	11,575	8,092	51,513	4,593	16,200	4,014	12,186	4,040	12,865	13,815	2,638	11,177
June	76,308	24,481	642	3,837	20,002	11,755	8,247	51,827	4,661	16,335	4,096	12,239	4,089	12,999	13,743	2,631	11,112
July	75,368	24,307	644	3,934	19,729	11,608	8,121	51,061	4,653	16,262	4,112	12,150	4,113	12,982	13,051	2,616	10,435
August	75,686	24,647	648	3,981	20,018	11,676	8,342	51,039	4,659	16,279	4,136	12,143	4,121	13,009	12,971	2,617	10,354
September	76,238	24,717	641	3,944	20,132	11,801	8,331	51,521	4,671	16,367	4,127	12,240	4,082	12,982	13,419	2,608	10,811
October	76,914	24,731	640	3,923	20,168	11,856	8,312	52,183	4,680	16,515	4,162	12,353	4,076	13,057	13,855	2,613	11,242
November	77,322	24,667	643	3,822	20,202	11,909	8,293	52,655	4,659	16,780	4,188	12,592	4,079	13,096	14,041	2,628	11,413
December	77,391	24,391	642	3,639	20,110	11,878	8,232	53,000	4,644	17,113	4,181	12,932	4,080	13,062	14,101	2,677	11,424

NOTE: Data include Alaska and Hawaii beginning 1959.

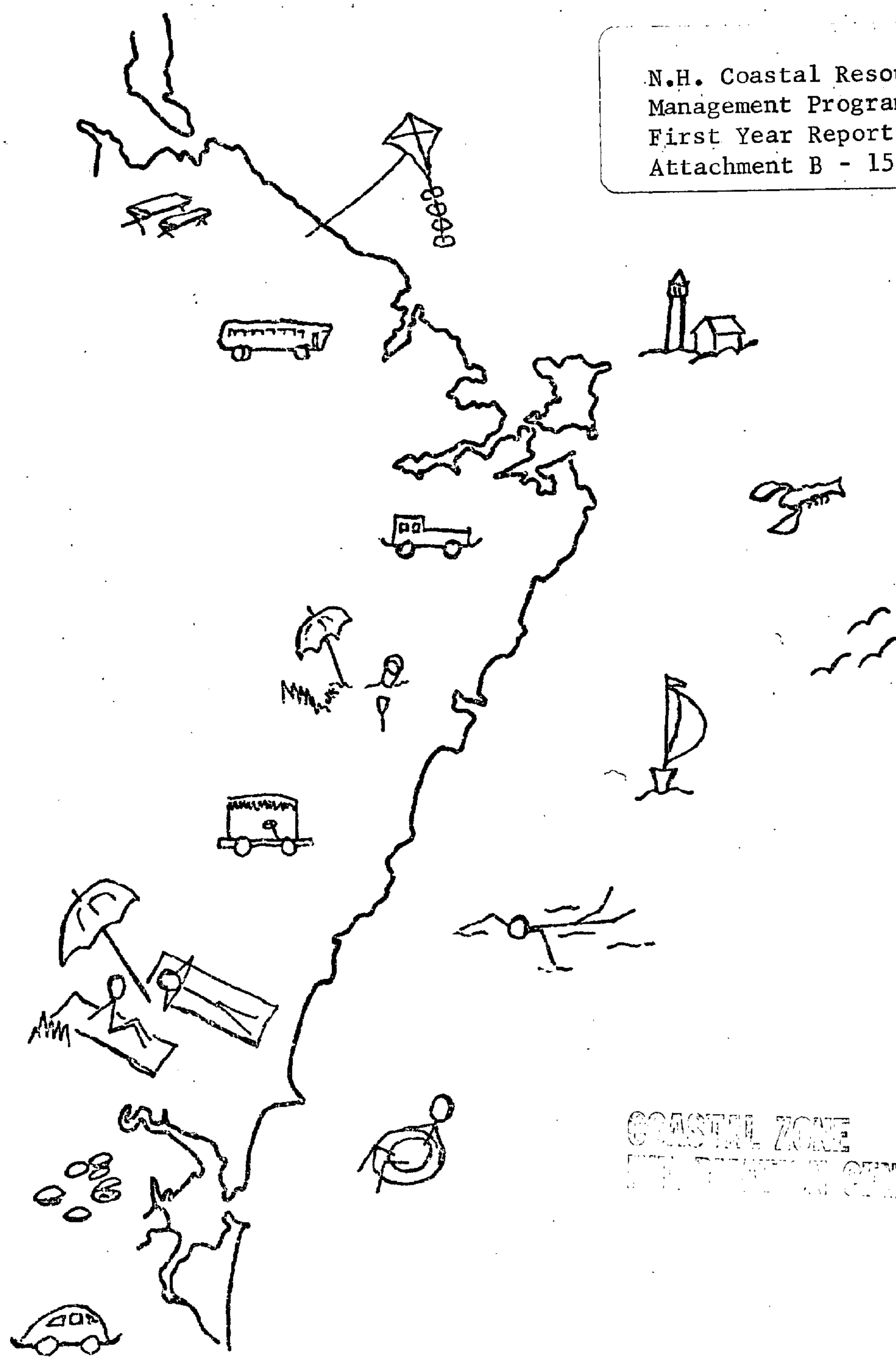
U.S. Department of Labor, Handbook of Labor Statistics 1974, Bulletin 1825, U.S.G.P.O., Table 39, P. 103.

W.P.

07158

ECONOMIC IMPACT of CERTAIN SHORELINE USERS on the NEW HAMPSHIRE COASTAL ZONE

N.H. Coastal Resources
Management Program
First Year Report
Attachment B - 15



NEW HAMPSHIRE COASTAL ZONE STUDY

ABSTRACT

TITLE:	Economic Impact of Certain Shoreline Users on the New Hampshire Coastal Zone
AUTHOR:	Southeastern New Hampshire Regional Planning Commission
SUBJECT:	Beach and Picnic Area Users at New Hampshire's Coast
DATE:	October 1975
LOCAL PLANNING AGENCY:	Strafford Rockingham Regional Council 99 Water Street, Exeter, New Hampshire 03833
SOURCE OF COPIES:	Southeastern New Hampshire Regional Planning Commission 3 Water Street, Exeter, New Hampshire 03833
PROJECT NO:	04-4-158-50014
SERIES NO:	None
NO. OF PAGES:	55
ABSTRACT:	Analysis of personal interviews done on the New Hampshire coast in summer of 1974 with special emphasis on the spending patterns of visitors.

ECONOMIC IMPACT OF CERTAIN SHORELINE USERS
ON THE
NEW HAMPSHIRE COASTAL ZONE

prepared under the auspices of

The Strafford Rockingham Regional Council

by the

Southeastern New Hampshire Regional Planning Commission

3 Water Street

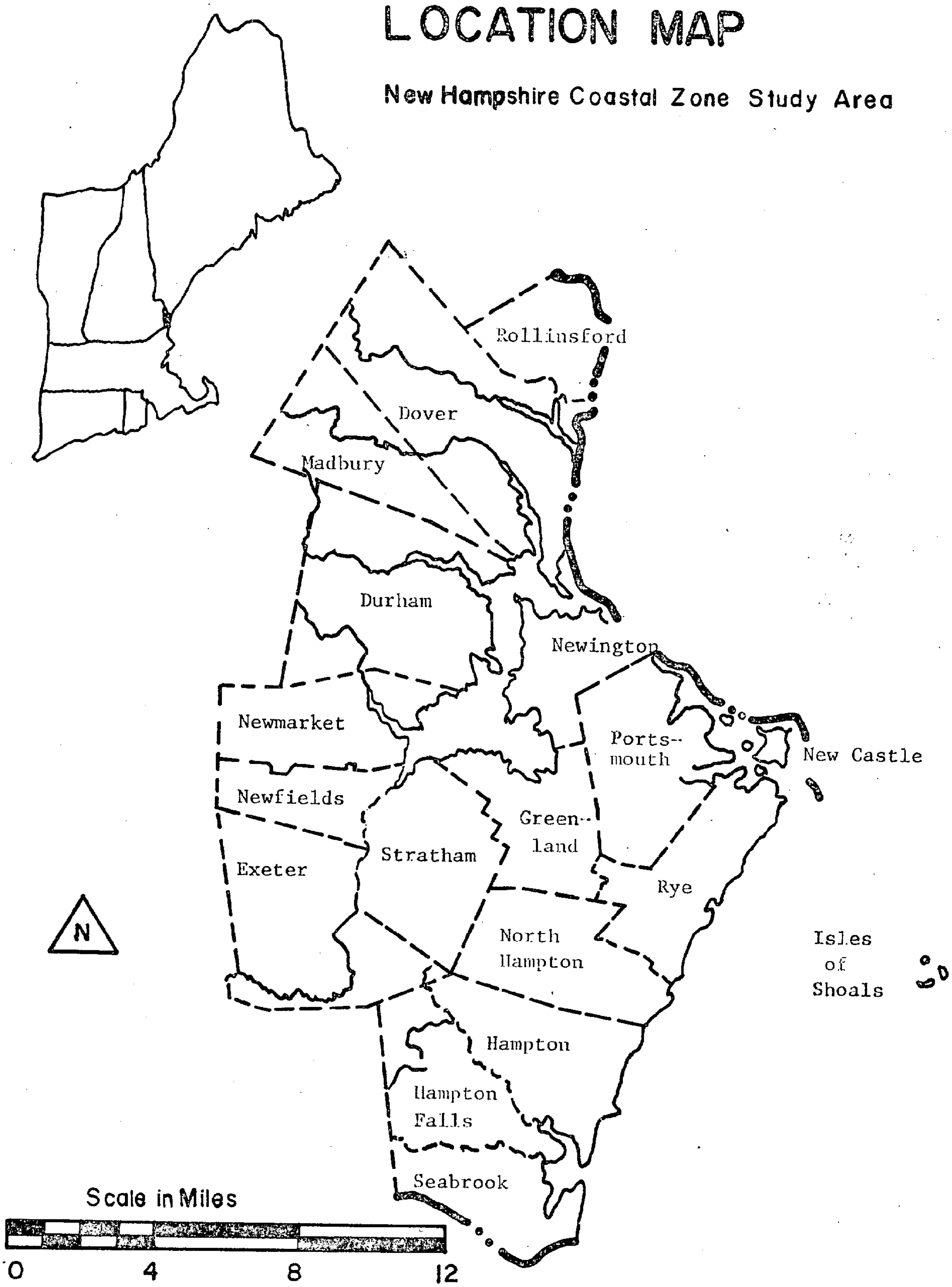
Exeter, N.H. 03833

October 1975

The preparation of this report was supported in part by a grant provided by the Coastal Zone Management Act of 1972, administered by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration and a grant by the Bureau of Outdoor Recreation of the U.S. Department of Interior under provisions of the Land and Water Conservation Fund Act of 1965 and by a grant of the Office of Comprehensive Planning, State of New Hampshire.

LOCATION MAP

New Hampshire Coastal Zone Study Area



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PREFACE

During July and August of 1974 the staff of the Southeastern New Hampshire and Strafford Regional Planning Commissions interviewed individuals representing approximately 900 recreation parties using the New Hampshire shoreline. The purpose of these interviews was to gather data on the economic impact of the coastal recreation industry. This report details the analysis of the interview results.

During this process only one type of coastal user was interviewed. This was the person who came for the purpose of enjoying the beaches and/or picnic areas in the day time. People who came to visit the historic sites in Portsmouth, to use the charter fishing boats, to hunt or fish along the shore, to go boating on Great Bay, or who visited the beach only after 3 P.M. were not interviewed. Other studies exist for most of these users. In cases where such studies do not exist, the work should be done, but time and budget limitations did not permit it in this study.

This study makes very few recommendations for future action along the coast. Its primary purpose was to gather information which would be of use to planners, businessmen, and citizens.

Primary responsibility for this report was borne by Otis E. Perry, Assistant Planning Director, Southeastern New Hampshire Regional Planning Commission. The bulk of the interviewing, questionnaire design, data tabulation and manipulation was the work of Alice Estill, Patricia Bristol, and Nancy Porter, Summer Interns. Additional interviewing assistance was provided by the entire staffs of the Strafford and Southeastern New Hampshire Regional Planning Commissions.

SUMMARY

The work done by the Strafford Rockingham Regional Council and Southeastern New Hampshire Regional Planning Commission in the summer of 1974 provided a great deal of interesting and informative information.

The number of user days on the shore from 15 May to 1 October is estimated to be 3.25 million. A user day is defined as one person at the shore for one day. About 1.5 million of these user days represent people who spent only one day at the shore per trip. The other 1.75 million user days were spent by people staying overnight for at least one night.

The average daily spending of a person depended on whether or not they were overnight visitors. Our findings showed that those who came for one day spent $1.50 per day and those who stayed overnight spent $9.00 per day. This adds up to a total estimated receipts from the beach users on New Hampshire's coast of 16.6 million dollars.

Approximately half of the people interviewed came from Massachusetts, about five percent came from Canada. The Concord and Manchester, New Hampshire areas contributed another five percent. Local use of the coast was light. Only about five percent were from Strafford and Rockingham Counties, these were all Day Users. Most of the people used the Hampton Beach area though Day Users used swimming picnic areas fairly heavily.

The dollar effectiveness of general advertising in promoting is examined in the study. Of the 930 parties interviewed only 49 said that they were visiting the New Hampshire coast for the first time. Of those 49 only three said that advertising first told them about the New Hampshire beaches. Most people visiting the area for the first time heard about the coast through a friend.

The people using the beaches were asked what criticisms they had of the areas they were using. Most people had none. Of those who did the most common criticism was the lack of cleanliness of the beach, (especially Hampton Beach) and the lack of sufficient parking spaces and bathhouses at all areas. This is a fine record for such a large area dependent upon so many diverse public and private groups for its upkeep and operation.

Comparison with 1972 survey results show that the area has maintained its economic vitality despite the bad economic conditions nationally.

HISTORIC PERSPECTIVE

The history of human habitations of New Hampshire's coast is long and varied. Recent evidence found during an archelogical dig in Seabrook has placed Indians of the Algonguin Tribe in the area at least 1000 years ago. The evidence leads to the conclusion that there were periodic, probably seasonal, encampments of Indians all along the coast. The Indians were interested in harvesting the shellfish and possibly sea mosses.

European contact with the coast is also of long duration. Legend has it that the son of Lief Erickson landed in Hampton around the year 1000. More concrete proof exists of the use of the Isles of Shoals by Breton and English fishermen in the mid sixteenth century. At least fifty years before the founding of Plymouth Plantation, these fishermen used the Isles as a haven from storms and a place to process their catch for the trip back to Europe.

Portsmouth (the largest port on the New Hampshire coast) was settled by English people in 1632 and Dover, just up the Piscataqua, a year later. The original settlers were fishermen and farmers. Later Portsmouth became an important shipping point for the mast trees which were found in the nearby forests. Portsmouth continued to be an important port until the construction of the railroad and the use of steamships, enabling Boston to take over supplying the port's hinterland. The Navy Yard on Seavey Island, however, continues to flourish.

Intensive recreation use of the coast began in the period after the Civil War. Large hotels were built which catered to tourists who arrived by train to stay for their summer vacations. The biggest single development came in 1897 when the town of Hampton leased 14 acres of barrier beach to the Hampton Beach Improvement Company. That company in turn sublet parcels to organizations which developed the intensive commercial recreation area which continues today. During the 1860's and 1870's there was a very active artists colony on the Isles of Shoals. Many famous New England writers including Emerson and Thoreau spent their summers there.

PHYSICAL DESCRIPTION

The New Hampshire coast is short, only sixteen miles long from the mouth of the Piscataqua to the Massachusetts border. There are two large estuaries in that length: Great Bay, part of the Piscataqua system, and the Hampton/

Blackwater River Estuary. The coast itself is partly rocky and partly sandy. There are twelve miles of sandy beach. The sandy beaches were originally bordered on the landward side by barrier dunes, though most of these are not easily recognized as such, having been built upon or leveled and replaced by seawalls. There are approximately 7500 acres of tidal marsh on the coast. The largest portion is in the Hampton/Seabrook Marsh which surrounds the Hampton/Blackwater River Estuary behind the barrier dunes in Seabrook and Hampton, south of Great Boar's Head. A smaller but still significant amount of tidal marsh is found landward of Odiorne's Point State Park along Witch's Creek in Rye. Smaller areas of marsh are spotted all along the coast behind what were once barrier dunes.

There are several publicly owned parks along the coast. Starting in the north they are:

Hilton Park: This park is at the entrance to the Great Bay Estuary about seven miles up the Piscataqua River from its mouth. This is a state park providing a boat launching ramp and picnic and playground facilities. There is no entrance charge.

Great Island Common: Great Island Common is in New Castle. This is a town owned area with launching, picnic, bathing and municipal recreation facilities. An entrance fee is charged.

Odiorne's Point State Park: Ordiorne's Point State Park is a large (approximately 140 acres) state owned park. There are picnic tables, a natural history museum, nature trails and a small beach. There is an entrance charge during the summer.

Wallis Sands State Park: This is a small stretch of sandy beach. There is a bath house and off-street parking. There is a fee for parking during the summer.

Rye Harbor State Park: This park is a small picnic area with a boat launching ramp and commercial fishing pier nearby. There is an entrance fee for the picnic area.

Hampton Beach State Park: This park includes the longest stretch of sandy beach. There is no entrance fee for most of it, however, the state maintains parking meters on Route 1A through most of Hampton and derives the revenue therefrom. At the barrier beach near the entrance to the Hampton/Blackwater River Estuary there is a section of the park with off-street parking, a bath house, a snack bar and beach paraphernalia rental. There is a charge for parking in this area.

In addition to the parks there are long stretches of beach where the land access is essentially privately controlled.

ECONOMIC ACTIVITIES

The main economic activity along the coast is tourism. There are hotels, motels, restaurants, sourvenir shops, amusement areas, marinas and boat yards along much of the coast. By far the greatest concentration of these is at Hampton Beach. Hampton and Seabrook Beaches have the largest number of cottages and rooming houses. North of these beaches there are also seasonal homes but they are larger and few in number. Many of the summer houses and apartments have been converted into year-round dwellings, changing the character of the mid-winter coastal population significantly.

There are six communities which have frontage upon the Atlantic Ocean: Portsmouth, New Castle, Rye, North Hampton, Hampton and Seabrook. In addition there are two communities which are considered in the study and have frontage on the estuaries: Dover and Hampton Falls. The other estuarine communities are not a part of the study area. With the exception of Portsmouth and Dover the municipalities all have town government, derive much of their business income from tourism, and have little or no industrial tax base. The total year-round population of these towns is 69,052, (as estimated in 1974 by the Office of Comprehensive Planning).

SAMPLING PROCEDURE AND QUESTIONNAIRE DESIGN

The form of the questionnaire and the sampling procedure depended in part on the forms used for data collection in the summer of 1972. One of the purposes of doing this study was to see if there had been any change in the number of people or the amount of money spent from 1972 to 1974. The hypothesis to be tested was; "the energy shortage and the beginning of the recession have not had a major impact upon the use of New Hampshire beaches."

SAMPLING PROCEDURE

Each beach section was sampled independently each day interviews were taken. The method was to make an estimate of the number of parties occupying the beach section and then divide by the number of interviews it was possible to do that day. The resulting number was used to aportion the population so that the entire beach section would be covered. The interviewer started out at the land side of the beach and interviewed a party, then worked to the water's edge and then back to the land edge, and so on down the beach interviewing every 3rd, 7th, 11th, or whatever number of parties had been decided upon for that day. This procedure was followed for all of the sandy beaches. In the Not Sandy areas the same procedure of estimating and counting was used, but the counting was done around the entire area. This procedure resulted in a random sample but one in which the percent of parties sampled varied from day to day and beach to beach. Thus the sample could not be used directly to arrive at an estimate of the total population.

The method used to make estimates of the total population was to relate the information from the questionnaire on the number of occupants of a car to the number of cars at the beaches. In order to do this, aerial photographs were taken at noon hour on days when the interviewing was done. This was done on a Saturday and Sunday (selected as a typical weekend), a Wednesday and a Thursday (selected as a typical high use and average use weekday respectively). The number of cars at the coast was then counted from the photographs and the estimated population calculated from this total and the average occupants per car from the information.

Another hypothesis to be tested by the questionnaire was that "different sections of coast attract different types of people." In order to test this the coast was divided into fifteen interview areas. Starting in the south, these fifteen areas are as follows (see map, Figure I).

Seabrook Beach - the area of sand beach from Massachusetts to Hampton Harbor inlet.

Hampton State Beach - the southern section of Hampton Beach State Park. This is an area in front of the dune from Hampton Harbor inlet to the first set of cottages.

Cottage Beach - the area of Sandy Beach in front of the cottages between Epping Street and Haverhill Avenue, Hampton.

Hampton Beach - the main beach on the coast between Haverhill Avenue and Great Boar's Head.

North Beach - the narrow sand beach from Great Boar's Head to High Street, Hampton.

Plaice Cove - the sand beach from High Street to the North Hampton town line.

Little Boar's Head - the sand beach from the Hampton town line to Little Boar's Head.

Bass Beach - north of Little Boar's Head - the stoney beach used in great part by surfers.

Rye Beach - the sand and rock beach from Rye Ledge to Perkins Road.

Jenness Beach - the sand beach from Perkins Road to Straw's Road.

Rye Harbor State Park - the picnic area north of Rye Harbor inlet.

Foss - Rye North Beach - the sand beach from Ragged Neck Point to Concord Point.

Wallis Sands - the sand beach from Concord Point to Marsh Road.

Odiorne's Point State Park - the state park picnic area, from Odiorne's Point around Frost's Point to Witch's Creek.

Great Island Common - the municipal recreation area on Great Island, New Castle.

Hilton Park - a picnic area road-side rest area at southern tip of Dover Point in Piscataqua-Great Bay.

In order to further organize the data these sixteen areas were grouped into four coastal areas by location and beach types. The four areas are, Not Sandy: Hilton Park, Great Island Common, Odiorne's Point, Rye Harbor State Park; South Sandy: Seabrook Beach, Hampton State Beach, Cottage Beach, Hampton Beach; Mid Sandy: North Beach, Plaice Cove, Little Boar's Head; North Sandy: Bass Beach, Rye Beach, Jenness Beach, Foss-Rye North Beach, Wallis Sands. These divisions were chosen because of expected differences in the users. For instance, it was expected that comparatively few local, year-round residents use the South Sandy Beaches, while there would be proportionately more local people at the North Sandy and Not Sandy areas.

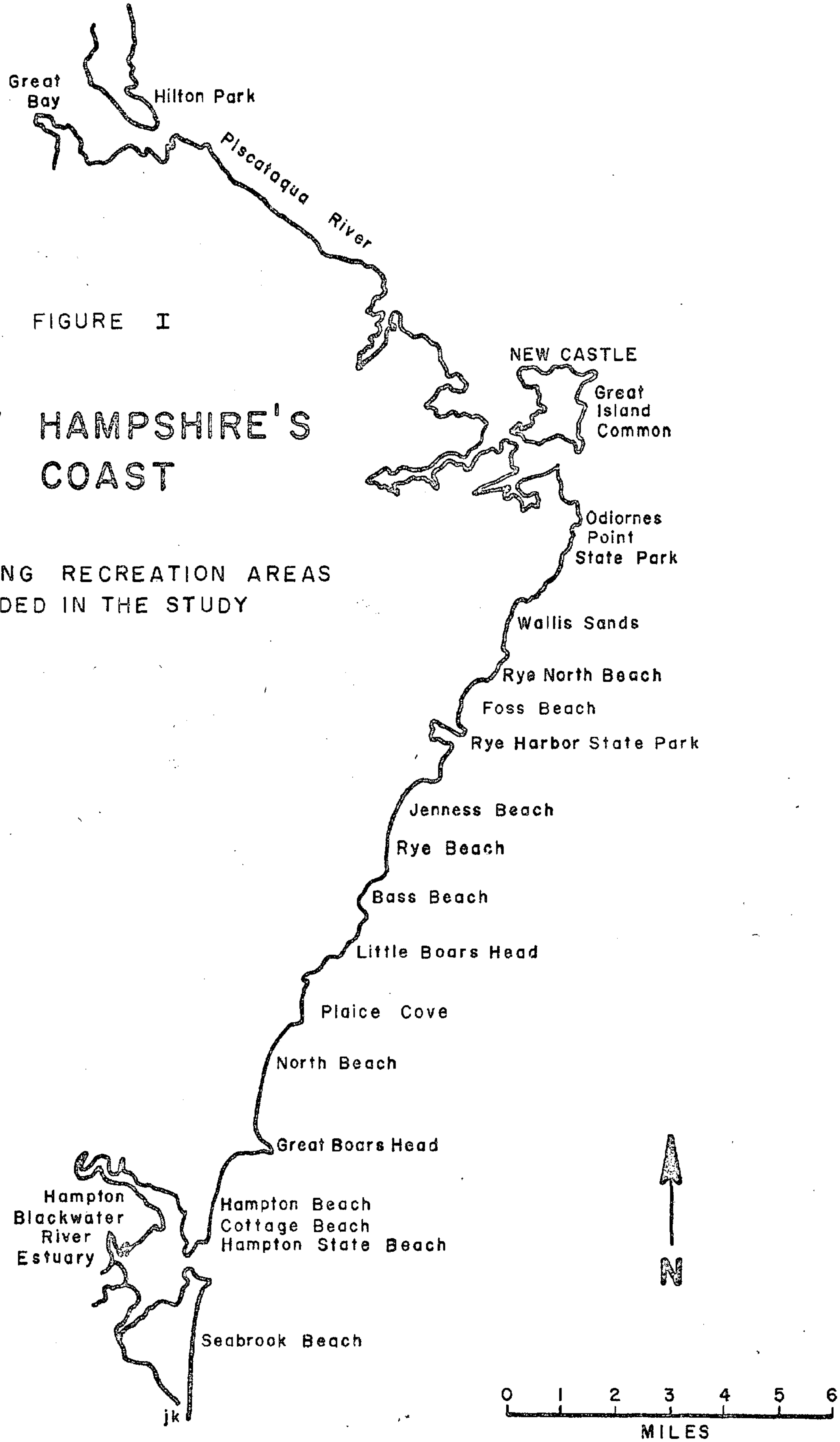
QUESTIONNAIRE DESIGN

The questionnaire was designed to provide seven basic kinds of information, 1) origin of the people using the coast, 2) length of stay, 3) socio-economic information about the visitors, 4) number of people, 5) amount of money spent and on what items, 6) reasons for coming, and 7) development preferences. A copy of the questionnaire is attached as Appendix A. Certain of the questions deserve special explanation. Question

FIGURE I

NEW HAMPSHIRE'S COAST

SHOWING RECREATION AREAS INCLUDED IN THE STUDY



4 was designed to measure the popularity of the beach and the effect of the advertising done by various promotion people. Question 15 is an attempt to measure the impact of shoreline recreation users on the local amusement attractions. Question 16 measures the users' desires for the future of the coast. The other questions measure the demographic and spending patterns of the respondents. These measures will be fully discussed in the next section.

RESULTS

This section presents in table form the results of the questionnaire. Each table will be explained as it appears. The first data to be discussed will be the characteristics of the vacationing population, then the money spent at the coast in 1974, and then a comprison of 1972 and 1974 expenditures. Throughout the section there are certain classifications used which should be explained. These classifications were done in order to organize the data for comparison so that the information may be useful to decision makers in the coastal area.

The first, and most basic classification, is that of length of stay in the coastal area. Two classes were identified. Day User and Vacationer. Day Users are people who have only come to the coast for a day trip on the day [illegible]d. Vacationers are those who are going to stay overnight at least one night on the trip on which they were interviewed. People who are in one class on the day they were interviewed may perhaps be in another on another trip. Another common classification is that of Group Types. This classification is also similar to the one used in the 1972 study, with one new sub class. There are six divisions in this classification. Family with children - nuclear family or grandparents, parents and children; Family without children - any number of related married couples without any children; Group of friends - any group of people including groups of married couples and/or single people not all related. Organized group - a camp, church, or club group; One person - self explanatory; Family with friends - group of families with children. The third general classification system which should be defined is that of Origin. This is the home residence of the people responding to the questionnaire. There are seven classes in this category. Table I defines the origin classes.

All of these classification schemes are used in the presentation of the data which follows:

TABLE I.

Definitions of Origin Classes

Class	Origin of Respondent		
Coastal N.H.	Hampton	Hampton Falls	New Castle
	North Hampton	Portsmouth	Rye
	Seabrook		
Inland Strafford Rockingham Region	Atkinson	Barrington	Brentwood
	Danville	Dover	Durham
	East Kingston	Epping	Exeter
	Farmington	Fremont	Greenland
	Hamptstead	Kensington	Kingston
	Lee	Madbury	Middleton
	Milton	New Durham	Newfields
	Newington	Newmarket	Newton
	Nottingham	Plaistow	Rochester
	Rollinsford	Salem	Sandown
	South Hampton	Stratham	Strafford
	Somersworth	Windham	
Merrimack Valley	Auburn	Bedford	Bow
	Concord	Goffstown	Hooksett
	Hudson	Londonderry	Manchester
	Merrimack	Nashua	
Massachusetts	All of Massachusetts		
New England	Connecticut	Maine	Rhode Island
	Vermont		
Other U.S.	All United States except New England		
Canada	All of Canada		

GENERAL POPULATION CHARACTERISTICS

The first of the general population characteristics measured is the total number of people. This is measured by the responses to questions eight and nine of the questionnaire. Question six which was supposed to answer that question was frequently not filled in or inaccurately filled in. Tables II through V show the population by class. The totals on Tables II and IV and Tables III and V do not agree due to the uneveness of responses: some people did not answer the questions on group type and/or origin. A comparison of the four tables shows that as expected the use of the four beach types varies by group type and origin. The largest group is the Family with Children class. Most of these people use the beaches at Hampton Beach State Park. This is the area with the most sand beach, parking, and other facilities. The large number of Vacationers in this class show that Hampton Beach's reputation as a family beach is deserved. From Tables IV and V it is obvious that most people come from Massachusetts, especially the Vacationers. In all four tables, the Day User population is much more e[illegible] distributed as to beach use than the Vacationer even though Massachusett[illegible] [illegible] the South Sandy beach are still the largest origin and destination respectively. The Not Sandy areas are used mostly by Day Users. Only one out of every five people there are Vacationers and over half of the Day Users are from New Hampshire.

Tables II through V show that the largest concentrations of people are at the South Sandy beaches, that Day Users are more evenly distributed along the coast, that Families with Children are the largest group type at the coast, and that New Hampshire residents, especially seacoast residents, prefer the Not Sandy and North Sandy areas, probably because they are less crowded. This result confirms the hypothesis upon which the beach divisions was based.

Tables VI and VII show the number of cars reported by the interviews and the average number of persons arriving at the coast in them. The differerences in the totals for these two tables may be attributed to sampling error. The difference is small and not significant enough to have a major impact upon results. The two tables show that the average number of occupants has a relationship to the beach chosen and the origin. The parties from further away tend to have fuller cars, as do those at the South Sandy beaches. It seems clear that people have taken notice of the inadequate parking facilities in the South Sandy area as well as the cost efficiency of a full car for long distance travel.

TABLE II: POPULATION OF PARTIES INTERVIEWED BY GROUP TYPE AND BEACH (DAY USER)
(Number of People)

	NOT SANDY #	NOT SANDY %	SOUTH SANDY #	SOUTH SANDY %	MID SANDY #	MID SANDY %	NORTH SANDY #	NORTH SANDY %	TOTAL #	TOTAL %
Family w/children	282	13.83	418	20.50	136	6.67	192	9.42	1,028	50.42
Family w/o child.	87	4.27	84	4.12	27	1.32	43	2.11	241	11.82
Group of friends	96	4.71	193	9.47	58	2.84	103	5.05	450	22.07
Org. group	29	1.42	4	0.20	--	---	9	0.44	42	2.06
One person	7	0.34	13	0.64	14	0.69	8	0.39	42	2.06
Family & friends	45	2.21	128	6.28	23	1.13	40	1.96	236	11.57
Total	546	26.78	840	41.20	258	12.65	395	19.37	2,039	100.0

TABLE III: POPULATION OF PARTIES INTERVIEWED BY GROUP TYPE AND BEACH (VACATIONER)
(Number of People)

	NOT SANDY #	NOT SANDY %	SOUTH SANDY #	SOUTH SANDY %	MID SANDY #	MID SANDY %	NORTH SANDY #	NORTH SANDY %	TOTAL #	TOTAL %
Family w/children	68	3.87	760	42.23	134	7.62	193	10.98	1,155	65.70
Family w/o child.	29	1.65	80	4.55	31	1.76	65	3.70	205	11.66
Group of friends	7	0.40	92	5.23	55	3.13	46	2.62	200	11.38
Org. group	2	0.11	2	0.11	8	0.46	--	--	12	0.68
One person	3	0.17	5	0.28	2	0.11	2	0.11	12	0.68
Family & friends	8	0.46	133	7.57	22	1.25	11	0.63	174	9.90
Total	117	6.66	1072	60.98	252	14.33	317	18.03	1758	100.0

TABLE IV: POPULATION OF PARTIES INTERVIEWED BY BEACH TYPE AND ORIGIN (DAY USER)
(Number of People)

	NOT SANDY		SOUTH SANDY		MID SANDY		NORTH SANDY		TOTAL	
	#	%	#	%	#	%	#	%	#	%
Inland S.R.	122	6.16	39	1.97	38	1.92	65	3.28	264	13.33
Coastal N.H.	100	5.05	42	2.12	64	3.23	88	4.44	294	14.85
Merrimack Valley	55	2.78	77		57	2.88	42	2.12	231	11.67
New England	63	3.18	70	3.54	21	1.06	72	3.64	226	11.41
Massachusetts	165	8.33	561	28.33	71	3.59	109	5.51	906	45.76
Other U.S.	34	1.72	20	1.01	1	0.05	5	0.25	60	3.03
Total	539	27.22	809	40.86	251	12.68	381	19.24	1980	100.0

TABLE V: POPULATION OF PARTIES INTERVIEWED BY BEACH TYPE AND ORIGIN (VACATIONER)
(Number of People)

	NOT SANDY		SOUTH SANDY		MID SANDY		NORTH SANDY		TOTAL	
	#	%	#	%	#	%	#	%	#	%
Merrimack Valley	9	0.52	40	2.32	43	2.49	50	2.90	142	8.22
New England	28	1.62	59	3.42	50	2.90	44	2.55	181	10.48
Massachusetts	41	2.37	780	45.17	110	6.37	167	9.67	1098	63.58
Other U.S.	16	0.93	59	3.42	20	1.16	30	1.74	125	7.24
Canada	9	0.52	152	8.80	12	0.69	8	0.46	181	10.48
Total	103	5.96	1090	63.12	235	13.61	299	17.31	1727	100.0

TABLE VI: Number of Cars and Average Number of People Per Car By Group Type and Beach

	NOT SANDY		SOUTH SANDY		MID SANDY		NORTH SANDY		TOTAL	
	Cars	Occ.	Cars	Occ.	Cars	Occ.	Cars	Occ.	Cars	Occ.
Family w/child.	97	3.61	314	3.75	74	3.65	103	3.74	588	3.71
Family w/o child.	48	2.42	61	2.69	25	3.32	46	2.35	180	2.47
Group of friends	34	3.03	91	3.13	42	2.69	49	3.04	216	3.01
Organized Group	10	3.10	1	6.0	2	4.0	2	4.50	15	3.60
One Person	10	1.0	18	1.0	16	1.0	10	1.0	54	1.00
Family and friends	15	3.53	67	3.90	11	4.09	11	4.64	104	3.94
Total	204	3.25	552	3.46	170	3.00	221	3.22	1157	3.28

TABLE VII: Number of Cars and Average Number of People Per Car By Origin and Beach

	NOT SANDY		SOUTH SANDY		MID SANDY		NORTH SANDY		TOTAL	
	Cars	Occ.	Cars	Occ.	Cars	Occ.	Cars	Occ.	Cars	Occ.
Inland S.R.	44	2.77	12	3.25	16	2.38	24	2.71	96	2.75
Coastal N.H.	33	3.03	9	4.67	27	2.37	22	4.00	91	3.23
Merrimack Valley	16	4.00	29	4.03	33	3.03	27	3.41	105	3.55
New England	27	3.37	31	4.16	23	3.09	34	3.41	115	3.54
Massachusetts	73	2.82	403	3.33	60	3.02	96	2.88	632	3.17
Other U.S.	15	3.33	19	4.16	5	4.2	12	2.92	51	3.63
Canada	2	4.5	45	3.38	2	6.0	6	1.33	55	3.29
Total	210	3.06	548	3.47	166	2.93	221	3.08	1145	3.24

POPULATION ESTIMATES

The importance of Tables VI and VII is that they form the basis along with Table VIII, for making estimates of the number of people at the coast. Similar aerial photography** may be taken and cars counted at any time in order to arrive at a reasonable estimate of the number of beach users. Table VIII shows the number of cars counted from aerial photographs taken at noon on selected days. Most of the photographs were taken at the end of July 1974, but the photographs of the South Sandy Area taken at that time were incomplete. Because of this, this area was reflown in 1975.

TABLE VIII: Cars Counted on Coast by Beach and Day

Day	Not Sandy	South Sandy	Mid Sandy	North Sandy	Total
Weekday	103	7496*	1005	897	9,501
Saturday	280	4486	826	490	6,082
Sunday	639	8269	2053	1689	15,583

* Data from flight on 7/22/75.

Table IX shows the estimates of people on the coast. This estimate was made by multiplying the number of cars counted in Table VIII by the average number of occupants by beach from Table VI. The cars counted from the photographs include those in private driveways. The low figure for Saturday at the South Sandy area may be attributed to people leaving at the end of a vacation while the new commers have not arrived yet.

TABLE IX: Estimated Population on Coast by Beach and Day*

Day	Not Sandy	South Sandy	Mid Sandy	North Sandy	Total
Weekday	300	25,900	3000	2900	32,100
Saturday	900	15,500	2500	1600	20,500
Sunday	2100	28,600	6200	5400	42,300
Total	3300	70,000	11,700	9900	94,900

* Figures to nearest 100.

** See Page 5 for discussion of aerial photography.

The area photographed included all of Route 1A, east of Route 1A, and west of 1A to the salt marsh or to subdivisions known to have year round use. The days for photography were chosen carefully. They were during the week when most of the interviews were being done. The weekend days were considered to be high average. That is, the number of people on the coast would be typical of a mid summer weekend, not a holiday or off-season weekend. The weather during both the days of interviewing and photographing was warm and sunny, "good beach weather". Using the information from above to estimate the relationship of "season" days and "off season" days an estimate of the total number of "visitor days" at the coast may be made. A "visitor day" is defined as one person visiting the coast for one day. People who stay overnight will be counted once for each day of their stay. The "season" is defined as July 1 to the Tuesday after Labor Day plus an operating "off season" as May 15 to July 1 and September 4 to September 30. The population during the season may be expected to be similar to that calculated from the survey, except that holiday numbers will be similar or somewhat higher than those experienced on the sample Sunday. During the off-season, the numbers were taken to be 70% of those expected on "season" days. Using this criteria the total visitor days at the coast is estimated to be 3,252,400. Of these, 55 percent are Day Users and 45 percent Vacationers. This distinction between Day Users and Vacationer is most important as Vacationers out-spend Day Users by five to ten times. This will be explained in the next section.

Table X is an attempt to find an estimate of the number of "visitor days" for Day Users and Vacationers at each beach type for the year. The result is a very crude estimate. The first line of the table is the percent of the total estimate from Table IX that may be attributed to each beach, using the totals in the table as a sample. The next two lines are the percents for each beach of Vacationers and Day Users from the sample information. Line five is the amount of the total user estimate that may be attributed to Vacationers or Day Users using the estimate in line four and the percentages in lines two and three.

In the calculation of the estimate number of people at the beach, two classes of people were left out. The first of these is the local people who go to the beaches and picnic areas in the late afternoon and evening. No interviews were made after about 3:00 P.M. Neither was any attempt made to photograph the cars along the beach in the evening.

TABLE X: Estimated Distribution of Visitor Population By Beach and Class (Annual total visitor days)

		Not Sandy	South Sandy	Mid Sandy	North Sandy	Total
1.	Percent from Table IX	3.48	73.76	12.33	10.43	100
2.	Percent Day User	.83	.44	.51	.55	.45
3.	Percent Vacationer	.17	.56	.49	.45	.55
4.	Estimated "Visitor Days" (Total)	113,200	2,399,000	401,000	339,000	3,252,400
5.	Estimated "Visitor Days" (Day User)	94,000	1,055,600	204,500	186,500	1,778,820
	Estimated "Visitor Days" (Vacationer)	19,200	1,343,400	196,500	152,600	1,463,580

* Figures to nearest 100.

Consequently the number of cars needed for estimating evening populations is not now available. Even though the precise number of people present cannot be determined, some description of their activities may be given. The descriptions are drawn from the observations of local businessmen and long-time residents of the area. There are three basic activities in which people who are not present at the beach in the daytime engage. There are the people who come to eat at a restaurant, others come to cool off, and third are the young people who come down for the excitement. Many of these people also attend the special events sponsored by the Chamber of Commerce at Hampton Beach. These include a beauty pageant, bingo, talent shows, and band concerts. The probable spending patterns of these people will be discussed in the next section.

The second class of people to be left out of direct enumeration are those people who go to the shore, but never go on the beach. The study method accounts for those people in two ways. In cases where the person who never goes on the sand is part of a group of which at least one member does go on the sand, then that individual is counted directly, when the member of the group on the sand is questioned. The questionnaire was designed to elicit information about entire parties, not just individuals. In cases where a whole group comes to the beach but no one ever appears on the sand a slightly more indirect accounting was made. These people do not figure in the spending estimates by class or type. There is no reason, however, to suppose that their spending habits would be much different, than the vacationers who do go to the sand beach. Since their cars are counted they do figure in the total population estimates and total spending estimates. Again there is no reason to suppose that the average number of people per car would be radically different for this group than for the beach users. Thus these non-beach users figure in the total estimates.

A further word about the figure for average people per car. Each group, beach users and non-beach users, arrive mainly by car. There are a few, however, who come by bus, hitchhike, bicycle or some other means. These people are counted in the estimates as well. The average number of people per car is calculated by dividing the number of cars of interviewed parties by the total number of people in interviewed parties. This includes all the people who arrived by non-automobile means. For example, if there were twenty-five cars reported as bringing eighty people and another twenty people arrived by another means, than the average people per car is four (one hundred divided by twenty-five). This was done deliberately so that the number of cars counted could be used as a quick way to estimate total numbers of people on the beach, including those who arrived by means other than automobile.

EXPENDITURES OF COASTAL VISITORS

Question 12 of the interview schedule asked respondents about their spending patterns while at the New Hampshire beaches. The purpose of this question was to help local businessmen and state and local government to find the best areas for investment in order to increase the economic viability of the beach recreation industry. Tables XI through XIV show the expenses per capita per day for the people interviewed on the coast. These figures were arrived at by dividing the total expenditures, reported by category and beach, by the number of people in the parties interviewed - from TAbles II through V. These figures indicate the average amount per person per day spent at the coast. There was not a great deal of difference in the amount except that people at the Not Sandy areas seemed to spend slightly less. Vacationers spent much more than Day Users as was expected due to the higher amounts spent on food and the extra amount needed for lodging. These figures are important in calculations of the total amount of money spent on the coast in a particular time period.

An intuitive estimate of the financial contribution of the local evening visitors whose characteristics were not measured may be made. The first group of evening visitors probably have per capita expenditures similar to vacationers. They eat supper at restaurants which can easily cost $7 to $10 per person. The second two groups (those who come to cool off and young people) probably more closely resemble the day users in their spending habits. They eat snacks or bring their own food. If some means of measuring the numbers of people in each class could be found then the total spending could be reasonably estimated as described.

The per capita spending figures seem to be quite low, especially in some classes of Vacationers. A quick look at the characteristics of the people measured will explain most of this seeming lowness. First these are average figures. They include infants and older people who spend little. They include people using camping areas as well as hotels. The consistantly low figure for vacationers at the Not Sandy areas may be attributed to tourists who are on vacation but are just passing through the New Hampshire coast and have stopped here for a picnic.

Further, it should be kept in mind that these figures are averages which were arrived at by using the perceptions of people of their spending habits. People often underestimate the amount of money they are spending. Because of the data classifications in question #12, however, this underestimation should not be great. Most people would know fairly precisely how much they are spending on lodging, not quite as precisely for food and much less precisely for incidentals. As food and loding are the major contributors to the expenses of a vacation, the figures should be reasonably accurate. Also these figures are not designed to provide predictions about the precise change in business income resulting in a visitor day increase in use. The purpose of collecting the data and preparing the tables is to arrive a reasonable estimate of overall beach influenced business activity and to show what types of visitors it would be in the best interest of the area to attract. Clearly, Day Users add less to local income than Vacationers and among Vacationers, Families without Children and Single Persons contribute the most.

Table XV shows an estimate of total expenditures for the entire "season" and "off season". It is based upon the averages in Tables XI and XII and

TABLE XI
PER CAPITA DAILY EXPENSES BY ORIGIN AND BEACH (VACATIONER)

(Dollars)

	NOT SANDY	SOUTH SANDY	MID SANDY	NORTH SANDY	TOTAL
Merrimack Valley	6.22	4.95	9.21	6.62	6.91
New England	8.68	10.54	8.52	10.68	9.73
Massachusetts	3.71	7.26	9.56	8.14	7.49
Other U.S.	8.88	13.27	9.30	14.00	12.25
Canada	2.44	10.23	3.67	15.75	9.65
Total	5.97	8.09	8.95	9.05	9.26

TABLE XII
PER CAPITA DAILY EXPENSES BY ORIGIN AND BEACH (DAY USER)

(Dollars)

	NOT SANDY	SOUTH SANDY	MID SANDY	NORTH SANDY	TOTAL
Inland S.R.	.79	1.21	.47	1.51	.98
Coastal N.H.	.52	2.26	.63	.63	.82
Merrimack Valley	.89	1.31	1.11	1.88	1.26
New England	1.16	4.01	1.71	1.61	2.79
Massachusetts	2.28	1.43	3.13	2.20	1.81
Other U.S.	.09	2.25	2.00	.40	.87
Total	1.21	1.69	1.52	1.55	1.51

TABLE XIII
PER CAPITA DAILY EXPENSES BY GROUP TYPE AND BEACH (VACATIONER)

(Dollars)

	NOT SANDY	SOUTH SANDY	MID SANDY	NORTH SANDY	TOTAL
Family w/Children	7.82	7.76	9.18	7.66	7.62
Family w/o Children	10.52	15.73	12.29	11.71	13.20
Group of Friends	1.43	11.00	7.56	8.52	9.15
Organized Group	-	13.00	-	-	2.17
One Person	13.0	8.20	99.50	23.50	27.17
Family and Friends	7.38	5.17	3.82	7.91	5.27
Total	5.17	8.32	9.17	8.73	8.31

TABLE XIV
PER CAPITA DAILY EXPENSES BY GROUP TYPE AND BEACH (DAY USER)

(Dollars)

	NOT SANDY	SOUTH SANDY	MID SANDY	NORTH SANDY	TOTAL
Family w/Children	.97	1.48	1.28	1.43	1.30
Family w/o Children	2.22	1.81	3.19	2.70	2.27
Group of Friends	1.25	1.62	1.36	1.59	1.50
Organized Group	.28	2.50	-	.11	.45
One Person	.71	2.92	2.57	1.75	2.21
Family and Friends	1.67	1.20	.35	1.65	1.17
Total	1.19	1.53	1.48	1.61	1.45

the population estimates in Table X. This estimate is subject to error due to the many calculations and averages involved. It can be used, however, with a reasonable amount of confidence to indicate the relative magnitude of the beach recreation industry's activity.

TABLE XV: Estimated Value of Beach and Picnic Recreation Spending By Beach (Dollars)

	Not Sandy	South Sandy	Mid Sandy	North Sandy	Total
Day User	113,700	1,784,000	310,800	289,200	2,497,700
Vacationer	114,600	10,868,100	1,758,700	1,381,000	1,412,400
Total	228,300	12,652,100	3,069,500	1,670,200	16,620,100

COMPARISON 1972 TO 1974

One of the reasons for doing this study was to be able to make comparisons with data collected in 1972. The two years were much different in the state of the national economy. In 1974 there was the threat of gas rationing, a year's worth of uncontrolled inflation and fears by many merchants that business would be bad. 1972 was considered to be a good year, though there was some feeling that it could have been better. This comparison was made to try to determine if there had in fact been a decline in business due to the uncertain state of the economy.

Tables XVI and XVII show the comparisons of per capita daily expenditures for each of the spending categories and three group types for the two years. The tables show only three group types because two of the classes which were common to both years were so small that the results were not statistically significant. The class Family and Friends used in 1974 was not used in 1972. Those people are added into the class Group of Friends which is where they were put in 1972. The area labled South Sandy in 1974 is the one used for comparison. This is the area which most nearly approximates the study area for 1972.

The percent change in total per capita daily expenditures in these tables shows a marked difference between Day User and Vacationer. Vacationers show an increase which approximates, except in the Group of Friends category, the inflation between the two years. The Day Users, however, show a marked decrease in individual spending. The reasons for this are

TABLE XVI
PER CAPITA DAILY EXPENDITURES BY GROUP TYPE AND SPENDING CATEGORY;
HAMPTON BEACH 1972 and 1974 COMPARED (VACATIONERS)

(Dollars)

	Family w/* Children		Family w/o* Children		Group of* Friends		Total	
Year	1972	1974	1972	1974	1972	1974	1972	1974
Food	2.86	2.46	6.20	5.69	3.42	3.05	3.21	2.80
Gas	.12	.35	.21	.81	.18	.53	.13	.41
Clothes	.26	.28	.65	.26	.19	1.47	.28	.39
Souvenirs	.24	.34	.67	1.55	.23	.33	.27	.44
Amusements	.52	.89	.89	1.59	.57	1.23	.56	.98
Lodging	3.16	3.32	5.67	5.68	4.49	3.80	3.56	3.57
Parking	.01	.04	.10	.10	.14	.15	.03	.06
Other	.09	.08	.05	.05	.22	.43	.11	.12
Total	7.26	7.76	14.44	15.73	9.44	10.99	8.15	8.77
% Increase 1972-1974	6.89		8.93		16.3		7.35	
No. People In Sample	1244	760	129	80	233	92	1606	932

* The other group types are not included because of small numbers or lack of comparable date.

TABLE XVII
PER CAPITA DAILY EXPENDITURES BY GROUP TYPE AND SPENDING CATEGORY;
HAMPTON BEACH 1972 and 1974 COMPARED (DAY USER)

(Dollars)

	Family w/* Children		Family w/o* Children		Group of* Friends		Total	
Year	1972	1974	1972	1974	1972	1974	1972	1974
Food	1.17	.88	2.29	1.21	.99	.90	1.14	.93
Gas	.12	.16	.05	.05	.23	.20	.16	.16
Clothes	.24	.12	.08	0	.15	.04	.20	.08
Souvenirs	0.16	.08	.26	.31	.12	.11	.15	.12
Amusements	0.31	.16	.22	.08	.19	.10	.25	.13
Parking	0.17	.07	.35	.11	.13	.13	.16	.09
Other	0.04	.01	0	.05	.01	.14	.03	.05
Total	2.22	1.48	3.26	1.81	1.83	1.62	2.09	1.56
% Change	-33.3		-44.5		-11.0		-25.4	
No. People In Sample	888	418	65	84	691	193	1644	695

* The other group types are not included because of small numbers or lack of comparable date.

not completely clear. It must be assumed that once a person decides upon an overnight vacation, his level of expenditure is relatively fixed, and out of his control, while Day Users can bring from home most of what is needed. Big declines were shown in expenditures for luxury items such as souvenirs, clothes, etc. Spending for food also showed a decline indicating that people were bringing picnics rather than buying hot dogs, etc. at the lunch counters, or were buying hot dogs rather than shore dinners.

The increase experienced in the Vacationer class was distributed in a very interesting way. Food spending dropped. Gasoline, clothes, amusements and sourvenirs increased and lodging remained the same. This shows an interesting priority of spending, due probably to the state of the economy. People seemed to be accepting the higher costs of vacation luxuries but not food.

In order to determine the impact of the national economic woes on the New Hampshire coast, it is not enough to know the spending patterns of individuals, it is also necessary to know if there has been a significant change in the number of people coming to the coast. This data was difficult to determine in comparable form. Because the days on which interviews were taken were considered to be representative of their type, these days will be used here to make comparisons. Table XVIII shows the relationship between the two years 1972 and 1974 for Hampton Beach.

TABLE XVIII: Estimated Number of People At Hampton Beach
1972 and 1974 Compared

	1972		1974[1]	
Typical Day	Day User	Vacationer	Day User	Vacationer
Weekday	3360	3160	3423	3289
Saturday[2]	5775	1850	6393	6142
Sunday	8950	5675	11,156	10,718

[1] Calculated from area photograph data and Tables VIII and X this report.
[2] The unusually low number of people estimated for Saturday 1972 is due to poor weather at the beach on the day of interviews.

The table shows that there were more people using the beach in 1974 than in 1972. This information tallys with what local businessmen have said. That is, that the summer of 1974 was a good year at the beach. The strange low figures for Vacationers on Saturday in 1972 is due to poor weather at the beach on that day. On days like that Vacationers who are staying in the vicinity, can tell what the weather is and not bother to come out on the beach, whereas the Day Users who travel some distance cannot. Many of them arrive to find poor weather but stay anyway after making the long drive.

The data in Tables XVI, XVII, XVIII lead to the conclusion that, for Hampton Beach at least, the vacation industry is not as hard hit by a poor economic climate as would be expected. People do not spend as much on casual day trips, but the overnight vacationer is still spending and still coming to the beach. There is No no compariable 1972 data for the rest of the coast so nothing can be said about changes from 1972-1974, in the other beach area.

OTHER INFORMATION OF INTEREST

There were other bits of information gathered from beach users. Some of that information is quite interesting. The following tables describe those results.

FREQUENCY OF USE AND EFFECT OF ADVERTISING

As mentioned earlier, question 4 asked for information about the users pattern of use and how he had learned about the coast. Tables XIXa - XIXc tabulate that information. It is a very fine comment on the quality of the recreation facilities that 95 per cent of the people interviewed were at the coast for at least the second time. It is an even finer comment that 60 per cent of the people who were repeat visitors had been coming for more than ten years.

Question four also attempted to measure the effectiveness of advertising on beach income. Specifically, people who were at the beach for the first time were asked how they first discovered the area. Only 3 persons, or six (6) per cent, responded "advertising". This implies that the advertising does not bring in a great many first time users. Most of the first time users heard about the New Hampshire coast from friends (see Table XIXb). Advertising is probably responsible for reminding people about the beaches and whetting their appetite for a visit. The role advertising plays in this and in helping to build a positive image for New Hampshire's coast was not

TABLE XIXa: Number of Parites at the Coast For The First Time: By Beach

	NOT SANDY	SOUTH SANDY	MID SANDY	NORTH SANDY	TOTAL
1st Trip	11	20	8	10	49
Not 1st Trip	159	339	154	167	819

TABLE XIXb: Method of Discovery For Those At The Coast For The First Time: By Beach

	NOT SANDY	SOUTH SANDY	MID SANDY	NORTH SANDY	TOTAL
Relative	2	0	0	1	3
Friend	1	14	4	5	24
Advertising	1	0	2	0	3
Passing through	4	1	1	3	9
Other	2	4	0	1	7
No Answer	1	1	1	0	3
Total	11	20	8	10	49

TABLE XIXc: Number of Years Respondent Has Been Coming To Coast: By Beach

	NOT SANDY		SOUTH SANDY		MID SANDY		NORTH SANDY		TOTAL	
	#	%	#	%	#	%	#	%	#	%
Less Than 5 years	37	28	68	17	38	27	29	18	172	21
5-10 years	30	23	81	21	20	14	25	15	156	19
10-20 years	25	19	98	25	26	19	33	21	182	22
Greater than 20 years	40	30	146	37	50	40	75	46	317	38
Total	132	100	393	100	140	100	162	100	827	100

TABLE XX
FUTURE DEVELOPMENT BY ORIGIN (DAY USER)
(Number of Responses)

	COMMERCIALIZED	STATE PARK	INDUSTRIAL	NO DEVELOPMENT
Inland S.R.	4	35	2	35
Coastal N.H.	7	38	2	39
Merrimack	3	23	7	24
New England	3	26	1	18
Massachusetts	22	35	7	76
Other U.S.	2	5	-	5
Total	41	162	19	197

TABLE XXI
FUTURE DEVELOPMENT BY ORIGIN (VACATIONER)
(Number of Responses)

	COMMERCIALIZED	STATE PARK	INDUSTRIAL	NO DEVELOPMENT
Merrimack	3	18	2	16
New England	1	15	2	15
Massachusetts	31	84	1	100
Other U.S.	7	19	2	14
Canada	10	20	1	9
Total	52	156	8	154

measured by the question and thus cannot be quantified here.

DEVELOPMENT PREFERENCES OF USERS

Another question asked of coastal users was what, if any, development would they prefer to see happen on the coast. (Question 16 of the questionnaire). This question was included in the questionnaire with some misgivings. It was not expected that the sample interviewed here would be a representative one of the people of the coast or even the state, but it was feared that some people would use the results as if it were. The information developed here may not be used to indicate the region or state population's preferences for development of the coast. The sample is one of the beach and picnic area recreation users, thus it was expected that recreation development would be the type favored. In fact that is so. Only about 3.5 percent of those interviewed preferred industrial development to the others. What is surprising is the low number of people who preferred commercial recreational development. This category was included because it was expected that people who came to the beach would want the facilities they use expanded or upgraded. Surprisingly, this was not so. The feeling was "leave it alone" or develop more of the beaches as state parks. Neither response showed much disatisfaction with the present facilities. Tables XX through XXIII display the responses to question 16.

The answers to question 16 and question 4 show that New Hampshire's coastal recreation industry has been successful in satisfying the desires of a large number of people. Whether or not the small number of new visitors (5.6% of total interviewed) is healthy or not from a business standpoint is not capable of being answered by this study. However, if all of the people who are visiting for the first time come back regularly, in twenty years they would replace the people who are presently using the coast. That seems to be a good indication of possible long-term success as 40 percent of those interviewed had been coming to the beach for twenty years or more!

CRITICISMS OF FACILITIES AT THE COAST

Question 17 asked respondents if they had any criticisms of the beach or facilities at the beach. Table XXIV summarizes the responses to this question. The headings in the response column are shorthand titles of the

TABLE XXII
FUTURE DEVELOPMENT BY BEACH (DAY USER)

(Number of Responses)

	COMMERCIALIZED	STATE PARK	INDUSTRIAL	NO DEVELOPMENT
Not Sandy	10	74	9	43
South Sandy	18	109	5	67
Mid Sandy	6	38	4	39
North Sandy	7	41	2	48
Total	41	262	20	197

TABLE XXIII
FUTURE DEVELOPMENT BY BEACH (VACATIONER)

(Number of Responses)

	COMMERCIALIZED	STATE PARK	INDUSTRIAL	NO DEVELOPMENT
Not Sandy	-	17	2	11
South Sandy	39	84	4	84
Mid Sandy	4	28	1	34
North Sandy	9	32	2	30
Total	52	161	9	159

respondent's criticism. It is to the credit of the management of the beaches, recreation areas, and businessmen that half of the people questioned had no criticism of the beaches or facilities. With the exception of the complaints about lack of cleanliness and the lack of parking at the South Sandy beach, most of the rest of the critisms were minor. It is interesting that the complaints about cleanliness at the Not Sandy areas are not as strong as at the Sandy areas. Parking is a problem. In fact it is the most limiting factor in increased use of the coast. Various plans have been aired to solve the problem, though at this time, none has been yet adopted.

SURVEY OF COASTAL BUSINESSMEN

Along with a survey of beach recreation users, a survey of beach businessmen was conducted. The purpose of the questionnaire was to assess the attitude of the businessmen to development along the coast. The questionnaire (attached as Appendix B) asked the businessmen to rate a series of development types either as very desirable, somewhat desirable, necessary but not desirable or undesirable under any circumstances as well as to rate areas for preservation. There were eighty-eight questionnaires handed out, forty-eight (48) or 55 percent were returned. Table XXV shows the type of respondents and the responses to the questions on preservation of natural features. The highest priorities for preservation are those that the coastal businesses are most closely tied to: museums, marinas, and public parks and picnic areas.

Tables XXVI and XXVIII show the responses of the businessmen to the development part of the questionnaire. Table XXVI shows the total responses. Table XXVII shows the responses ranked by percent of those indicating high level of desirability for the proposed development. Those items which ranked highest on Table XXVII are those which would most complement a vacation oriented business. It was somewhat surprising to find year round residences ranking higher than seasonal residences. Year round residences mean more school children and other services and are generally a tax burden while seasonal houses are a net tax asset. The low ranking of parking facilities is surprising in view of the visitor complaints and local realization of the problem. Table XXVII shows only the most and least desirable categories, 54% of the respondents considered parking facilities to be somewhat desirable or necessary. The low rank of heavy industry in general

TABLE XXIV: Criticisms of Facilities By Beach

(Number of People)

	NOT SANDY	SOUTH SANDY	MID SANDY	NORTH SANDY	TOTAL
Lifeguards (not enough)*		17	1	2	20
Roads (lack of access)		5			5
Cleanliness (lack of)	11	72	23	29	135
Restaurants (lack of)		2	2	3	7
Parking (lack of)	2	46	15	1	64
Bathhouses (lack of)*	19	13	14	16	62
Telephones (lack of)			2		2
Commercialism (too much)		8	5		13
Rules (too many)	4		6	3	13
People (too many)		6	2	11	19
More Private		3			3
More Public			2		2
Playgrounds (lack of)		2		1	3
Other	32	38	16	16	102
None	99	197	70	95	461
No. Of Respondents	171	420	162	177	930

* No comments on the competency of life guards or the quality of the bathhouses were received.

TABLE XXV: Characteristics of Businessmen Respondents to Survey

A. Location of Respondent's Business

Location	Number	Percent*
Seabrook	7	(15%)
Portsmouth	2	(4%)
Rye	11	(23%)
Newington	3	(6%)
New Castle	1	(2%)
No. Hampton	4	(8%)
Hampton	19	(40%)
No location given	2	
Total	48	(102%)

* Total does not equal 100 because of rounding.

B. Business Types

Type	Number	Percent
Restaurants	16	33
Gifts & clothing	1	2
Motel/hotel lodging	11	23
Grocery, Bakery, Var.	11	23
Miscellaneous	6	13
Realty Insurance	3	6
Total	48	100

C. Recommendations for Natural Features to be preserved.

Type	Number	Percent
Public Beaches	45	94
Coastal waters	41	
Bays	39	85
Forest	31	65
Marshes	27	56
Other: Lakes	1	2

TABLE XXVI

SUMMARY OF COASTAL BUSINESSMEN'S ATTITUDES ON COASTAL DEVELOPMENT

Type of Development	Level of Desirability* Very Desirable	Somewhat Desirable	Necessary But Not Desirable	Undesirable Under Any Circumstances	Total Responses
Apartments and Condominiums	12 (26%)*	16 (35%)*	6 (13%)*	12 (26%)*	46
Auto Dealerships	3 (6%)	4 (9%)	12 (25%)	28 (60%)	47
Auto Repair/Parts	7 (15%)	7 (15%)	16 (34%)	17 (36%)	47
Banks and Bank Branches	18 (38%)	15 (32%)	8 (17%)	6 (13%)	47
Bird/Wildlife Sanctuaries	28 (59%)	13 (27%)	4 (8%)	3 (6%)	48
Camping Areas	18 (37%)	8 (17%)	12 (25%)	10 (21%)	48
Children's Playgrounds	33 (77%)	8 (19%)	1 (2%)	1 (2%)	43
Clothing Shops/Boutiques	22 (46%)	13 (28%)	7 (15%)	5 (11%)	47
Discoteques	9 (19%)	16 (33%)	7 (15%)	16 (33%)	48
Fishing Piers	34 (72%)	8 (17%)	2 (4%)	3 (7%)	47
Food Concessions	19 (42%)	16 (36%)	3 (7%)	7 (15%)	45
Gasoline Stations	14 (30%)	11 (23%)	15 (32%)	7 (15%)	47
Gift Shops	23 (49%)	16 (34%)	2 (4%)	6 (13%)	47
Heavy Industry	2 (4%)	4 (9%)	6 (13%)	33 (74%)	45
Hotels/Motels	9 (36%	6 (24%)	1 (4%)	9 (36%)	25

* Indicates percentage of persons who responded to that question.

TABLE XXVI

(Continued)

Type of Development	Level of Desirability* Very Desirable	Somewhat Desirable	Necessary But Not Desirable	Undesirable Under Any Circumstances	Total Responses
Industry In General	10 (23%)	7 (16%)	4 (9%)	23 (52%)	44
Light Industry	12 (26%)	7 (15%)	6 (13%)	21 (46%)	46
Marinas	36 (82%)	7 (16%)	--	1 (2%)	44
Museums	39 (83%)	6 (13%)	2 (4%)	--	47
Oil Refineries	3 (7%)	1 (2%)	9 (20%)	33 (72%)	46
Parking Lots/Structures	14 (30%)	14 (30%)	11 (24%)	7 (16%)	46
Public Boat Launching	29 (62%)	9 (20%)	3 (7%)	5 (11%)	46
Public Picnic Areas	38 (82%)	3 (7%)	3 (7%)	2 (4%)	46
Restaurants	26 (58%)	10 (22%)	3 (7%)	6 (13%)	45
Roads and Highways	28 (61%)	5 (11%)	6 (13%)	7 (15%)	46
Sanitary Landfill Sites	13 (29%)	8 (17%)	13 (28%)	12 (26%)	46
Seasonal Residences	27 (59%)	12 (26%)	--	7 (15%)	46
Service Industries	14 (30%)	13 (28%)	11 (24%)	8 (18%)	46
Shopping Centers	11 (24%)	9 (20%)	14 (32%)	11 (24%)	45
Super Port	15 (44%)	9 (26%)	5 (15%)	5 (15%)	34
Theaters/Movie Houses	26 (56%)	9 (20%)	6 (13%)	5 (11%)	46
Utility Installations	15 (33%)	6 (13%)	9 (19%)	16 (35%)	46
Year Round Residences	30 (65%)	9 (20%)	3 (6%)	4 (9%)	46

TABLE XXVII

LEVEL OF DESIRABILITY OF DEVELOPMENT, RANKED IN ORDER OF MOST DESIRABLE TO LEAST DESIRABLE

Type of Development	Very Desirable	Undesirable Under Any Circumstances	N*
Museums	83%	--	47
Marinas	82%	2%	44
Public parks, picnic areas	82%	4%	46
Children's Playgrounds	77%	2%	43
Fishing pier	72%	7%	47
Year round residences	65%	9%	46
Public boat launching areas	62%	11%	46
Roads and Highways	61%	15%	46
Seasonal residences	59%	15%	46
Bird/Wildlife Sanctuaries	59%	6%	48
Restaurants	58%	13%	45
Theaters/Movie houses	56%	11%	46
Gift shops	49%	13%	47
Clothing shops	46%	11%	47
Super port	44%	15%	34
Food concessions	42%	15%	45
Banks and bank branches	38%	13%	47
Camping areas	37%	21%	48
Hotels/Motels	36%	36%	25
Utility Installations	33%	35%	46
Gasoline Stations	30%	15%	47
Parking Lot/Structures	30%	16%	46

TABLE XXVII (Continued)

Type of Development	Very Desirable	Undesirable Under Any Circumstances	N*
Service Industries	30%	28%	46
Sanitary landfill sites	29%	26%	46
Light industry	26%	46%	46
Apartments and Condominiums	26%	26%	46
Shopping centers	24%	24%	45
Industry, in general	23%	52%	44
Discotheques	19%	33%	48
Auto repair/parts	15%	36%	47
Oil refineries	7%	72%	46
Auto dealerships	6%	60%	47
Heavy industry	4%	74%	45

* N - the number of respondents who answered that question.

and oil refineries in particular is interesting especially when compared with the relatively higher rank of an offshore terminal or superport.

Figure II shows the preferences of businessmen organized by development categories. This was done in order to facilitate generalizations about these preferences. Responses were categorized as either positive or negative. Positive responses were Very Desirable or Somewhat Desirable. Negative responses were Necessary But Not Desirable and Undesirable Under Any Circumstances. The development options were categorized into several classes. Table XXVII shows the categories and options included. Figure II shows that coastal businessmen responded as would be expected of people expressing enlightened self-interest. The anomaly is the rather large preference for housing, especially as this is basically reflected in a desire for year round residences, which traditionally cause a higher tax burden. Apartments, which at least initially may be a tax benefit, rank very low.

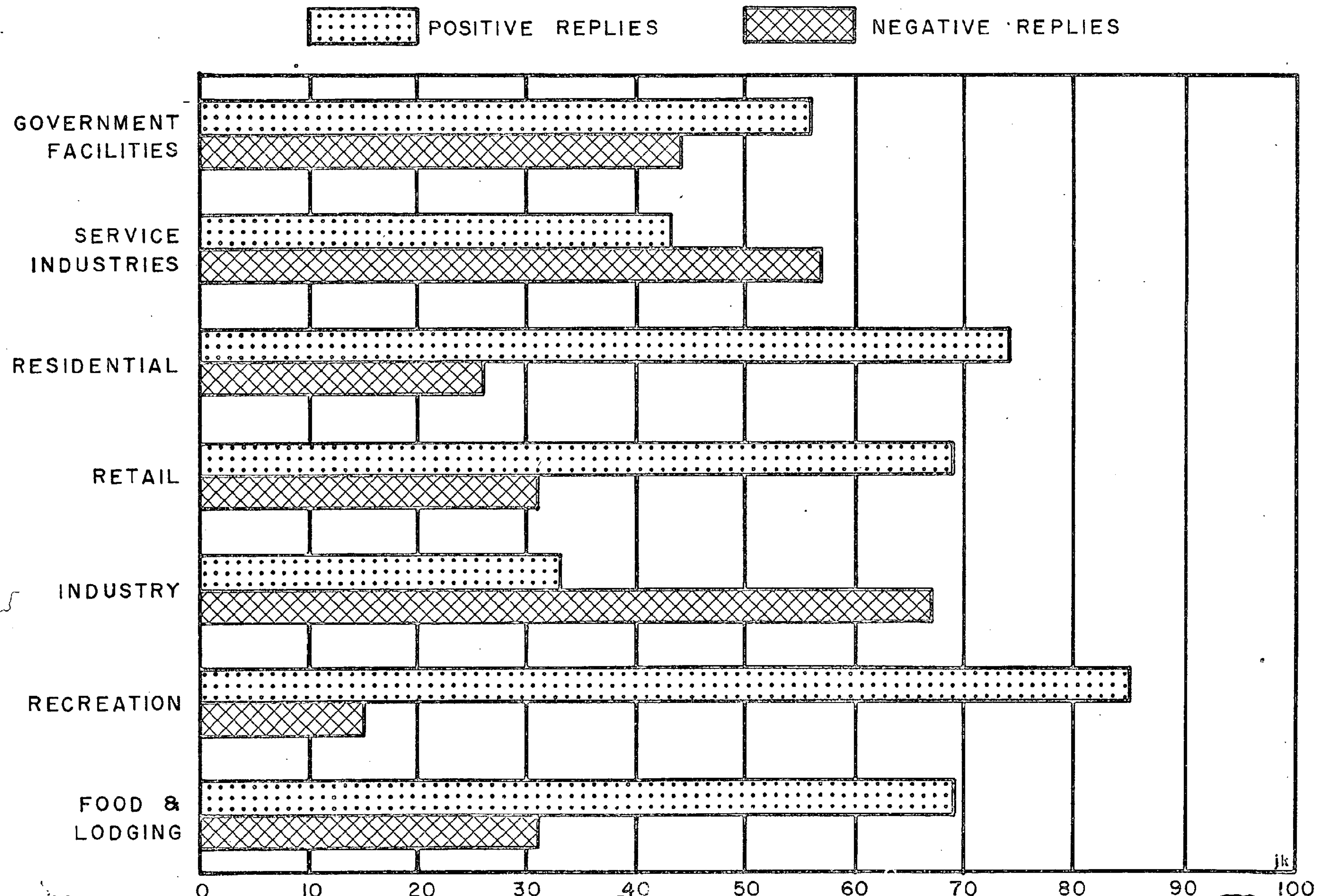
CONCLUSIONS

This study of recreation users at the coast does not present a plan for

TABLE XXVIII: Developement Options Categorized For Figure II.

Category	Options Included
Government Facilities	Sanitary land fill Roads and highways Parking lots and structures
Service Industries	Automobile dealerships Automobile repair Banks Gas stations General service
Residential	Apartments Seasonal Residences Year-round residences
Retail	Clothing stores Gift shops Shopping centers Theatres
Industry	Heavy industry Light industry General industry Super port Oil refinery Utility
Recreation	Bird Sanctuary Campground Children's playground Fishing pier Marina Museum Boat launching Parks
Food and lodging	Restaurants Food concessions Discotheques Hotels/motels

FIGURE II DEVELOPMENT PREFERENCES (OF COASTAL BUSINESSMEN)



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changing the uses. Rather the study was an attempt to describe as accurately as possible the characteristic s of the people using the coast, especially the amount of money that was spent. However, from this description, some feeling for possible changes can be had. For instance, the general lack of parking is especially true at the South Sandy area. The table shows that there are certain group types which spend more money than others. These group types should be catered to by the coastal businessmen, especially if they are groups which do not use many services such as groups with 3.5 or more people per car, thus providing more spenders with less parking space use.

The information presented in this report is just a small portion of the information available from the study. There is a great deal of data which has not been extracted because of the limits in time and budget. The basic classes of beach type, group type, origin and length of stay have been the focus of this report. It is possible, however, to organize the data in many other ways. Appendix C is a list of tables already prepared but not included in the presentation in this report. These tables are available at the Commission office for inspection and use. In addition to these tables, other organization of the data may be done if useful.

APPENDIX A

ON SITE SURVEY OF RECREATION USERS

Date: ________ Time: ________ Interviewer: ________ Location: ________

1. WHERE IS YOUR PERMANENT HOME RESIDENCE? ____________________
   Town State
2. WHAT IS YOUR OCCUPATION? ____________________
3. HOW LONG DID IT TAKE YOU TO GET HERE TODAY? ____________________
4. HAVE YOU BEEN TO THE NEW HAMPSHIRE SEACOAST BEFORE: Yes No
   - (if no) HOW DID YOU FIRST DISCOVER THIS AREA? ____________
   - (if yes) WHEN DID YOU FIRST START COMING HERE? ____________
   - (if yes) HOW MANY TIMES A YEAR DO YOU COME? ____________
   - (if yes) HOW LONG DO YOU USUALLY STAY WHEN YOU COME? ________
5. HOW LONG WILL YOU STAY (THIS TIME)?
   - 1 day ____________
   - 1 - 7 days ____________
   - 8 - 30 days ____________
   - 31 days - 3 months ____________
6. HOW MANY PEOPLE ARE THERE IN YOUR GROUP TODAY? ____________
7. WHAT KIND OF GROUP ARE YOU WITH TODAY?
   - family with children ____________
   - family without children ____________
   - group of friends ____________
   - organized group ____________
   - one person alone ____________
   - (please note) other ____________
8. WHAT IS YOUR AGE ____________ Sex: M F

9. WHAT ARE THE AGES OF THE OTHER PEOPLE IN YOUR PARTY? (Interviewer: Put one slash in each group for each party member, e.g. ////)

Under 5 years	______	20-24 years	______	40-44 years	______
5 - 9 years	______	25-29 years	______	45-49 years	______
10-14 years	______	30-34 years	______	50-54 years	______
15-19 years	______	35-39 years	______	55-59 years	______

60-64 years ______
65-69 years ______
70-74 years ______
75-79 years ______

10. HOW MANY CARS DID YOUR GROUP COME IN TODAY? ______________________

11. HOW MUCH MONEY DO YOU ANTICIPATE SPENDING ON THE COAST DURING THIS TRIP? ______________________

12. HERE IS A LIST OF THINGS YOU MIGHT SPEND MONEY ON WHILE IN THE SEA COAST REGION. WOULD YOU PLEASE ESTIMATE HOW MUCH YOUR GROUP SPENDS PER DAY ON EACH ITEM? (money spent at the beach)

FOOD (spent today at concessions, restaurants) $__________

GASOLINE (purchased near coast only) $__________

CLOTHING $____________ PARKING $____________ OTHER $__________
(what?) __________

SOUVENIRS $__________ AMUSEMENTS $__________ NR ____________

13. (If staying overnight or longer, ask:) IN WHAT KIND OF LIVING ACCOMMODATIONS ARE YOU STAYING?

tent or trailer camping __________

a hotel/motel unit __________

a rented cottage/efficiency unit __________

a friend's cottage or house __________

other (what?) ______________________

14. HOW MUCH WILL YOUR GROUP SPEND PER NIGHT FOR LODGING? $__________

15. HAVE YOU EVER VISITED ANY OF THE FOLLOWING RECREATION FACILITIES?

________ HAMPTON BEACH PLAYHOUSE ________ SALISBURY AMUSEMENT PARK

________ HAMPTON CASINO BALLROOM ________ GOLF COURSES

________ HAMPTON BEACH PENNY ARCADES ______ SEABROOK DOG TRACK

________ HAMPTON BAND SHELL CONCERTS ______ ROCKINGHAM PARK

________ ODIORNE'S POINT STATE PARK ______ LEE RACEWAY

_________ WALLIS SANDS STATE PARK

_________ RYE HARBOR STATE PARK

_________ STRAWBERRY BANKE TOUR

_________ ISLES OF SHOALS CRUISE

_________ STAR SPEEDWAY

_________ NEW ENGLAND DRAGWAY

_________ WENTWORTH COOLIDGE MUSE

16. OVER THE NEXT FEW YEARS NEW HAMPSHIRE WILL HAVE TO MAKE SOME DECISIONS ABOUT THE FUTURE DEVELOPMENT OF THE COAST. IF IT WERE UP TO YOU TO CHOOSE, WHAT KINDS OF DEVELOPMENT WOULD YOU PREFER FOR NEW HAMPSHIRE'S COASTLINE?

_____ COMMERCIALIZED RECREATION DEVELOPMENT (Interviewer: if you are asked to clarify say, restaurants, motels, shopping facilities, cottages)

_____ DEVELOPED FURTHER AS A STATE OR NATIONAL PARK (Clarification: more picnic areas, parking, beach maintenance, possibly fees)

_____ INDUSTRIAL DEVELOPMENT (Clarification: such as electronic assembly plants, oil refineries)

_____ NO DEVELOPMENT WHATSOEVER (Clarification: the way it is now)

17. DO YOU HAVE ANY CRITICISMS OF THE FACILITIES AVAILABLE AT THIS ____________________? (Interviewer: place, name of beach, park)

APPENDIX B

COASTAL BUSINESS SURVEY QUESTIONNAIRE

Dear Sir or Madam:

The Strafford Rockingham Regional Council and the Southeastern New Hampshire Regional Planning Commission are currently conducting a survey of people's attitudes about the coast as a recreation area. We are particularly interested in your opinion as a businessman in this area. We would like to know what your views are concerning the future development of the coastal region. What kinds of development, if any should take place along the coast?

We would appreciate it if you would answer this short questionaire sometime today. It should take only about 5-10 minutes to fill out. One of our pollsters will return later today to pick up your questionaire, or you can mail it to us in the attached envelope. All answers will remain anonomous. No one will be able to connect you with your answers.

THANK YOU FOR YOUR COOPERATION,

Otis Perry, Assistant Planning Director
Southeastern New Hampshire Regional Planning Commission

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1. Please rate the following kinds of development as to how desirable you think they would be for New Hampshire's coast. Check one answer for each development type.

	VERY DESIRABLE	SOMEWHAT DESIRABLE	NECESSARY BUT NOT DESIRABLE	UNDESIRABLE UNDER ANY CIRCUMSTANCES
Apartments and Condominiums	____	____	____	____
Auto Dealerships	____	____	____	____
Auto Repair and Auto Parts Dealers	____	____	____	____
Banks and Bank Brances	____	____	____	____
Bird and Wildlife Sanctuary	____	____	____	____
Camping Areas	____	____	____	____
Children's Playgrounds	____	____	____	____
Clothing Shops or Boutiques	____	____	____	____

	VERY DESIRABLE	SOMEWHAT DESIRABLE	NECESSARY BUT NOT DESIRABLE	UNDESIRABLE UNDER ANY CIRCUMSTANCES
Discoteques, Bars and Lounges				
Fishing Piers				
Food Concessions or Franchises				
Gasoline Stations				
Gift Shops				
Heavy Industry (mining, auto fact-ories, lumber mill, etc.)				
Industry in general				
Light industry (shoes, clothing, electronic parts, etc.)				
Marinas				
Museums and/or Historical Sites				
Oil Refineries				
Parking Lots/Parking Structures				
Public Boat Launching Areas				
Public Parks and Picnic Areas				
Restaurants				
Roads and Highways				
Sanitary Land Fill Sites				
Seasonal residences				
Service Industries (advertising, insurance, real estate, etc.)				

	VERY DESIRABLE	SOMEWHAT DESIRABLE	NECESSARY BUT NOT DESIRABLE	UNDESIRABLE UNDER ANY CIRCUMSTANCES
Shopping Centers	____	____	____	____
Super Port (Portsmouth Only)	____	____	____	____
Theaters and Movie Houses	____	____	____	____
Utility Installations (electricity, water treatment, nuclear power plants)	____	____	____	____
Year Round Residences	____	____	____	____
Other	____	____	____	____
Other	____	____	____	____

What natural features of our coast and rivers should be preserved especially because of their importance (however indirect) to your business? (Check all that apply).

____Public Beaches ____Marshlands ____Coastal Waters

____Bays ____Forests and Grasslands ____Other (What?) ____________

What kind of business do you operate? ______________________________

General location or town of the business: ______________________________

Is it a seasonal or a year-round operation? (Circle One) Seasonal Year Round

Do you have any parking spaces for customers? Yes ___ No ___ If yes, how many? ________

If hotel or motel, how many units are in operation? ____________

If restaurant, what is the total seating capacity? ____________

Thank you. Results of the survey will be available (sometime in August) at the Southeasstern New Hampshire Regional Planning Commission, 3 Water Street, Exeter, New Hampshire 03833.

APPENDIX C

List of Tables prepared for the Coastal Recreation Study but not included in it.

The following list of tables is a partial list of the tables available at the Southeastern New Hampshire Regional Planning Commission. These tables are the ones that have been pulled out of the data.

DAILY EXPENSES BY GROUP TYPE AND BEACH (DAY USER) (IN DOLLARS)

DAILY EXPENSES BY ORIGIN AND BEACH (VACATIONER) (IN DOLLARS)

PER CAPITA DAILY EXPENSES BY ORIGIN (SOUTH SANDY-DAY USER)

DAILY EXPENSES BY ORIGIN (MID SANDY-VACATIONER)

DAILY EXPENSES BY ORIGIN (MID SANDY-DAY USER)

DAILY EXPENSES BY ORIGIN (SOUTH SANDY-VACATIONER)

DAILY EXPENSES BY ORIGIN (SOUTH SANDY-DAY USER)

DAILY EXPENSES BY ORIGIN (NOT SANDY-VACATIONER)

DAILY EXPENSES BY ORIGIN (NOT SANDY-DAY USER)

PER CAPITAL DAILY EXPENSES BY ORIGIN (NOT SANDY-VACATIONER)

PER CAPITA DAILY EXPENSES BY ORIGIN (NOT SANDY-DAY USER)

PER CAPITA DAILY EXPENSES BY ORIGIN (MID SANDY-DAY USER)

PER CAPITA DAILY EXPENSES BY ORIGIN (MID SANDY-VACATIONER)

DAILY LODGING AMOUNT (VACATIONERS)

DAILY EXPENSES BY ORIGIN (NORTH SANDY-DAY USER)

PER CAPITA DAILY EXPENSES BY ORIGIN (NORTH SANDY-DAY USER)

DAILY EXPENSES BY ORIGIN (NORTH SANDY-VACATIONERS)

PER CAPITA DAILY EXPENSES BY ORIGIN (SOUTH SANDY-VACATIONER)

PER CAPITA DAILY EXPENSES BY ORIGIN (NORTH SANDY-VACATIONER)

PER CAPITA DAILY EXPENSES BY GROUP TYPE (NOT SANDY-VACATIONERS)

PER CAPITA DAILY EXPENSES BY GROUP TYPE (NOT SANDY-DAY USER)

DAILY EXPENSES BY GROUP TYPE (DOLLARS) (NOT SANDY-VACATIONER)

DAILY EXPENSES BY GROUP TYPE (NOT SANDY-DAY USER)

PER CAPITA DAILY EXPENSES BY GROUP TYPE (SOUTH SANDY-DAY USER)

PER CAPITA DAILY EXPENSES BY GROUP TYPE (SOUTH SANDY-VACATIONER)

DAILY EXPENSES BY GROUP TYPE (SOUTH SANDY-VACATIONER)

DAILY EXPENSES BY GROUP TYPE (SOUTH SANDY-DAY USER)

DAILY PER CAPITA EXPENSES BY GROUP TYPE (NORTH SANDY-VACATIONER)

PER CAPITA DAILY EXPENSES BY GROUP TYPE (NORTH SANDY-DAY USER)

DAILY EXPENSES BY GROUP TYPE (NORTH SANDY-VACATIONER)

DAILY EXPENSES BY GROUP TYPE (NORTH SANDY-DAY USER)

DAILY EXPENSES BY GROUP TYPE (MID SANDY-DAY USER)

DAILY EXPENSES BY GROUP TYPE (MID SANDY-VACATIONER)

PER CAPITA DAILY EXPENSES BY GROUP TYPE (MID SANDY-VACATIONER)

PER CAPITA DAILY EXPENSES BY GROUP TYPE (MID SANDY-DAY USER)

APPENDIX D

LIST OF COMMISSIONERS AND STAFF

COMMISSIONERS

SOUTHEASTERN N.H. REGIONAL PLANNING COMMISSION

	Brentwood
Patrick Jackson	Epping
Robert Dodge	Epping
Edward Ingraham (alt)	Epping
Helen Carr Dix	Exeter
Thaddeus Klemarczyk	Exeter
Richard Rugg	Greenland
Herman Parker	Greenland
Louisa Woodman	Hampton
James Fallon	Hampton
Jerome Healey	Hampton Falls
Mark Kelley, Jr.	Hampton Falls
Seth Perry	Kensington
Margaret Hartford	New Castle
Sidney Palmer	New Castle
William Tebo	Newfields
Thomas Hackett	Newfields
Sydney Frink	Newington*
Frederick Smith	Newington*
David Sanderson	Portsmouth
James Ritzo	Portsmouth
Calvin Canney	Portsmouth
Charles Tallman	Rye
Shirley Tibbetts	Rye
Wallace Verge	South Hampton
Norman Felch	South Hampton
Richard Scammon	Stratham*
Christopher Rowe	Stratham*

*Non-member of the Strafford Rockingham Regional Council

COMMISSIONERS

SOUTHERN ROCKINGHAM REGIONAL
PLANNING DISTRICT COMMISSION

	Atkinson*
Leonard Chase	Hampstead
Charles Lindquist,Jr.	Hampstead
Jean DuBois	Kingston
John Impey	Kingston
Thomas Cullen	Plaistow
Donald McKendry	Plaistow
Michael Carney	Salem
Michael Mariolis	Salem
John Sununu	Salem
Ronald Coish	Windham
Peter Bronstein	Windham

*Non-member of the Strafford Rockingham Regional Council

COMMISSIONERS

STRAFFORD REGIONAL PLANNING COMMISSION

Pat McManus	Dover
Robert Rowe	Dover
Tom Dunnington	Dover
Hugh Tuttle(alt)	Dover
Rebecca Frost	Durham
Nelson LeRay	Durham
George Shaw(alt)	Durham
Aaron Chadborne	Lee
Lane Goss	Madbury
Joan Schreiber	Madbury
Clyde L. Tufts	Middleton
Loran Smith	Middleton
Charles DiPrizio III	Middleton
Thomas Blanchette	Newmarket
Harold Szacik	Newmarket
Dave Colby	Nottingham
John Williamson	Nottingham
Fred Barry	Rollinsford
George Leuchs	Rollinsford
David Lamprey	Somersworth

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SOCIO ECONOMIC PROFILE
OF RESIDENTS OF THE COASTAL ZONE PLANNING AREA

by
Strafford Rockingham Regional Council

This report was financed in part by the Coastal Zone Management Act of 1972, administered by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration.

SOCIO ECONOMIC PROFILE
OF RESIDENTS OF THE COASTAL ZONE PLANNING AREA

The following information on the socio economic status of residents of the Coastal Zone Planning Area was taken from the 1970 census. Because of that, the information is somewhat out of date. The Census was taken more than five years ago and there have been many changes in the make-up of the region since that time. Unfortunately there is little information available on those changes. New information that is available on employment has already been presented in the Economic Base report. Population projections and estimates do exist but they are not broken down into age/sex categories. Other characteristics such as family compostion, eduction levels, and poverty level have not been collected in comparable detail since the census. Thus in order to prepare a detailed profile of the area's residents it is necessary to use the census data.

There are two other considerations which must be kept in mind when studying the following tables. The census data 1970 was partially collected through sampling. The basic population unit used for extrapolating from the sample data to the total population was 2500 persons. This has led to some inaccuracies in the estimates for the total population; especially for small towns. Those tables based on sample information are identified as is the size of the sample taken. Also the Coastal Zone Planning Area has two large institutional populations which tend to skew the data: these are Pease Air Force Base and the University of New Hampshire. The impacts of these two institutions show up differently in the various tables. This difference is due to the differing character of the people associated with them. Pease Air Force Base increases the general population of the city of Portsmouth where the on-base housing is located. These people do not vote in Portsmouth nor do they demand much in the way of services from the city. They are families and their impact is spread throughout the figures for Portsmouth. The students at the University have a much different impact on Durham's population. They may register to vote in Durham and the services provided by Durham are shared by the University and partially funded by it. The students have a dramatic impact on the population which will be noted in the discussion of individual tables.

In spite of these problems the census tabulations seem to be the best means of providing the socio economic profile of Coastal Zone Planning Area residents. The information is presented here in tabular form with a short discussion of each table.

Table I shows the age/sex distribution of the population. The age categories chosen are modified from the census to show major socio economic categories. 5 and under represents all people in pre school years. This specific population group has few programs directed at it, though it is one of the most important. The 6-19 category are those people most likely to be in school. Ages 20-44 are the child bearing ages for women and thus the ages of most young families. Ages 45-64 are separated because they are after child bearing and before retirement. They are the ages where people generally earn the most. Age 65 plus is the true retirement from the labor force and eligibility for many special programs. It is in this table that some of the effects of the University of New Hampshire show up. Durham, with a total population similar to Exeter and Hampton, shows a disproportionate number of individuals in the "school" and "child bearing" categories. This is due to the large number of young students present at the university. Portsmouth and Newington also have institutional populations. In these cases, however, it is impossible to pick out the skewed population categories as the Pease people are distributed throughout the classifications.

Table II shows the nativity of residents of the planning area. About one half of the population was born in New Hampshire. It is not possible to say what percentages of these were born in the coastal area. It certainly may be said that over half of the 1970 population are migrants to the planning area.

Table III shows the family status of people in the planning area. As the census did not measure this directly this table was modified from one concerned with women and employment. It shows the family organization as expressed by the marital status of women. Also included is data on the presence of children. This tables shows more dramatically than table one the influence of the University of New Hampshire on Durham. The class of single women with no children under 18 is much higher than would be expected in a population of that size. This is due to the single female students.

Table IV shows the eduction of people 25 years old or older. These are the employment years. The Coastal Zone Planning Area has a very high standard of education. Even so there is a surprisingly large number of people without any high school education at all.

Tables V - VIII shows the economic condition of the area in 1970. This information has changed the most significantly in the last five years. However, this is the only compleation which is avilable in which it is possible to identify the Coastal Zone Planning Area communities. For this reason the data are included in this profile. More recent data on an area larger than the Coastal Zone Planning Area is discussed in the Economic Base report.

TABLE I

Age Sex Composition of Coastal Zone Populations
(1970 Census)

	Pre School 5 & under		School 6-19		Child Bearing 20-44		Working 45-64		Retired 65+	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Dover	1187	1172	2879	2949	3255	3192	2027	2191	841	1353
Durham*	218	215	1792	1768	2049	1841	349	328	96	167
Exeter	519	454	1182	1117	1241	1371	891	992	441	666
Greenland	146	129	248	232	260	326	181	152	53	57
Hampton	577	592	1021	1085	1223	1306	672	735	340	460
Hampton Falls	554	96	188	137	188	169	131	117	50	99
Madbury	4	32	79	114	114	116	71	66	30	36
New Castle	19	37	96	89	253	124	90	108	44	29
Newfields	61	52	161	136	132	134	62	76	11	37
Newington*	23	23	43	84	49	48	61	66	16	15
Newmarket	174	167	430	410	578	563	343	337	148	206
North Hampton	115	183	488	474	463	525	326	318	121	166
Portsmouth*	1430	1447	3654	3364	5152	4194	2116	2364	913	1554
Rollinsford	95	114	291	239	344	393	230	263	38	70
Rye	192	171	546	536	638	628	469	490	167	246
Seabrook	208	173	345	259	432	451	318	343	107	143
Stratham	56	88	232	227	260	213	127	160	62	85
Total	5578	5145	13675	13220	16631	15644	8464	9106	3478	5391

* Population figures distorted by the enumeration of large institutional populations.

Source: U.S. Census 1970

TABLE II

	Born In New Hampshire	Born In U.S. not N.H.	Foreign Born	No Answer	Total Population
Dover	12569	6242	234	1085	20130
Durham	3145	4691	128	632	8596
Exeter	4653	3335	66	487	8541
Greenland	826	840	41	36	1743
Hampton	2577	4662	97	430	7766
Hampton Falls	571	582	0	58	1211
Madbury	410	273	4	12	699
New Castle	318	516	17	23	874
Newfields	399	310	0	135	844
Newington	204	155	0	63	422
Newmarket	2120	934	0	142	3196
North Hampton	1165	1826	31	158	3180
Portsmouth	9861	13088	615	1495	25059
Rollinsford	1221	531	5	253	2010
Rye	1717	1979	57	159	3912
Seabrook	1346	1409	0	60	2815
Stratham	674	755	9	30	1468
Total	43776	42128	1304	5258	92466
Percent of Total	47.3	45.6	1.4	5.7	100

Source: U.S. Census 1970

TABLE III

Family Status in Coastal Zone Planning Area
Women 16 Years Old and Over by Marital Status and Children

	Married, Husband Present		Separated, Divorced Never Married, Widowed	
	Children Under 18	No Children Under 18	Children Under 18	No Children Under 18
Dover	2598	1754	320	2958
Durham	573	406	46	2681
Exeter	1105	901	172	1118
Greenland	249	163	33	146
Hampton	1143	702	106	830
Hampton Falls	168	83	19	139
Madbury	87	71	9	100
New Castle	102	68	14	91
Newfields	121	44	11	111
Newington	43	62	0	35
Newmarket	390	380	49	392
North Hampton	442	308	55	304
Portsmouth	3236	2333	431	2822
Rollinsford	291	229	38	220
Rye	540	457	52	464
Seabrook	391	304	46	270
Stratham	123	89	11	101
Total	11602	8354	1412	12782

Source: U.S. Census 1970

TABLE IV

Education of the Coastal Zone Planning Area Population
(Persons 25 or older)

Years of School Completed	Male	Female	Total
None	178	188	366
1-4	226	206	432
5-6	510	541	1051
7	629	566	1195
8	2650	2824	5474
9-11	3687	4256	7943
12	8093	10122	18215
13-15	2615	3988	6603
16	2344	2144	4488
17 or more	1980	772	3752
Total	22912	25607	48519
% H.S. Diploma	35.3	39.5	37.5
% Some College	11.4	15.6	13.6
% College Diploma	10.2	8.4	9.25
% Graduate School	8.6	3.0	5.7

Source: U.S. Census 1970

TABLE V

Employed Individuals 14 Years Old and Over
By Industry Coastal Zone Planning Area

	Male	Female	Total	Percent
Agriculture and Fishing	482	96	578	1.62
Mining	16	5	21	.06
Construction	1646	107	1753	4.90
MFG Durable	4721	1551	6272	17.53
MFG Nondurable	2054	1971	4025	11.25
Transportation	1076	438	1514	4.23
Wholsale/Retail	3774	2868	6642	18.56
Finance, Ins., Real Estate	558	599	1157	3.23
Business and Repair	402	90	482	1.37
Personal Services	382	1123	1505	4.21
Entertainment/Recreation	181	40	221	0.62
Professional Services	2957	4376	7333	20.49
Public Administration	1100	430	1530	4.28
Not Reported	1402	1440	2842	7.94
Total	20751	15034	35785	100.0*

Source: U.S. Census 1970

* Total exceeds 100 due to rounding

TABLE VI

Labor Force in Coastal Zone Planning Area
(No. Persons 16+ in Labor Force)

	Employed		Unemployed	
	Male	Female	Male	Female
Dover	5205	3428	196	154
Durham	1950	1405	98	116
Exeter	2208	1421	59	52
Greenland	416	253	17	3
Hampton	1871	1023	53	61
Hampton Falls	313	149	5	0
Madbury	170	93	5	23
New Castle	186	146	0	0
Newfields	191	122	0	10
Newington	104	64	0	0
Newmarket	811	567	64	45
North Hampton	817	412	31	5
Portsmouth	4542	3271	196	107
Rollinsford	593	461	0	10
Rye	975	574	25	12
Seabrook	716	419	30	24
Stratham	374	198	6	12
Total	21442	14006	785	634

Unemployment rates: Male = 3.53%
Female = 4.33%
Total = 3.85%

Source: U.S. Census 1970

TABLE VII

Income of Persons Over 14 by Type and Sex 1970

	Male	Female	Total
Wage and Salary	177,338,100	53,254,350	230,592,450
Non Farm Self Employed	19,620,750	1,854,700	21,475,450
Farm Self Employed	992,550	13,000	1,005,550
Social Security or R.R.	4,262,150	4,889,200	9,151,350
Public Assistance	1,018,700	897,050	1,915,750
All Other	14,434,500	9,058,900	23,493,400
TOTAL	217,666,750	69,967,200	287,633,950

Source: U.S. Census 1970

Table VIII

Poverty Level

	Number of Individuals in Families With Income Below Poverty Level	Total Population	% Poor
Dover	1149	21406	5.46
Durham	225	8873	2.54
Exeter	580	8874	6.54
Greenland	73	1786	4.09
Hampton	449	8011	5.60
Hampton Falls	56	1729	3.24
Madbury	24	662	3.63
New Castle	32	889	3.60
Newfields	27	862	3.13
Newington	48	428	11.21
Newmarket	233	3356	6.94
North Hampton	198	3179	6.23
Portsmouth	3118	26188	8.09
Rollinsford	121	2077	5.83
Rye	237	4083	5.80
Seabrook	170	2779	6.12
Stratham	152	1510	10.07
Total	5892	96332	6.12

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SOCIOECONOMIC PROFILE OF

USER/S OF COASTAL RECREATION FACILITIES

I. <u>Introduction</u>: In July of 1974, the Strafford Rockingham Council conducted a mail survey of attitudes of the regional residents towards the recreation opportunities in the region. The survey forms are attached as Appendix A of this report. The surveys were mailed to 2,000 households in the region and 323 forms were returned in time to be included in the analysis.

In general, the results showed that there is a wide variety of recreation opportunities within the region and that people do take advantage of them. There is, however, some dissatisfaction with these opportunities. Most respondents to question 2, measuring satisfaction with recreation opportunities, indicated that while they were satisfied, desired recreation facilities were not always available.

The rest of this section is an explanation of the survey technique and exhibits of the results.

II. <u>Survey Technique</u>

The survey was mailed randomly to 2,000 households within the region. The addresses were chosen from the telephone book. The total mailing size of 2,000 was chosen arbitrarily as the largest mailing that could be done economically. The number of questionaires sent to each municipality was based upon the ratio of that municipality's population to the total regional population. (The population figures used were the <u>1973 Estimates of Population</u> prepared by the New Hampshire Office of Comprehensive Planning, July, 1973). For example, Atkinson's population was 1.4 per cent of the regional total so 28 questionaires were sent to households in that community. The addresses were chosen from the telephone book in a way that distributed the households over the entire telephone using population of the municipality.

This sampling method was not perfect. By using the telephone book those people who did not have telephones were automatically excluded, thus biasing the sample to those people with income enough to afford a telephone. This was not considered a serious drawback, for two reasons. First, the use of a telephone is no longer considered a luxury but a necessity. Thus there are not many households which did not have a chance to be in the sample. Second, the other group of people who would be excluded were those with unlisted numbers. This group was considered to be quite small and thus was expected to have little impact on the results. Both of these considerations, however, must be kept in mind as minor limiting assumptions on the results.

III. Characteristics of the Population

Before considering the results of the survey and their implications on recreation planning, it is necessary to look at the characteristics of the population responding. In the first place the age/sex characteristics of the respondents were much different than the total regional population. The respondents were mainly young and middle aged males: 55% between the ages of twenty-five and forty-four and 75% male. While the regional population, using the 1970 census figures, is only 50% male and 24% aged twenty-five to forty-four, this skewing is likely due to heads of households being listed in the telephone book and subsequently filling out the form.

Table I shows a comparison between the total population of the region and the sample in education level completed. It can be readily seen that the respondents to the survey are a much better educated group than the general population. Whether this means that better educated people do more recreation, (because they have higher incomes and more leisure) or that they are more willing to respond to questionaires of this nature, cannot be positively determined from the data.

However, there is some evidence that the former is the major reason for the high number of college graduates in the respondents. An attempt to cross-correlate education with a recreation activity index showed no significant difference between education levels for each level of activity. This suggests that the respondents were the people most interested in recreation regardless of education.

The above described characteristics of the population must be considered in evaluating the responses of the survey. The regional population was not proportionately represented by the returned questionaire. However, it is fair to say that the differences are not the result of the sampling method and thus have significance for recreation planning for whatever the reason. The better educated (thus presumably higher paid) people, because they are more vocal and have more leisure to engage in recreation, will have more impact upon recreation facilities in the region.

TABLE I.

Comparison of Sample and Population: Education

Years of School Completed	Sample (Total Size 317)		Population* (94108)	
	%	Number	%	Number
8	2.5	8	7	6233
9-11	2.5	8	10	9021
12	14.8	47	20	19,151
1-3 College	20.5	65	7	6932
4 College	24.0	76	4	3305
5+ College	21.5	68	1	1152

* From 1970 Census

IV. Data

The survey attempted to measure those activities which were most often done and, the places where the activities took place. In addition, questions were asked about the respondents' satisfaction with recreational opportunities in the region and an open ended question was asked requesting the respondents' opinion of what local officials could do to improve local recreational opportunities. The remaining questions were demographic in nature so that a profile of the respondents could be constructed.

Because of the large number of activities and places considered it would not be practical to discuss each activity individually here. Table II shows the activities ranked by the number of times it was picked as either a frequent or occasional activity. Surprisingly, even after the gas shortages this winter, driving for pleasure was the most common activity. Predictably, swimming was very high on the list. A new entry, though expected, was bicycling, indicating that recreation planners should be working on bicycle facilities, especially considering the ages of the respondents. Outdoor tennis out-polled golf though neither were very high. An interesting sidelight is that five of the ten highest ranking activities were passive pursuits such as driving or sunbathing. This is an interesting result in a survey of outdoor recreation activities which one might expect to primarily involve invigorating physical exercise.

In order to further simplify the analysis each respondent was given an activity rating. This rating was calculated from the responses to question 1. Classes of activity were designed by plotting the activity ratings on a normal curve. The five classes and the number of respondents in them are shown in Table III.

TABLE II.

Activities Ranked By Frequency
(Number of times done frequently and occasionally)

Activity	Rank*
Driving for pleasure	69.3
Freshwater swimming	67.5
Saltwater swimming	67.8
Visiting museums, zoos & historical sites	66.3
Picnicking	63.5
Bicycling	63.5
Sun bathing	62.5
Day hiking or walking for pleasure	53.3
Ice skating	51.7
Boston area activities	50.8
Craft & art fairs, antique shows, auctions	48.6
Freshwater fishing	48.3
Pool swimming	44.3
Nature observation (tide pool, marshes, forest)	44.0
Motor boating	43.0
Live ball and hockey games	42.7
Saltwater fishing	42.1
Tent camping	35.9
Sledding and tobagganing	34.1
Bird-watching	33.7
Outdoor tennis	32.2
Golf	30.3
Canoeing	29.5
Skiing (downhill & cross country)	28.5
Farm animal shows	28.0
Outdoor concerts & plays	27.9
Hunting	26.0
Baseball	23.8

Activity	Rank*
Water skiing	23.5
Sailing	22.6
Basketball	21.1
Backpacking	21.0
Target shooting (rifle, traps, archery)	20.7
Miniature golf	20.1
Jogging, track	19.2
Vehicle camping	18.6
Horse shows	18.0
Badmitton	14.9
Snow mobiling	14.9
Horseback riding	14.6
Snow-shoeing	13.9
Volleyball	13.6
Hockey	13.6
Motorcycling	13.3
Indoor tennis	10.8
Flying	9.3
Roller skating	9.0
Dog shows	8.4
Stock and sports car racing	7.7
Scuba diving	5.6
Soccer	5.3
Surfing	2.5
Dog racing	0.6
Horse racing	0.6
Sky diving	0.6

* Percent activity was chosen as done whether frequently or occasionally.

TABLE III.

Activity Classes For Resident Recreation Survey

Class	Definition	No. Cases
Very Active	Greater than 2 standard deviations above the mean	12
Moderately Active	Between 1-2 standard and deviations above the mean	47
Active	+1 standard deviation	211
Moderately Innactive	Between 1-2 standard and deviations below the	48
Very Innactive	Greater than 2 standard deviations below mean	0

These activity indices were compared with other variables from the questionaire.

V. Results

Table II summarizes the results of Question 1 concerning the frequency of each activity. The information on where each activity took place is so voluminous that it cannot be listed here. It is available at the offices of the Council. The most important questions in the survey were number 2 and 3. Question 2 was designed to assess the respondents satisfaction with his recreation opportunities. Table IV shows the responses to that question. Table V shows the relationship between gender and recreation satisfaction. If "does not matter" and "do not go out" are considered to be negative or at least neutral indications of satisfaction, then women are markedly less satisfied with their recreational opportunities than men.

TABLE IV.

Responses to Question 2.

No. of Respondents	Response*
15	Extremely happy
81	Satisfied
154	Something missing
22	Not satisfied
9	Does not matter
28	Do not go out

* For complete text of response see the survey schedule in Appendix A.

TABLE V.

Recreation Satisfaction By Percent Male and Female

	Male	Female
Extremely happy	6.5%	0.0%
Satisfied	29.1	17.3
Something missing	47.4	58.0
Not satisfied	6.5	8.6
Does not matter	2.6	3.7
Do not go out	7.8	12.3

Table VI shows the relationship between recreation satisfaction and activity index. It is clear that the very active people are not more satisfied with their opportunities. The moderately active people are more satisfied but still find something missing. In fact, the only group that seems satisfied with it's recreational opportunities are those who do not use them often.

TABLE VI.

Activity Index and Satisfaction With Recreational Opportunity (Percent)

Satisfaction	Very Active	Moderately Active	Active	Moderately Inactive
Extremely happy	0%	8.3%	3.8%	6.8%
Satisfied	16.7	27.1	25.5	31.8
Something missing	75.0	60.4	52.4	20.5
Not satisfied	8.3	4.2	8.7	2.3
Does not matter	0.0	0.0	1.0	15.9
Do not go out	0.0	0.0	8.7	22.7
	100.0	100.0	100.0	100.0

Table VII shows the relationship between gender and activity index. There is little difference in the activity indexes for male and femalês. What difference there is shows a higher percentage of women in the more active classes then men.

TABLE VII.

Activity Index By Gender (Per cent)

	Male	Female
Very Active	3.4	4.9
Moderately Active	14.3	17.1
Active	65.5	68.3
Moderately Inactive	16.8	9.8
	100.0	100.0

TABLE VIII.

COMMENTS BY RESIDENTS CONCERNING RECREATION*

No.	
40	More tennis facilities (indoor, outdoor, lights)
20	More bike trails and facilities
15	More swimming pools (indoor, outdoor, meets, lessons)
13	More ice skating rinks (indoor, w/hockey facilities)
12	More park areas (state, w/wide variety of activities)
9	Facilities adequate
9	More camping and tenting areas
9	More fish stocking and game stocking
9	More cultural activities and exhibits
9	Limit horsepower allowed on certain bodies of water
8	More advertising of recreational activities and facilities
8	Snowmobile trails (groomed, in cities)
7	More picnic areas
7	Acquire more land for parks (state, local), beaches and other future recreational expansion (on rivers)
6	Need more facilities (indoor, outdoor, public)
6	More organized sports programs (men & women, children, year round)
6	More water pollution control
6	Insure more access to water (fresh and salt)
5	Bug control
5	More playgrounds (in every town)
5	More nature reserves and trails
5	Horse trails or bridle paths
5	More boating facilities (salt and fresh water, in Rye Harbor, docking, etc.)
5	More public open space for recreation
5	More activities for children
5	Improve recreational areas and sports facilities

* Responses to Question 3 of Resident Recreation Questionaire.

Question 3 was an open-ended question whose purpose was to let the respondents let off some steam against the local officials. Table VIII shows the most frequently given responses. Not all responses were worded exactly alike but if the sense of a response was similar to one already existing, they were counted together. The five most mentioned comments all concern capital intensive development. Two of the five are related to activities which ranked high on the activity frequency list (Table II).

VI. Conclusion

The results may be used to begin to describe the perception of recreation opportunities of the residents and those activities which should be considered in future recreation development.

One point that may be made reasonably convincingly, is, that there are differences in the opportunities for men and women. Table VII shows that there are relatively more women active in recreation than men; while Table V shows that more women are disatisfied or only moderately happy with their recreation activities. Perhaps there is some sex discrimination in recreation.

It seems clear from other data in the study that the residents of the region are not completely satisfied with their opportunities and that those people who wish to use the facilities the most are the least satisfied. It seems also that this lack of satisfaction is in the area of capital intensive development which requires a large tax money imput to satisfy. It is also important to note that the facilities most wanted are those whose primary use is by individuals and not for organized team or league sports. In Table VII, the five most common comments are requests for more facilities, only one of which might be thoughtof as primarily for organized team sports (skating rinks). In Table II, baseball, the highest ranking team recreation activity, is twenty-seventh out of fifty-seven activities. Not very high for a staple of municipal recreation programs throughout the country. It seems, from this survey at least, that we should be spending more money on non-competitive individual recreation pursuits. Unfortunately those activities cost more to provide.

W.P.

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RECREATIONAL FISHING AND BOATING

Recreational Fishing and Boating

A large portion of the marine and estuarine waters of New Hampshire is used for recreational fishing and boating activities. Intensity of use varies geographically, however, and depends on such factors as the availability of boat launching and mooring facilities, the presence of obstructions such as low water, low bridge crossings and tidal currents, and the location of finfish and shellfish resources.

For the purpose of this review, recreational fishing and boating activity will be broken down into the following parts:

1) Pleasure boating
    a. General recreational boating (cruising, sailing, water-skiing).
    b. Fishing (private craft, party boats).
2) Recreational shellfishing
3) Shore or ice-based finfishing

This study is limited to a review of existing literature on these topics, supplemented by personal observations of the Planning Commission staff and discussions with concerned state officials and local residents.

The goal of this report is to identify the geographic location and extent of the various recreational fishing and boating activities in New Hampshire's Coastal Zone. Information on numbers of participants and their expenditures have been included where available. Supplementary maps and charts relating the presence of resources such as clams, oysters, lobsters, and finfish accompany this report. (See various maps entitled Clams, Clams and Oysters, and Offshore Fishing Areas.)

Pleasure Boating

Pleasure boating in New Hampshire consists of water-borne fishing, cruising, sailing and water-skiing. Whereas the Atlantic coast of the state is heavily used for fishing and other recreational purposes, use of the Great Bay estuary is much less intense, due largely to a combination of adverse natural factors such as tides and currents. Heavy private ownership of the shoreline also contributes to the lower level of Great Bay usage.

The distinction between pleasure boating for fishing alone, and for other activities, such as cruising, sailing, and water skiing is not clear. The same facilities are used for launching, mooring, docking and servicing boats used for any of the above activities. The same geographic areas are used in many cases. The only significant difference between the activities lies in implications for the management of coastal resources. Concentration on improving the quality of water-borne recreation for non-fishing purposes depends in part on developing increased launching, mooring and docking facilities, whereas improvements in fishing activity depend more on the management of the fishery resources which may preclude the construction or expansion of new launching, mooring, or docking facilities in selected locations.

The nature and extent of pleasure boating of all types is determined in part by the availability of access to New Hampshire coastal waters. Commercial and state-owned marina facilities, boat launching ramps, and boat rental areas are located throughout the coastal zone. Numerous private anchorages exist throughout as well. The heavy concentration of facilities is along the Atlantic coast. Great Bay has comparatively fewer support facilities. A list of boating access points including marinas, mooring sites, and boat launching ramps is presented in Table 1. Private docks and moorings have not been included in the list, although these have a significant impact on boating activities as well. It is estimated by several sources that there are about as many private docking and mooring facilities in New Hampshire's coastal zone as there are commercial and public.

Evidence exists that boating activities in the seacoast region are growing rapidly and pushing the capacity of available facilities. Shaw and Henry (1974) have conducted a state-wide marina industry survey. Their findings point to increasing demand for access to coastal waters. Boats registered by the United States Coast Guard, and used on federally controlled (marine) waters of the state, numbered 7,621 in 1972. Inland lakes boats are not included in this figure. This represented a 43.9% increase from the 5,295 registered in 1967 and includes only craft with ten horsepower motors or greater. These vessels do not have to be registered with the state if they are only used on federally-controlled waters, though it is certain that a large number of them will be registered with the state and used on inland waters as well. No distinction is made between trailered craft and those moored or occupying slip spaces. There were 360 vessels documented with the Department of Transportation, Portsmouth, New Hampshire District in 1972. These vessels probably all exceed 30 feet in length and are confined to coastal waters.

Levels of boating activity in the seacoast may be lower than they would be if sufficient mooring and docking facilities were available. More than 80 percent of marina dealers surveyed on a statewide basis in 1974 turned away customers for summer berthing and storage spaces and almost 50 percent of the dealers surveyed ran out of winter storage areas. The situation is the same in the seacoast. With the possible exception of those who prefer to trailer their boats to the coast, there may be an untapped market of people who are deterred from buying boats and/or using them there for lack of space to keep them.

TABLE 1

Boating - Slips, Ramps, and Moorings

Name/Location	Operation	Moorings	Ramp	Slips
Seabrook				
Town of Seabrook	Municipal		double	
State of New Hampshire	State	50-60		
Eastman's Fishing Parties	Commercial		X	
Hampton				
State of New Hampshire	State	80	double	
Hampton Beach Marina	Commercial	5	X	95
Hampton River Boat Club	Private Club	70	X	
Rye				
State of New Hampshire	State	135	X	
Gosport Harbor, Isle of Shoals	State	15-20		
Portsmouth				
Pierce Island	Municipal		X	
Prescott Park (short-term dock)	Municipal			
Mike's Marina	Commercial	6	X	75
Portsmouth Yacht Club	Private Club	15		30
Newington				
Town of Newington	Municipal		X	
Unimproved Launch Site	State		X	
Great Bay Marina	Commercial	40	X	72

Table 1 (cont.)

Name/Location	Operation	Moorings	Ramp	Slips
Greenland				
Unknown	Commercial		X	
Town of Greenland	Municipal		X	
State of New Hampshire	State		X	
Unknown	Commercial		X	
Stratham				
Chapman's Landing	Commercial	15	X	
Newmarket				
Gallant's	Commercial	#unknown	X	
Town of Newmarket	Municipal		X	
Durham				
Adam's Point	State		X	
Town of Durham	Municipal		X	
Dover				
Hilton State Park	State		X	
Mike's Bait Shop	Commercial		X	
Ben's Marina	Commercial		X	40
George's Marina	Commercial			15-20

General Recreational Boating
Great Bay, Little Bay

Information on the location and extent of generalized recreational boating activities (sailing, cruising, water-skiing) has been obtained for Great Bay from the studies by Nevers and Olson (1968) and Stevenson, et.al. (1974), supplemented by personal knowledge of the Commission staff. Very little information is available on coastal activities, though the National Marine Fisheries Service has just released some data on number of participants by activity (NMFS, 1975).

Nevers and Olson (1968) reported on recreational use of the Adams Point Wildlife Management Area from July of 1967 through July of 1968. Some of their findings are useful in developing an understanding of the nature of recreational boating in Great and Little Bays. They found, for example, that the large portion of boats launched at the Adams Point ramp were engaged primarily in oystering, clamming, hunting, and fishing (see Table 2). A smaller number of boats (about one-third) were used for combinations of the above activities with each other or with cruising, sailing, and picnicking. Only two boats of 89 surveyed were for sailing and no mention was made of water-skiing. Heaviest usage was during the fall for hunting purposes (geese and duck).

Stevenson, et.al. (1974) conducted a comprehensive survey of recreational activities of the Great Bay-Little Bay complex. Much use was made of the data reported by Nevers and Olson, but this was supplemented by personal interviews and aerial surveys of the area. Stevenson found that most boat launching occurred at either one of three commercial facilities on Great Bay or at the Hilton Park launch area, Adams Point being much less heavily used, due perhaps to more severe tidal limitations (see Table 3). In addition, in an aerial survey of the Great Bay shoreline, they reported sighting 75 private boat piers or docks and 50 private moorings (highly variable on a year-to-year

Table 2

Recreational Activities of 89 Parties Launching Boats at Adams Point, 1967-1968.

Activity	# Boats Launched	# Parties Interviewed	% of Total
Oystering	43	48	90
Hunting	16	58	28
Fishing	3	9	33
Sailing	1	1	---
Lobstering	1	1	---
Photography	1	1	---
Oystering - Clamming	8	9	89
Oystering - Fishing	1	1	---
Oystering - Hunting	1	1	---
Oystering - Picnicking	1	1	---
Oystering - Picnicking - Birdwatching	1	1	---
Oystering - Clamming - Picnicking - Boating	4	4	---
Fishing - Clamming	3	2	---
Fishing - Picnicking	2	1	---
Fishing - Clamming - Picnicking - Boating	1	1	---
Sailing - Picnicking	1	1	---
Swimming - Picnicking - Sightseeing - Birdwatching - Boating	1	1	---
Total	89		

Source: Nevers & Olson (1968)

Table 3

Aerial Surveys of Recreational Activity on Great and Little Bay Compared With Access From Adams Point, 1967-1968.

Date	Activity	Aerial Survey	Access from Adams Point (Number)	Access from Adams Point (Percent)
October 21, 1967	Oystering	12 boats	3 boats)	
"	Hunting	19 "	13 ")	53%
"	Other	5 "	3 ")	
December 2, 1967	None	--	--	--
January 6, 1968	Smelt fishing	230 shanties	none	--
February 18, 1968	Smelt fishing	776 shanties	none	--
April 7, 1968	Oystering	11 boats	3 boats)	23%
"	Other	2 "	0 "	
June 8, 1968	Fishing	4 boats	none	--
"	Sailing	1 "	none	--
"	Other	5 "	none	--
June 23, 1968	Fishing	1 boats	0 boats)	
"	Boating	30 "	1 ")	3%
"	Other	6 "	0 ")	
July 7, 1968	Fishing	3 boats	0 boats)	
"	Boating	32 "	0 ")	2%
"	Sailing	12 "	1 ")	

Source: Nevers & Olson (1968)

basis) as compared to the approximately 180 commercially operated slips, docks or moorings located on Great Bay. The commercial facilities were generally reported as "full to capacity during the summer months" by Stevenson.

No indication was given by Stevenson that activities undertaken by all Great Bay boaters are any different from those reported by Nevers and Olson (1968), further indicating that hunting, fishing, and clamming are the main pursuits of those boating in Great Bay during most of the year. Cruising was more prevalent in the summer. It was mentioned that water-skiing activities were largely confined to those persons having private access to the Bay. The reason for this is probably that the time period each day during which the water is deep enough for this activity is limited.

The pattern of recreational usage in the Great Bay area that emerges from these reports is that heaviest boating occurs during the summer and fall months, with cruising in the summer and fishing and hunting during the remainder of the year the primary activities. Craft used are generally small in size being limited by depth restrictions throughout the bay. No doubt the 3.5 mile distance from the mouth of the Piscataqua River to Dover Point at the head of the Great Bay-Little Bay complex serves to discourage vessels from entering the area from the ocean side. Private ownership of much of Great Bay's shoreline serves to add to the access problem.

Atlantic Coast

Information on recreational boating along New Hampshire'a Atlantic coast is not as well documented as that in Great Bay. Publicly available moorings, piers, and slips along the Atlantic coast total in excess of 800, of which approximately two-thirds are state operated or supervised (see Table 1 for a partial list). Concentrations are located in Hampton-Seabrook, Rye Harbor, Little Harbor and Sagamore Creek, as well as the Piscataqua River. Private docking and mooring facilities may double these figures.

There are also a number of state, municipal, and commercial boat ramps available for use. (See Table 1)

No breakdown whatever is available for numbers and types of boats engaged in fishing, as opposed to cruising, sailing, or water-skiing. The concentration of cruising and sailing activity undoubtedly is higher in the nearshore marine waters than in Great Bay, due to the lack of bridge obstructions and tide and current hazards. But, like Great Bay activity, much of marine boating is geared toward fishery resources. For example, private craft are used to gain access to some otherwise inaccessible clam flats in the Hampton-Seabrook area.

Concentrations of vessels will fish the nearshore waters to distances of six miles or so, with the larger vessels headed further out for species such as bluefin tuna (see the sections on fishing for locations of heaviest activity). Some ground fishing on Jeffreys Ledge occurs as well. These activities occur primarily during the summer months (May to October). Duck and goose hunting also occurs, primarily in the Hampton-Seabrook area, and small boats are also used in this activity.

Information on either the overall numbers of participants in marine and estuarine recreational boating in New Hampshire or on the economic impact of their expenditures is unobtainable at present. The National Marine Fisheries Services, however, has just released data on the numbers of "households" engaged in such activities (one or more family members participating). Their survey showed that 17,000 households throughout New Hampshire participated in marine sailing, 42,000 in pleasure boating, and 61,000 in fin-fishing in marine waters in the months from June 1973 to June 1974. No attempt was made to determine frequency of activity nor manner of participation -- whether the activity was conducted in personally owned boats, those of friends, or rental or party-fishing craft. No detailed information on the location of their activity was given. Assuming that effects of residents of one state performing their water-borne recreation in other states cancel each other out, these numbers apparently do not seriously over-estimate levels of New Hampshire activity, especially when compared with numbers of New Hampshire boats registered with the Coast Guard in 1972 (7,621) and considering the fact that registration is not required for craft with less than ten horsepower engines.

Fishing from Private Craft or Party Boats

Sport fishing from private, rental, and commercial craft occurs throughout New Hampshire's coastal zone, being supported by the marinas, boat launching ramps, and related facilities identified in Table 1. The geographical distribution of fishing activity closely resembles the location of these support facilities, with fishing activity in Great Bay being considerably less than that along New Hampshire's Atlantic coast. Most party boat facilities, state mooring sites, and commercial docking and mooring facilities are located along the Atlantic coast and lower Piscataqua River areas. Conditions for boating are better in these areas.

No inventory of party or charter vessels running from various seacoast marinas has been made as part of this study. However, Sullivan and Sawyer (1969) reported twenty-five vessels in 1966. DRED(1970),in a promotional pamphlet, listed twenty. These vessels run primarily from Hampton Harbor and Rye Harbor and generally fish inshore for mackerel, and on Jeffrey's Ledge for haddock, cod, and pollock. Recent warm water has attracted bluefish to the region, which forces the mackerel offshore (N.H. Department of Fish & Game, 1975). There are also party or charter boats located in Portsmouth and New Castle.

Information on the location of fishing grounds comes from three sources: the New Hampshire Department of Fish and Game, the New Hampshire Commercial

Fishermen's Association, and the National Marine Fisheries Services, which has recently published a guide to recreational fishing areas of the Atlantic coast. (See also the Offshore Fishing Areas map)

In the vicinity of the Isles of Shoals, concentrations of cod, mackerel, cusk, and halibut exist. Silver hake (whiting) are caught further south. In the surf zone along the entire coast and near the Hampton Harbor entrance, striped bass are caught. A concentration of mackerel exists near the mouth of Hampton Harbor. Both striped bass and mackerel are caught in the harbor. Winter flounder are caught in the estuarine and nearshore areas.

Further offshore, concentrations of cod, cusk, pollock and silver hake (whiting) also exist, primarily on elevated areas where hard bottoms occur. Such areas as Old Scantum, New Scantum and Jeffrey's Ledge harbor concentrations of these fish. Bluefin tuna are also sought by recreational fishermen seaward of the Isles of Shoals, though they are close to being listed by the Federal government as endangered species, (N.H. Department of Fish & Game, 1975). In the Great Bay, striped bass and winter flounder are caught. One favorite spot for striped bass is in Furber Strait in the vicinity of Adams' Point (Stevenson, et.al., 1974). In the tributaries eels and smelt may be caught.

Existing information on the numbers of fishermen using the coast for fishing from commercial or private vessels and what they spend on their activity is generally spotty or outdated. Sullivan and Sawyer (1969) indicated that in 1966, May to October expenditures (by both residents and tourists) for party boat fishing ranged between \$115,000 and \$500,000 representing a total of 22,000 man-days of effort. Using 1975 dollar values, this range would be from \$187,450 to \$815,000. "Expenditure" has not been defined, but it probably includes boat fare, bait, tackle, transportation to and from the dock, and other miscellaneous items. Data came from personal interviews with fishermen and from the U.S. Army Corps of Engineers.

The New Hampshire Department of Fish and Game has drawn up estimates of expenditures of New Hampshire residents only on salt water fisheries. The figure arrived at was $3,700,000 in 1971 (New Hampshire Department of Fish and Game 1975) and represented 174,270 man-days of effort. No differentiation between shore-based and water-based fishermen was made, making difficult any comparison with earlier data. Also, the estimate included fixed (one-time) costs for gear, which were not included in the estimates by Sullivan and Sawyer. The figures shown also represents a 12-month effort, as opposed to the five-month party-boat season which was investigated by Sullivan and Sawyer.

Recreational Shellfishing

Recreational shellfishing consists largely of the digging of soft-shelled clams (*Mya arenaria*). This activity is most prevalent in the Hampton-Seabrook estuary. Oysters are also taken for recreational purposes in the Great Bay and its tributaries, (See Clams and Oysters maps which accompany this report).

The New Hampshire Department of Fish and Game reports that in 1973 there were 12,686 adult clamming licenses issued, at a cost to users of $50,860.50. Almost 1200 junior (12 years old or younger) clam licenses were issued at a cost of $2,391.00 and 17 junior oyster licenses ($35.00). There were also 507 free clam and oyster licenses issued to persons over 70 years old. These licenses are for recreational purposes only. No commercial shellfishing is allowed in New Hampshire.

The numbers of persons engaged in clamming is expected to rise. The New Hampshire Department of Fish and Game estimates 15,000 license holders of all types for the 1975-1980 period, growing ultimately to 25,000 people around the turn of the century (1974 data indicates this estimate will be conservative as 15,000 license-holders are listed). Interestingly enough, total harvest is not expected to increase, due to the heavy pressure already being exerted on the clam beds. Recent studies in New Hampshire have indicated a drop in total clam population, especially in the heavily harvested Hampton-Seabrook area. The New Hampshire Department of Fish and Game is aware of this and is considering options for reducing clamming pressure. The Hampton-Seabrook flats have already been restricted to usage on Fridays, Saturdays, and Sundays only.

Oystering activity is limited somewhat by the restricted access to Great Bay and also the intense effort needed to tong oysters, and is not expencted to increase as rapidly as clamming. The New Hampshire Department of Fish and Game estimates no appreciable increase in intensity of effort until at least 1980. At that point, they estimate that improved water quality will increase the attractiveness of Great Bay oysters. From 1980-1990 the Fish and Game Department estimate 2500 license-holders. These figures could double in the 1990-2020 period, thus requiring some limitations to be placed on the allowable catch.

Estimates of the dollar values of shellfishing are scattered. The New Hampshire Department of Fish and Game referenced a 1971 study showing that 13,273 license holders did 111,834 man-days of clamming and spent an estimated $1,212,660 on the activity. This expenditure included fixed expenses for gear and variable costs associated with trips to the clam flats. Estimated harvest (assuming each person obtained 10 quarts of clams per trip) was more than 100,000 pecks of clams. Sullivan and Sawyer (1969) have presented data for clam fisheries only which estimated the effort and expenditures for 1966. Sixty-six thousand man-days of effort were estimated for 12,200 licenses, based on interview data and head counts at the Hampton-Seabrook flats. Total expenditures, both for "newcomers," which would include fixed and variable costs, and for old-timers, which would include variable costs only, totalled

$176,850 in 1966. This would be equivalent to $288,266 in 1975 dollars. An interesting sidelight to this research was the indication that up to 78 percent of the clammers were residents of New Hampshire living outside the secondary coastal zone.

An additional way the economic value of recreational shellfishing might be estimated, other than by expenditure, is by obtaining the market value of the harvested resource. Sullivan and Sawyer feel that this method is the most economically realistic. The 1971 catch of 100,000 pecks of clams and 7000 bushels of oysters was thus worth $600,000 and $49,000 respectively (1971 dollars). In 1975, this same catch would have been worth $978,000 and $79,870 respectively. There were 15,060 clam license-holders throughout the state in 1974. Assuming each license-holder made eight trips and obtained a ten-quart daily limit, clams harvested in 1974 were valued at $1,144,560. Oyster fisheries were valued at $59,520, assuming 1240 license holders, six days of oystering per year, and each taking the one-bushel daily limit.

The maps (Clams and Oysters) which detail clamming and oystering areas in the New Hampshire coastal zone, are self explanatory.

Several studies provide an idea of the quantity of shellfish resources as well as locations. Ayer (1970) provides detailed information on both the location and size of the oyster population in Great Bay. He estimated that 37,800 bushels of oysters existed in Great Bay in 1968. This is based on an estimated 50 acres of oyster beds at a density of 756 bushels per acre. The New Hampshire Department of Fish and Game believes this oyster population could reasonably sustain additional harvesting pressure without long-term damage to the population.

Clam-flat populations have been studied several times in recent years. Ayer (1968) published a comprehensive report on soft-shell clams in Hampton-Seabrook Harbor. This has since been augmented by studies conducted for the Public Service Company of New Hampshire by Normandeau Associates

(Normandeau 1974). No detailed published information on clam population in the Great Bay estuary, however, has been found.

Ayer (1968) reported on eight flats in the Hampton-Seabrook estuary. 168 acres of productive flats were surveyed and, based on average-density-per-acre calculations, estimates of production in bushels were made. The total estimate was 24,000 bushels of legal-sized clams on the 168 acres. The density ranged from five to 300 bushels per acre (mean 120 bushels).

Work accomplished by Normandeau Associates since the completion of the Ayer report shows a decrease in clam production in the Hampton-Seabrook estuary. Five of the same flats, (totalling 154 acres) were surveyed for population. These are shown in Figure 1. Results of the Normandeau investigations, published in 1974, reveal a significant decline in clam population from the levels earlier reported by Ayer for the same flats. Methods of sampling appeared to vary from that used by Ayer only in details of choosing sample locations, so the results are probably comparable in their accuracy. We have included a reprint of a diagram from the Normandeau report showing bushel-per-acre comparisons in legal-sized clams between the various studies accomplished by Normandeau and Fish and Game data (see Figure 2). These results indicate a definite drop in the density of harvestable clams since Ayer's data was first reported in 1968.

Shore or Ice-Based Finfishing

Information on the shore-based sport fishery is drawn from a number of sources. Sullivan and Sawyer (1969) detail the economic impact of summer salt-water sports fisheries in the New Hampshire and Maine seacoast region. Their report discusses, in addition to the shore-based fishery, the economics of party-boat and clam fisheries noted earlier. Stevenson, et.al. (1974) also gave details on the shore-based fishery. Additionally, ecological studies by Normandeau Associates, Inc., conducted in the Hampton-

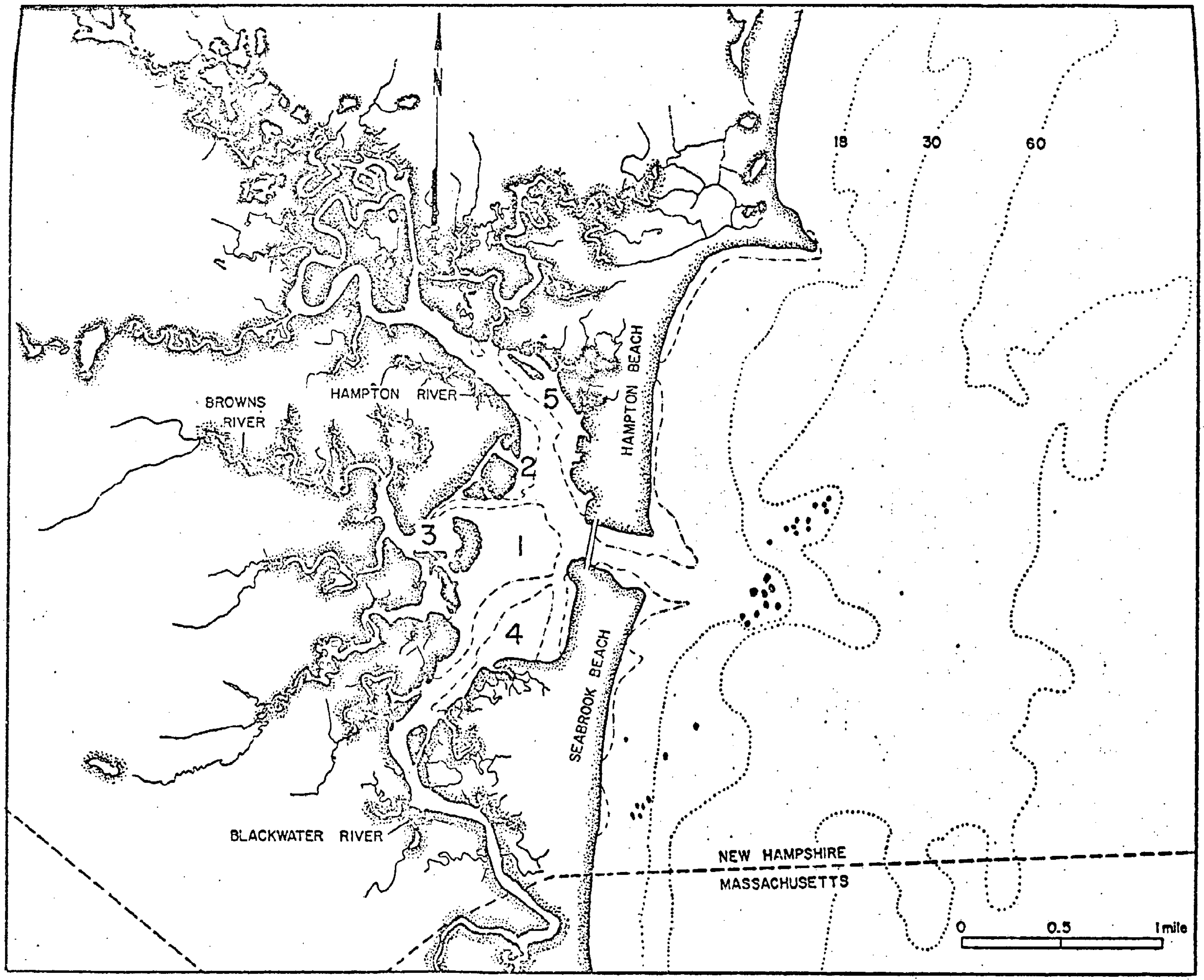

Figure 1. Clam Flat Locations. Source: Normandeau Associates (1974)

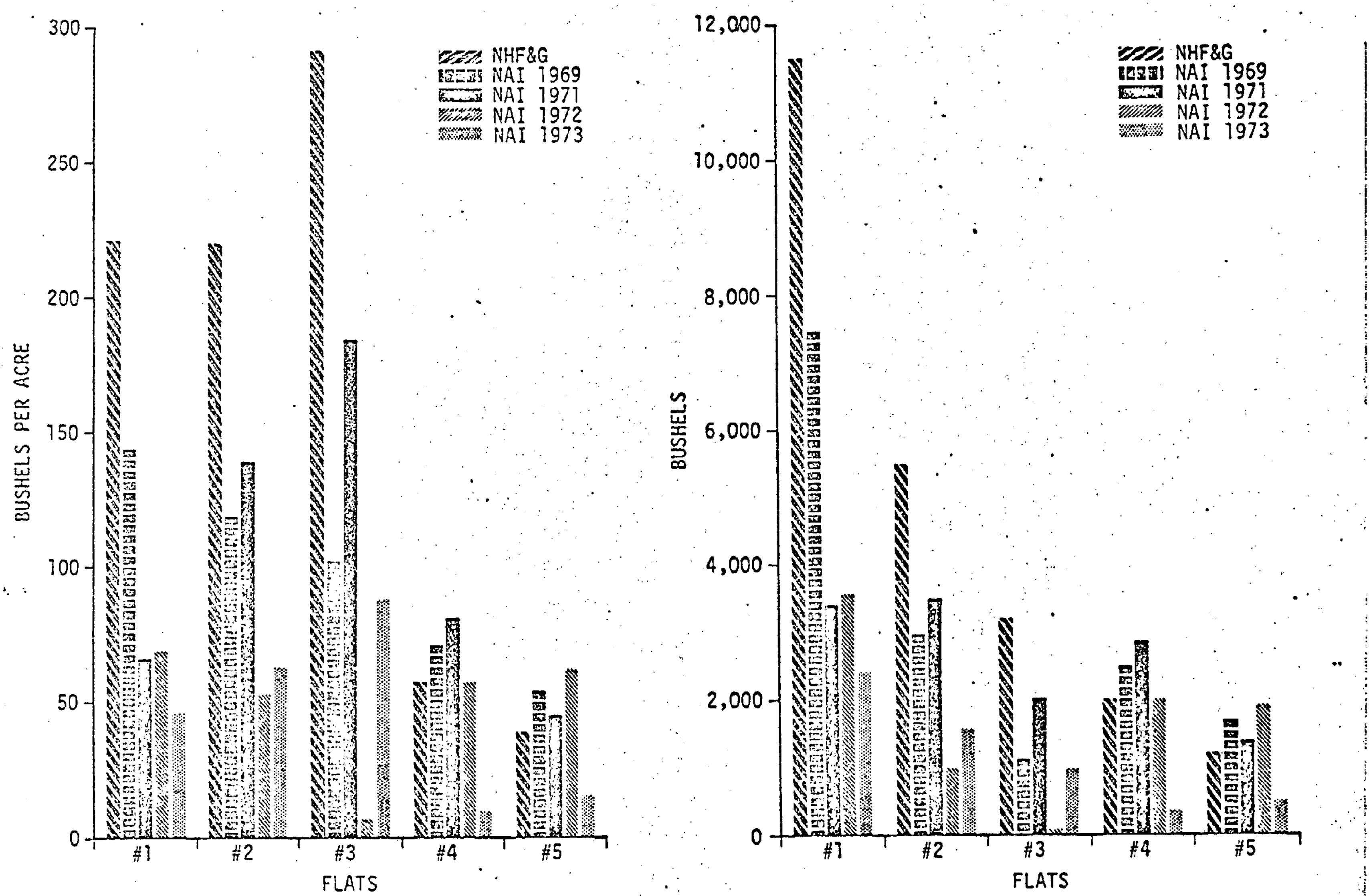

Figure 2. Recent estimates of soft shell clam productivity (adults over 50 mm or 2 inches) on five flats in Hampton-Seabrook estuary (NHF&G data from Ayer, 1968).

Seabrook Estuary and the Piscataqua River for the Public Service Company, deal in part with types of recreational fishing activity in those areas. Various publications of state agencies such as the New Hampshire Department of Fish and Game (N.H. Fish and Game, 1975) and the Department of Resources and Economic Development (DRED, 1970) which survey recreational fishing and boating have also been consulted. Several of these sources contain information as to location of shoreside activities. This information is summarized subject to later verification (Table 4).

A number of species are fished for from shore locations or through the ice in the New Hampshire coastal zone. Among these are striped bass, mackerel, pollock, cunner, winter flounder, and smelt. Normandeau Associates (1974) conducted a "creel census" of sport fishermen in the vicinity of Hampton Harbor in the summer of 1973. They reported that harbor fishing effort was principally for winter flounder, striped bass, and mackerel. Other sources would add pollock to this list. Sullivan and Sawyer (1969) reported that in coastal areas (Hampton-Seabrook, Rye Harbor, Piscataqua River in the vicinity of Portsmouth), "any" species of fish were being sought, we take this to mean striped bass, winter flounder, pollock, mackerel, plus lesser amounts of other species. Great Bay fishing is much more species-limited. The principal sport fish in Great Bay are the striped bass and winter flounder. Smelt are also caught, both by line through the ice in winter and by dip net from various tributaries throughout the rest of the year. Some angling for smelt also occurs in these areas and in the Piscataqua River near Portsmouth.

In addition to the shore-based fishing locations listed in Table 2, used primarily during the summer and at various times of the day according to tides, the upper reaches of Great Bay are used for through-the-ice smelt fishing. Intensity of activity is heavily dependent upon quality of ice cover at any given time. There is a closed season on salt-water smelt

TABLE 4

Principal Shore-Based Fishing Locations

A. Seabrook Harbor. West of Route 1-A. Sandy beach area provides fishing for winter flounder, striped bass, mackerel, and pollock, as well as various other species. Bait, tackle facilities nearby.

B. Hampton-Seabrook Bridge, Route 1-A. Reportedly fished heavily by Hampton Beach summer residents. Founder, pollock, some mackerel and striped bass are caught.

C. Blackwater Bridge, Route 86, Seabrook, and both sides of the Blackwater River. Primarily fished for winter flounder.

D. East side of Hampton-Seabrook Bridge and North Jetty, Hampton Beach State Park, Hampton. (Jetty designed with 1,000-foot walkway for sport fishing.) Heavily utilized. Flounder, pollock, some mackerel and striped bass.

E. Jetty at Rye Harbor State Park. Pollock, flounder. Frequently fished (more than twelve persons per day). Admission fee.

F. Bridge on Route 1-B, Portsmouth to Goat Island. Flounder, occasional striped bass on early morning incoming tides.

G. Bridge to Pierce's Island, Portsmouth. Infrequently utilized.

H. Prescott Park, Portsmouth. Small flounder, small school pollock, cunner, and smelt. Heavily utilized. Popular due to immediate availability of parking and proximity to downtown Portsmouth.

I. Memorial Bridge (Badgers Island to Kittery). Fished infrequently.

J. General Sullivan Bridge. Route 4. Newington to Dover Point. Fishing on southbound side of bridge only. Excellent fishing for striped bass. Heavily fished (20-per-day average).

K. Bellamy Bridge (Scammel Bridge), Route 4, Dover Point. Fishing on Southbound side of bridge only. Good location for striped bass. Also fished for flounders. Very popular.

L. Eliot Bridge, Salmon Falls River, Dover. Fished moderately by local sportsmen for striped bass and eels with fair success.

M. Stratham Bridge, Route 108, Stratham-Newfields line. Infrequently utilized in the summer.

NOTE: List covers effort during summer months only.

Sources: Sullivan and Sawyer (1969)
Department Resources and Economic Development (1970)

from April 15 to July 1, during the spring spawning run. Netting of smelt occurs in the Oyster, Squamscot, Bellamy, and Lamprey rivers. This fishery is for both commercial and recreational purposes.

Sullivan and Sawyer (1969) have conducted economic analyses pertaining to shore-based recreational fishing throughout the seacoast region of New Hampshire. Data was gathered during the months of July and August, 1966. It was estimated that some 5500 fisherman-days of effort were expended for shore-side fishing in the Great Bay and on the Atlantic coast of New Hampshire. Total expenditures were estimated to be $19,500 (1966 dollars), or $31,785 today. No other estimates of the location and extent of shore-based fishing have been made in recent years. However, the New Hampshire Department of Fish and Game obtained data in 1971 on the total amount spent annually for all recreational salt-water fishing efforts in New Hampshire. Results of that survey were related in an earlier section of this report.

SUMMARY

A large portion of the marine and estuarine waters of the New Hampshire coastal zone are used for recreational fishing and boating. These activities are comprised of pleasure boating of all types, recreational shellfishing, and shore or ice-based finfishing. Heaviest participation occurs during the months from May to October. Hunting and oystering activities extend this period somewhat, however.

Intensity of use varies geographically. Such factors as fast currents, extremely shallow waters and exposed flats at low tide, and a high proportion of private shoreline ownership tend to keep use of Great Bay and Little Bay at relatively low levels. Water quality becomes a problem up the tributaries. It will take extensive removal of physical obstructions (such as low bridges) and significant dredging activities to improve Great Bay to a point where it can be extensively used for boating activity. Water quality is being constantly monitored by the Water Supply and Pollution Control Commission and a program is under way which will achieve legislated standards by 1985. There has been concern voiced, however, that there is not enough money available to achieve these goals.

Fishing and boating activities along New Hampshire's Atlantic Coast do not suffer from the same restrictions that affect Great Bay's boating activity, though both suffer from a lack of mooring and docking facilities. All of New Hampshire's state-run mooring sites are located along the coast or in the lower Piscataqua River. There are several private mooring or docking facilities as well, plus party and charter boats. Also, most of New Hampshire's clamming activity, limited by law to state residents, takes place in the Hampton-Seabrook estuary. One study indicated that up to 78 percent of those people clamming came from outside the primary and secondary coastal zones. Comparable data for other fishing and boating activities does not exist.

Much of the boating activity which takes place throughout the coastal zone is determined by the location of fishing and hunting resources. Great Bay and Little Bay are species-limited - - most people fish for striped bass, winter flounder, and smelt. Oystering is also done. The ocean-side activities are geared mainly towards striped bass, mackerel and cod, much of the activity taking place within three to six miles offshore. Hunting activity (primarily duck and geese) takes place in the fall and winter, and is concentrated in Great Bay, but occurs along the Atlantic Coast as well.

Information on numbers of participants and their expenditures in these activities is spotty. Little concrete data is available on general recreational boating (sailing, cruising, water-skiing). Various counts and estimations of public, commercial, and private boat-docking and mooring facilities lead to the approximation of more than 1000 such spaces in the seacoast region, approximately two-thirds of them along New Hampshire's Atlantic Coast and the lower Piscataqua River. The U.S. Coast Guard registered some 7621 craft (greater than ten horsepower) for use in Federally controlled (navigable) waterways, which includes all marine and estuarine coastal waters. (Inland lakes are excluded from this count.) Also, the National Marine Fisheries Service has estimated that one or more members in 17,000 households throughout New Hampshire participated in marine sailing, 42,000 in pleasure boating, and 61,000 in fin-fishing in the year from June, 1973, to June, 1974. Shoreside fishing activity was included in the survey. Activities were not confined to New Hampshire waters, however. In 1973 there were also 15,000 license-holders engaging in clamming and oystering. The numbers from all sources seem compatible - at least in rough form. We are talking, then, about tens of thousands of participants annually in water-borne recreation and sport fishing in New Hampshire. Man-days of participation in these activities are in the hundreds of thousands, and perhaps higher. This is a large-scale activity.

Information on expenditures is confined to that from reports which are, at a minimum, four years old. A survey conducted in 1966 revealed that from \$100,000 to \$500,000 was spent by all participants on party boat fishing alone (\$163,000 to \$815,000 in 1975 dollars) in the May - October period. In 1971, the New Hampshire Department of Fish and Game reported \$3,700,000 spent annually for salt-water fishing of all types by New Hampshire residents only. This is equivalent to \$4,847,000 today. Shellfishing participants were reported by fish and game as spending an estimated \$1,200,000 on their activities during the same period. This is equivalent to \$1,572,000 today, and consisted of one-time expenses for gear and variable expenses associated with individual clamming trips.

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W.P.

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OCEAN-BORNE SHIPPING

OCEAN-BORNE SHIPPING

Ocean-borne shipping into Portsmouth Harbor and the Piscataqua River presently appears to be somewhat less than capacity. Cargo traffic is primarily composed of tankers and barges carrying petroleum products, though a significant amount of dry bulk and general cargo is handled as well. In addition to pier space on the Piscataqua River, this traffic requires the use of offshore waiting areas and shipping lanes, neither of which are formally specified. These areas are shown on the Marine Uses may accompanying this report.

The port itself has a limiting draft of 35 feet. It is open throughout the year. Along the south banks of the Piscataqua River are a number of wharves which handle such commodities as bulk salt and gypsum, general dry cargo, cable and various petroleum products. There are no similar facilities on the Maine side. No bunkering facilities exist in the harbor except for limited capability at the Portsmouth Naval Shipyard, and major repairs have to be made in Boston, though light machine capabilities exist in Portsmouth. Provisions and marine supplies are available.

Data from the U.S. Coprs of Engineers indicate that in 1973 Portsmouth Harbor handled approximately 2,300,000 short tons of cargo of all types. Of this cargo, approximately 2,084,000 short tons was petroleum products, with distillate and residual fuels comprising the bulk of this. Dry bulk and general cargo totalled approximately 221,000 short tons. Virtually all of this (about 200,000 tons) was comprised of bulk limestone and salt shipments. See Table 1 for a more detailed analysis.

The Corps of Engineers also listed vessel movements through the port. Their records show that in 1973, 366 vessels of all types entered the harbor (See Table 1).

Of these, 188 carried petroleum products, 76 were tugboats or towboats, and the remainder (102) were dry cargo/passenger vessels -- only 27 of which were vessels heading to industrial facilities along the Piscataqua. The remainder of these are likely to have been fishing boats or other small vessels, though no statistics are available to substantiate this.

SRRC staff has obtained from the Port Authority 1972 and 1973 records of shipping to the various industrial facilities along the Piscataqua River. The data is shown in Tables 2 and 3 and was previously published in an earlier report by the Southeastern New Hampshire Regional Planning Commission.
What these data show is that industrial traffic entering Portsmouth Harbor stayed about the same over the two year period (about 175 ships) with a drop in dry bulk/ general cargo vessels being counteracted by an increase in the number of vessels carrying petroleum products. The figures for numbers of petroleum vessels and amounts of cargo differ somewhat from Corps data -- the number of vessels reported being somewhat lower, the cargo carried somewhat higher. The difference in data are likely due to reporting methods and are not considered significant for the purposes of this report.

Two charts have been included showing traffic in the harbor by month for the years 1972 and 1973. (Figures 1 and 2). They reveal a highly fluctuating rate of port usage on a month to month basis. The general trend, however, is to have more vessels, chiefly tankers, arriving during the period from August until January, with a fall-off during the late winter to early summer period.

Investigation of available data reveals that cargo carried through Portsmouth Harbor rose from about 1,455,000 short-tons in 1962 to the 1973 figure of 2,314,000 short-tons (See Figure 3). Petroleum products accounted for over 90 percent of this increase. In 1962, petroleum accounted for 82 percent (about 1,160,000

1973

TABLE 1

PORTSMOUTH HARBOR, N. H.

SECTION INCLUDED: FROM MOUTH TO NEWINGTON, N. H., ON THE WEST BANK OF THE PISCATAQUA RIVER. CONTROLLING DEPTH: 35.0 FEET IN THE 35-FOOT CHANNEL (1970). PROJECT DEPTH: 35 FEET AT MEAN LOW WATER OVER LEDGES.

COMPARATIVE STATEMENT OF TRAFFIC

YEAR	TONS	PASSENGERS	YEAR	TONS	PASSENGERS
1964	1,460,325		1969	1,795,915	4,080
1965	1,654,508		1970	2,187,303	268
1966	1,740,119	64	1971	2,174,425	
1967	1,824,537	400	1972	2,188,071	
1968	1,833,373	556	1973	2,314,900	

FREIGHT TRAFFIC, 1973

(SHORT TONS)

COMMODITY	TOTAL	FOREIGN		DOMESTIC		
				COASTWISE		INTERNAL
		IMPORTS	EXPORTS	RECEIPTS	SHIPMENTS	RECEIPTS
TOTAL	2,314,900	1,294,195	13,453	944,262	62,984	6'
0841 CRUDE RUBBER AND ALLIED GUMS	582	582				
0911 FRESH FISH, EXCEPT SHELLFISH	139				136	3
0912 SHELLFISH, EXCEPT PREPARED	3					3
1411 LIMESTONE	115,706	115,706				
1491 SALT	84,277	84,277				
2011 MEAT, FRESH, CHILLED, FROZEN	483	483				
2421 LUMBER	5,408	5,408				
2431 VENEER, PLYWOOD, WORKED WOOD	128	128				
2822 SYNTHETIC RUBBER	11		11			
2911 GASOLINE	208,242			184,798	23,444	
2912 JET FUEL	78,615			65,626	12,989	
2913 KEROSENE	141,640	71,988		62,769	6,883	
2914 DISTILLATE FUEL OIL	747,137	223,209		504,996	18,932	
2915 RESIDUAL FUEL OIL	839,102	792,412		46,690		
2916 LUBRICATING OILS AND GREASES	23,358			23,358		
2991 PETROLEUM AND COAL PROD, NEC	56,025			56,025		
3316 IRON AND STEEL PLATES, SHEETS	2,766		2,766			
3511 MACHINERY, EXCEPT ELECTRICAL	618		18		600	
3611 ELECTRICAL MACH AND EQUIP	110		110			
4011 IRON AND STEEL SCRAP	10,548		10,548			
4112 COMMODITIES, NEC	2	2				

TOTAL TON-MILES, 9,449,586.

TRIPS AND DRAFTS OF VESSELS

HARBOR OR WATERWAY / DRAFT (FEET)	INBOUND: SELF PROPELLED VESSELS: PASSENGER AND DRY CARGO	TANKER	TOWBOAT OR TUGBOAT	NON-SELF PROPELLED VESSELS: DRY CARGO	TANKER	TOTAL	OUTBOUND: SELF PROPELLED VESSELS: PASSENGER AND DRY CARGO	TANKER	TOWBOAT OR TUGBOAT	NON-SELF PROPELLED VESSELS: DRY CARGO	TANKER	TOTAL
PORTSMOUTH HARBOR, N. H.												
37		4				4						
36		9				9		1				1
35		9				9						
34		15				15		1				1
33		7				7						
32	5	14				19		1				1
31	4	10				14		1				1
30	1	2				3		2				2
29	1	2				3						
28		2				2		4				4
27		2				2		2				2
26		3				3		5				5
25		5			1	6		6				6
24		4				4	3	15				18
23	2	1			2	5	1	8				9
22	4	2			1	7	4	18				22
21	2	1				3	8	7				15
20		1			1	2	3	10				13
19	3	1			1	5	3	6				9
18 AND LESS	78	49	76	2	39	244	74	48	70	2	47	241
TOTAL	100	143	76	2	45	366	96	135	70	2	47	350

Source: U.S. Army Corps of Engineers, "Waterborne Commerce of the United States."

TABLE 2

INDUSTRIAL COMMERCE IN 1972

		No. Ships	Homeport	Dead Wt. Tonnage	Cargo
1.	Atlantic Sales Corporation	16	U.S.	321,909	oil, kerosene
2.	New England Tank Industries	20	U.S.	336,536	oil, kerosene, jet fuel
3.	Sprague & Public Service Company	29	Libyia, other foreign	868,176	oil
4.	Mobil Oil	31	U.S.	707,911	gas, oil
5.	North East Petroleum	17	U.S.	170,361	oil
6.	Coleman Oil Company	6	U.S.	7,800	oil
	Total (Oil)	119		2,412,693	
7.	Simplex Corporation	17	U.S.	35,920	export cable
8.	National Gypsum	6	Libyia	105,943	gypsum
9.	Granite State	6	various foreign	133,155	salt
10.	New Hampshire Port Authority	27	various foreign	259,161	general
	Total (other industries)	56		534,179	
	Total all industries	175		2,946,872	

NOTE: Figures differ from U.S. Army Corps of Engineers data.

Source: Southeastern New Hampshire Regional Planning Commission: "Traffic: Piscataqua River-Portsmouth Harbor."

TABLE 3

INDUSTRIAL COMMERCE IN 1973

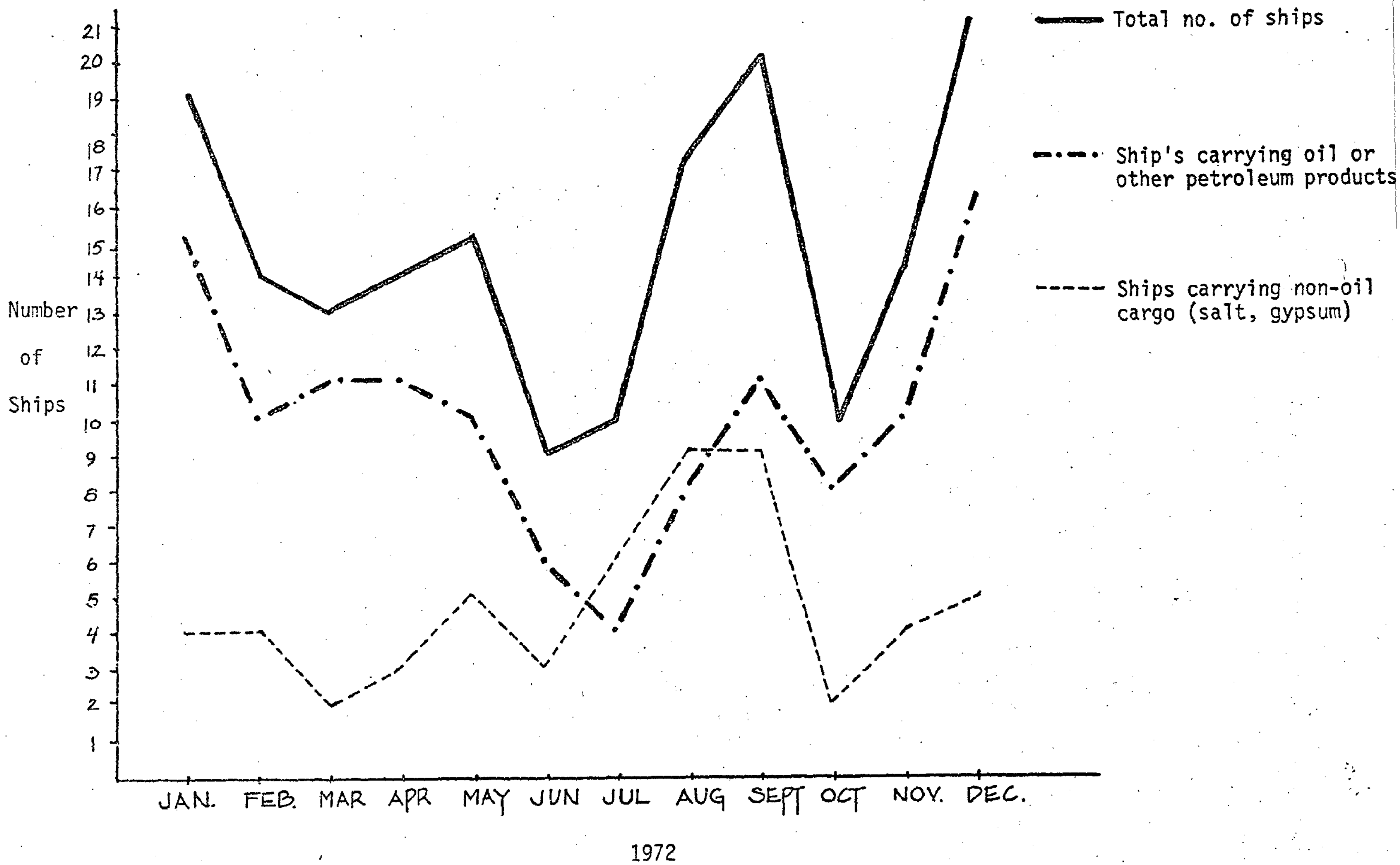
		No. Ships	Homeport	Dead Wt. Tonnage	Cargo
1.	Atlantic Sales Corporation	30	U.S.	378,907	oil
2.	New England Tank Industries	26	U.S.	378,295	oil jet fuel
3.	Sprague & Public Service Company	35	Libyia, other foreign	917,015	oil
4.	Mobil Oil	31	U.S.	684,992	gas, oil
5.	North East Petroleum	21	U.S.	232,890	oil
6.	Coleman Oil Company	1	U.S.	1,500	oil
	Total (Oil)	144		2,593,599	
7.	Simplex Corporation	6	U.S.	24,232	export cable
8.	National Gypsum	6	Libyia	105,942	gypsum
9.	Granite State	5	various foreign	100,174	salt
10.	New Hampshire Port Authority	10	various foreign	78,683	general
	Total (other industries)	27		309,031	
	Total all industries	171		2,902,630	

NOTE: Figures differ from U.S. Army Corps of Engineers data.

Source: Southeastern New Hampshire Regional Planning Commission: "Traffic: Piscataqua River-Portsmouth Harbor."

FIGURE 1

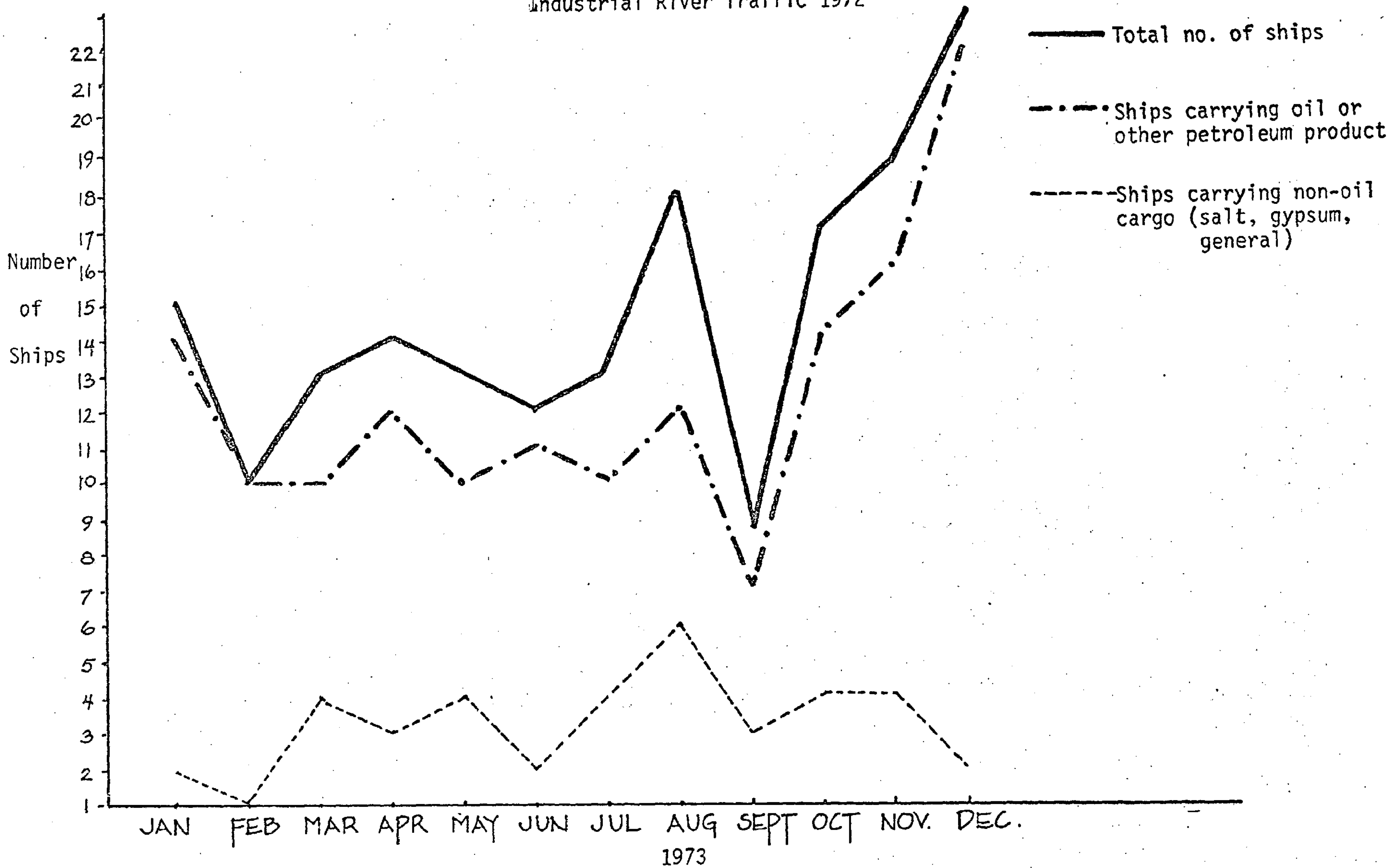
Industrial River Traffic 1972



Source: New Hampshire State Port Authority

<u>FIGURE 2</u>

Industrial River Traffic 1972



Source: New Hampshire State Port Authority

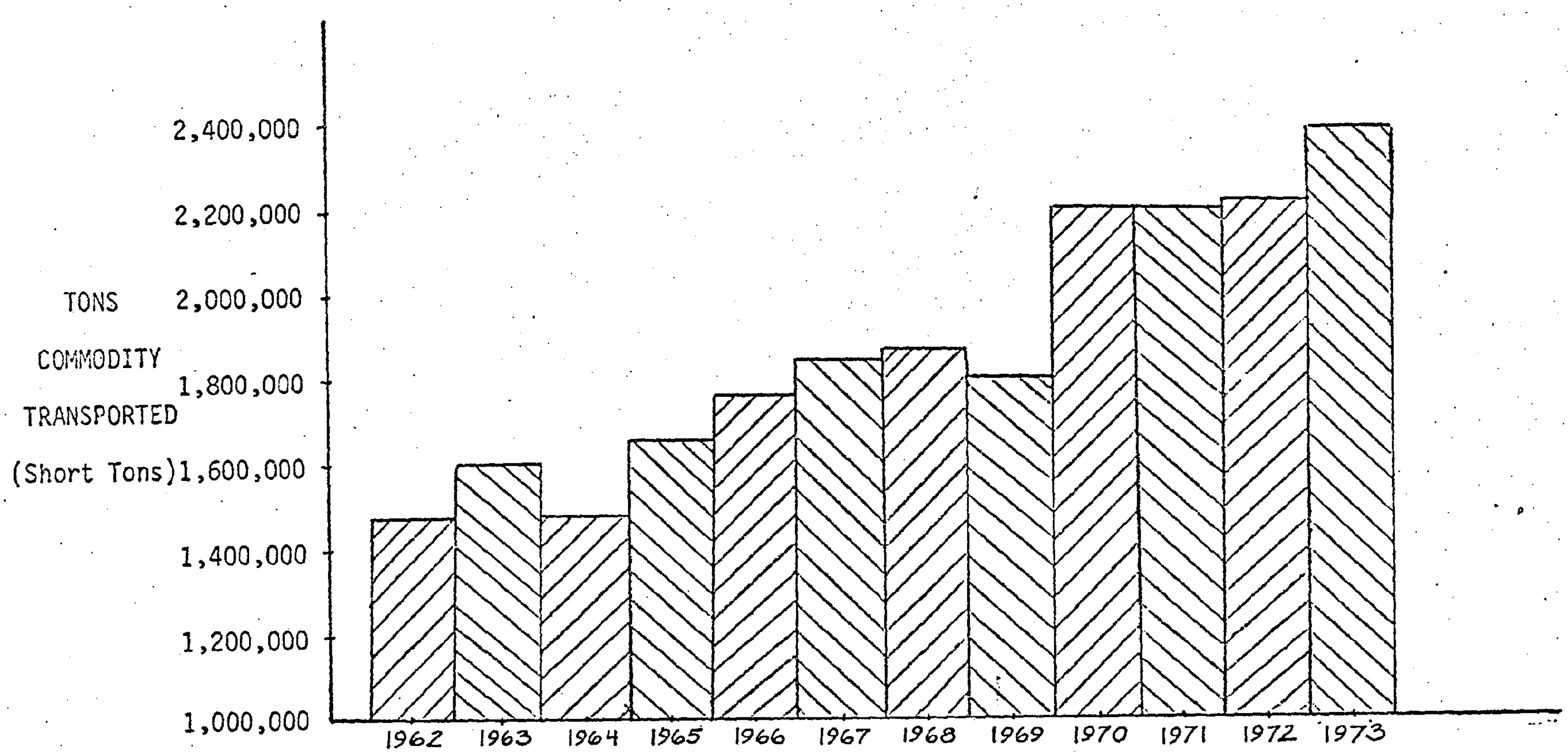


FIGURE 3

Rate of Traffic in Portsmouth Harbor from 1962 to 1973

Source: U.S. Army Corps of Engineers

tons) of commodities transported in Portsmouth Harbor, in 1973, 91 percent (about 2,100,000 tons). Imports as a percentage of petroleum transported rose from 41 percent in 1962 to 52 percent in 1973. To gain an understanding of the nature of the regional distribution picture associated with these petroleum shipments, diagrams have been included showing the New England regional products distribution systems by tanker (Figure 4) and by barge (Figure 5). From these diagrams, and with the additional information on dry bulk/general cargo deliveries to Portsmouth, diagrams were developed of relative activity of shipping lanes into Portsmouth Harbor. These shipping lanes are shown on the Marine Uses map.

The remaining cargo carried through Portsmouth Harbor is largely bulk salt and gypsum, with a minor amount of general dry cargo. 1973 data available from the U.S. Army Corps of Engineers reveals that 221,000 short-tons of dry bulk and general cargo was transported through the port. Of this, about 200,000 tons was bulk limestone and salt. While these figures are subject to considerable fluctuation, it appears that this trend has held for at least the past five years. A review of 1969 data shows 300,304 tons of bulk limestone and salt shipped into Portsmouth as opposed to only 22,133 tons of other dry cargo.

The trends noted in Portsmouth-increasing cargo through the port with the largest portion of it as petroleum and dry bulk commodities -- are typical of other ports along the Atlantic seaboard. The aggregate situation is unlikely to change in the near future. Adequate supplies of container vessel facilities (the area in which general cargo transportation is likely to grow) are located in Boston. A vast oversupply of general dry cargo facilities (not bulk) also exist in Boston, and the present Port Authority facility in Portsmouth is underutilized. Conversely, the recent location of a liquified petroleum gas (LPG) facility in Newington, not to mention the increasing volume of petroleum products being handled in Portsmouth Harbor, seem indicative of a trend toward more petroleum activity in the near future.

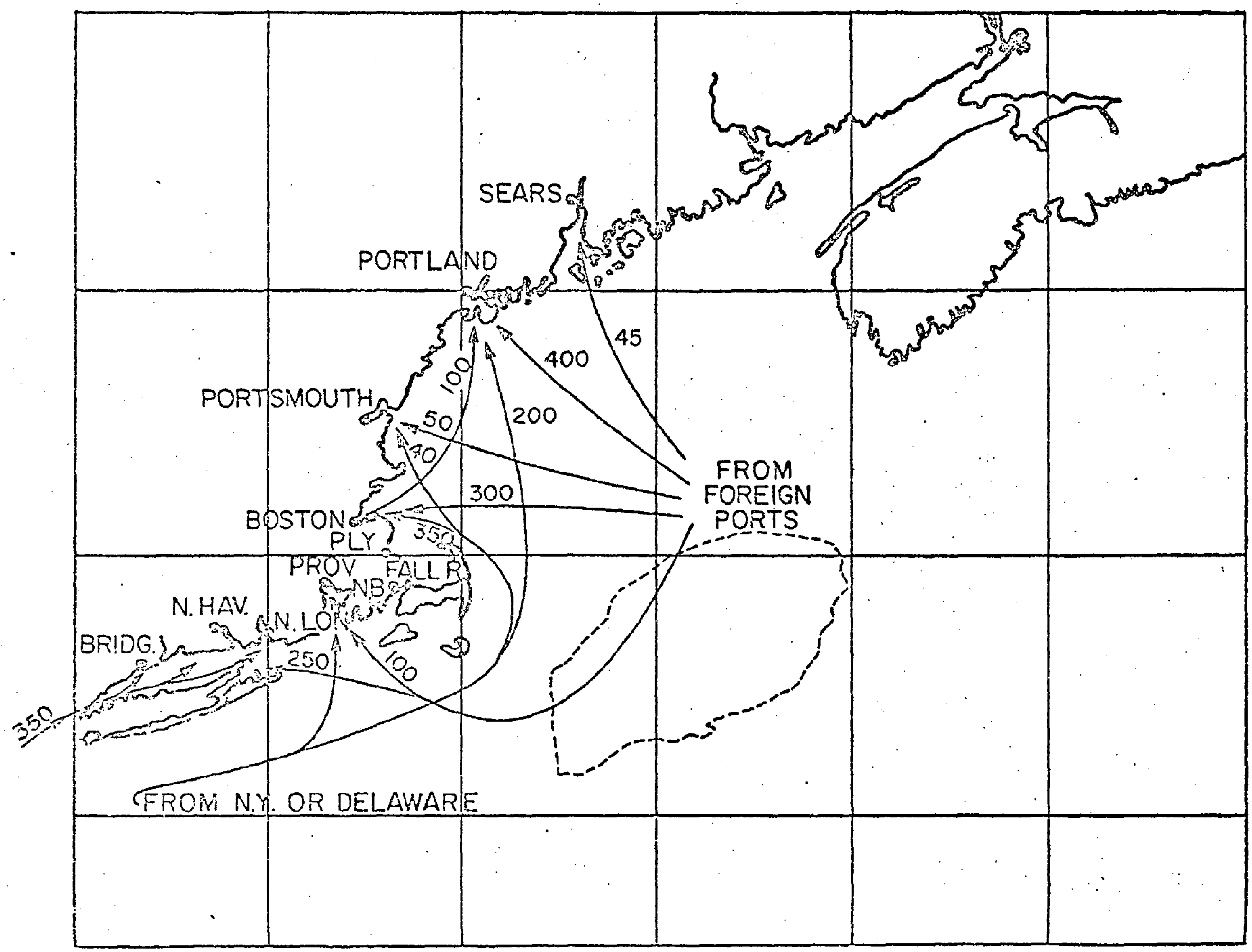


FIGURE 4. TANKER TRAFFIC - ARRIVALS PER YEAR

Source: "Georges Bank Petroleum Study", MIT Sea Grant Program. 1972.

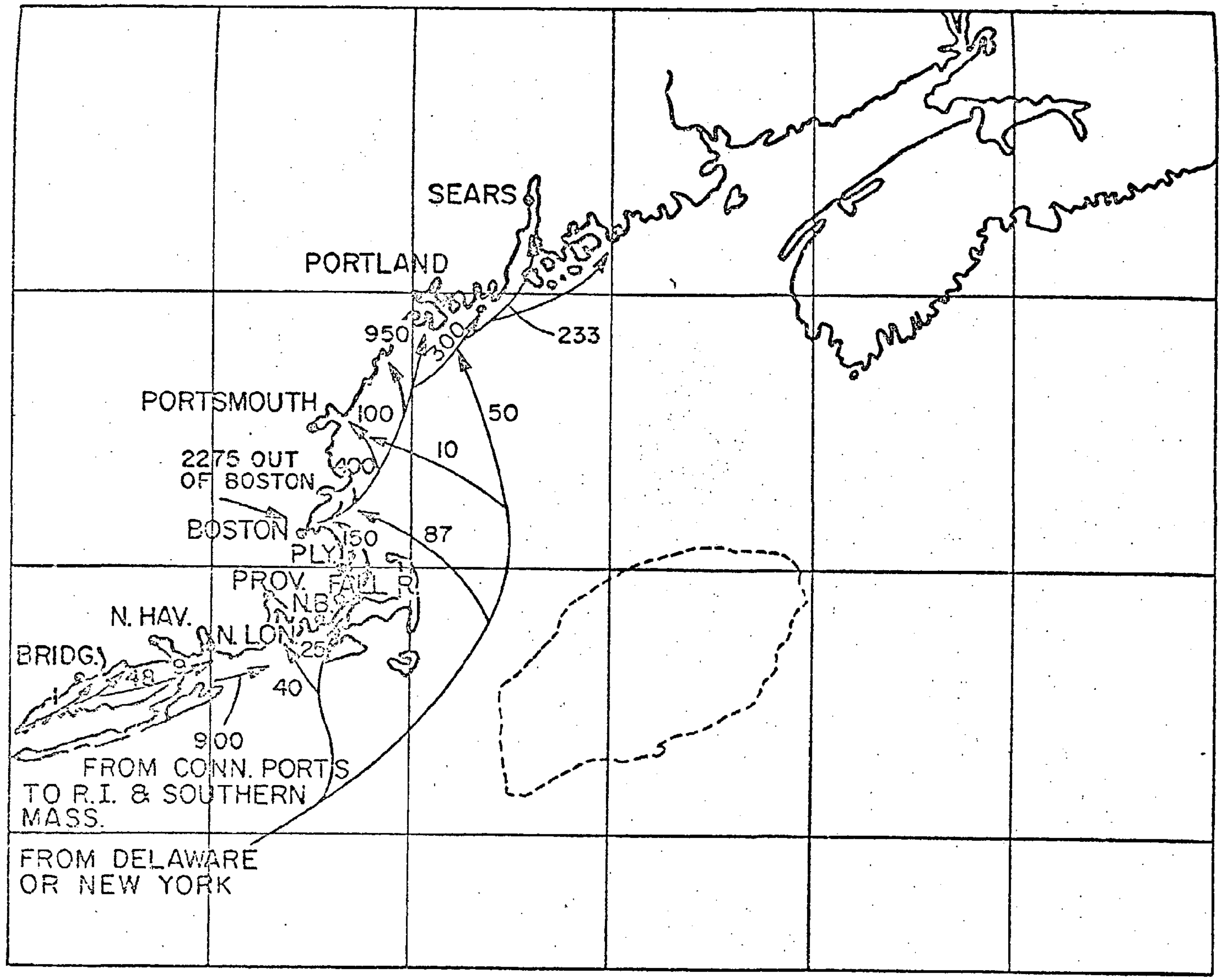


FIGURE 5 BARGE TRAFFIC—NUMBER OF ARRIVALS PER YEAR

Source: "Georges Bank Petroleum Study", MIT Sea Grant Program, 1972.

It appears that the future of ocean shipping into Portsmouth Harbor is, for the next ten to fifteen years, critically tied to petroleum products. Further, the volume of shipping in the harbor is expected by SRRC staff to turn most directly on the relationships between imported and outer continental shelf oil. Imported oil is already having an effect on shipping patterns, being responsible for virtually all of the increase in petroleum-related traffic since 1969. This has displaced coast-wise barge shipments from Boston. The result is more oil delivered by more tankers and fewer barges. This trend is expected to continue, barring such developments as a permanent oil embargo and also barring any large scale decreases in petroleum consumption due to higher prices. (NOTE: effects of the 1974 embargo, if any, on Portsmouth shipping have not been evaluated at the time of this writing.)

A large petroleum find on George's Bank could have far-reaching effects on this shipping pattern in any one of a number of ways. Were the oil transported to the New York-Delaware region for refining and shipment back to the region, one would expect an increase in coastal tankers and barge traffic unless there was developed a pipeline distribution system throughout the Northeast. If the oil was shipped to a refinery in New England, the situation would depend on a number of other variables: proximity of refinery to Portsmouth, location of unloading facilities; mode of transport of finished product: truck, tanker or pipeline. One might see a large jump in activity above the extended base case situation if conventional tankers transported crude to Portsmouth for refinery nearby, no essential difference if the refinery were elsewhere in New England and a barge/ tanker system were used to deliver, and perhaps even less traffic than today if there were a regional refinery with an extensive pipeline products distribution system.

At the present time, no reliable data on numbers of persons employed at Portsmouth shipping facilities or on the economic impact of these facilities has been gathered. It is anticipated that the University of New Hampshire Input-Output Study of the coastal zone economy will reveal these data in some detail.

NATIONAL DEFENSE

The Portsmouth Naval Shipyard (located in Kittery, Maine) and the U.S. Coast Guard Portsmouth Harbor Station (located in New Castle, New Hampshire) are both closely tied to other uses of New Hampshire's coastal waters. Pease Air Force Base (located in Newington, New Hampshire) has extensive frontage on Great Bay. However, except for shipments of jet fuel, covered implicity in the section on ocean-borne shipping, its impact on coastal water uses is minimal. No extensive discussion of Pease Air Force Base is included here.

Portsmouth Naval Shipyard employs approximately 5,900 persons, and is primarily engaged in the overhaul, repair, and conversion of nuclear submarines. It maintains a nuclear refueling capability. At the present time (June 1975) there are two nuclear ballistic missile submarines and three nuclear attack submarines in the yard undergoing work. The yard does not presently maintain a new construction capability, the last new submarine constructed there having been completed in 1968.

Portsmouth Naval Shipyard currently maintains four tugs, one yard workboat, and one floating crane, primarily for use in shifting submarines, loading and unloading of equipment and similar yard tasks. This equipment has been used in the past to assist in the movement of large oil tankers in the Portsmouth Harbor, and to load and unload general cargo at the New Hampshire State Pier. The shipyard has the only oil refueling facilities in Portsmouth Harbor. It provides water, steam, and other hotel services to naval vessels berthing there. Additionally, there is an oil spill cleanup team, designed for yard use, which has assisted in oil spills in other portions of Portsmouth Harbor.

Total annual movements of submarines (See Marine Uses map) to and from the shipyard number around ten, making the shipyard a very small factor in the usage of Portsmouth Harbor. Other vessels, such as the tugs and a reserve minesweeper, the USS Detector, also use the harbor. The minesweeper, for example, will make weekly training cruises, and the tugs will tow miscellaneous equipment to or from the yard on an occasional basis.

There are no plans to drastically alter the level of activity at the shipyard in the future. Current plans for improvements at the yard are not intended to increase its overall workload, or numbers of persons employed -- only the quality of existing facilities. Regaining a new construction capability, while possible, is not forseen.

In time of war, workloads at the yard would be likely to increase significantly. Activation of mothballed vessels, battle-damage repair, and faster turn-around on conversion and overhaul would probably occur. The type of war would determine in what manner and by how much activity would increase.

The U.S. Coast Guard's Portsmouth Harbor Station is a relatively small station with primary responsibility centering on search and rescue operations for the area from Rye Beach, New Hampshire to Cape Porpoise, Maine. The station handles approximately two-hundred cases of search and rescue a year, over 60 per cent of which occur between June and September. Although the majority of the search and rescue operations are local, the station does become involved in larger scale operations along the entire New England coast.

In addition to their primary search and rescue operations, the Portsmouth Harbor Station performs several secondary duties. They make routine checks on various aids to navigation (i.e. harbor buoys, lighthouses, day markers) and enforce a variety of Federal regulations, particularly those pertaining to boating safety (for example, proper possession of life preservers and fire extinguishers). The Coast Guard may also occasionally be called upon to escort dangerous ships, such as those carrying ammunition or flammable gas, into or out of Portsmouth Harbor.

The Portsmouth station also has limited responsibilities to regulate oil spills and ocean dumping. For example, whenever the Portsmouth station is notified of an oil spill or incidence of illegal ocean dumping within its jurisdiction area (as was the case with the Athenian Star oil leak), they will make an initial investigation of the size and amount of the damage. They then notify the Captain of the Port Station in Portland, Maine, which has the authority and capacity to conduct the clean-up activities.

Two large (210-foot) Coast Guard cutters, the Active and the Decisive, operate out of the Portsmouth station spending approximately 160 days a year at sea. No accurate estimates can be made at present on the number of movements each ship makes in or out of Portsmouth Harbor per year. The primary duties of these ships are to perform search and rescue operations and to patrol fishing areas designated by the International Commission of Northwest Atlantic Fisheries.

Activities at the Portsmouth station have remained fairly constant over the past several years and are not expected to change significantly in the near future. If change came, the activities and manpower of the station would likely be increased to assume additional responsibilities such as the inspection of tankers carrying hazardous materials.

OCEAN DUMPING

The dumping of wastes (dredged materials, solid wastes and toxic chemicals) into the ocean has been for many years a fairly common practice in the United States, though it has never been a significant activity along the New Hampshire coast. Recent federal legislation has brought much of the dumping activity under Environmental Protection Agency control. This section of the marine uses summary will examine the present status of ocean dumping both nation wide, and off New Hampshire.

Ocean dumping has been strictly regulated since 1972, following passage of the Marine Protection Research and Sanctuaries Act of 1972 (MPRSA). Only those dumping activities which meet Environmental Protection Agency criteria or which are part of an implementation schedule leading towards compliance with such criteria are now permitted. In accordance with the act, all dumping of high-level radio-active wastes and all biological chemical and radiological warfare agents is prohibited, while dumping of all other materials requires a permit from the EPA.

Special sites are designated for the disposal of "toxic" materials. At present, each new site proposed for disposal is evaluated on a case-by-case basis by the EPA and is subject to an Environmental Impact Statement before approval for the dumping is granted. Only one site in New England waters, the Boston Foul Dump Site (42^{o} 25.5'N, 70^{o} 35' W) is presently being used for the disposal of limited amounts of toxic materials (i.e. waste chemicals). In fact, the EPA is intending to phase out all ocean dumping of toxic wastes in the next few years and does not foresee the possibility that any dumping of toxic wastes will occur off the New Hampshire coast.

Dredge spoils represent the greatest percentage (between 80 and 90 percent) of total materials being dumped in the oceans. The dumping of dredge spoils is regulated by the United States Army Corps of Engineers, but every permit they issue must first be reviewed by, and receive concurrence from, the EPA. The Corps is required to use EPA designated dumpsites whereever feasible but may use other sites with approval of the EPA.

Dumping of dredge spoil along the New Hampshire coast has been minimal during the past ten years. No exact figures are available. The only significant incidences have resulted from the dredging of the Piscataqua River (Portsmouth Harbor) during the late 1960's and the occasional dredging of Hampton Harbor. Two dumpsites off the Isles of Shoals (43° 01' N, 70° 38' W, and 42° 59' N, 70 34' W) have been used by the Corps in the past and could be used again. Most dredge spoil is presently being deposited above the mean high water level rather than being transported to ocean dumpsites. For example, most of the material dredgedfrom the Hampton Harbor in recent years has been used to replenish areas of Hampton Beach subject to beach erosion. The Army Corps of Engineers does not foresee any increase in its dumping of dredge spoil off the New Hampshire coast in the near future.

The environmental effects of dumping dredge spoils are not fully known. The Army Corps of Engineers is conducting a five year Dredge Material Research Program (DMRP), which should provide some answers. For example, parts of the DMRP studies are focusing on the impacts of ocean dumping on aquatic organisms. In addition, investigations are being conducted to determine the possibility of creating artificial marshes using dredge materials.

The effects of dumping dredge spoil are probably similar, in many respects, to those associated with mining sand and gravel (See Appendix E). However, variations in effects may be expected depending on the nature of the spoil. For example, the effects of dumping clean sand will vary significantly from the effects of dumping material from the bottom of a heavily used harbor, i.e., material which may have an excess of heavy metals or other contaminants. However, considering the minimal amount of dredge spoils dumping which has occurred in the past and the limited amount expected in the future, its dumping off the New Hampshire coast does not appear to be a problem of major significance.

The long-term environmental effects of dumping materials other than dredge spoils (i.e. industrial waste, sewage sludge, solid wastes) are not yet clearly understood. Studies are being carried out at present to determine some impacts of limited dumping. For example, the University of New Hampshire has been studying the effects of dumping baled solid wastes, off the Isles of Shoals. The University of Rhode Island is conducting a similar study. It may be that, under carefully controlled conditions, the dumping of certain types of solid waste will not cause serious environmental damage. In fact there could be some benefits. Uses of junk cars or tires to build artificial fishing reefs provide one example. The Maryland Environmental Service is also studying the possibility of creating fish spawning areas along Cheasapeake Bay using discarded tires.

The results of such efforts may indicate that ocean dumping of certain solid wastes can provide an environmentally acceptable alternative to on-land disposal. If so, it is always possible that certain highly-specialized dumping activities will occur along the New Hampshire coast. This possibility appears unlikely at the present time, however, given the cost of obtaining raw materials, which will soon make the recycling of solid waste more attractive than it is today.

To summarize, very little dumping of any kind as been occurring off the New Hampshire coast. In fact the only dumping activities which are of any significance involve disposal of dredge spoil from the Piscataqua River and Hampton Harbor. Even these activities, however, have been curtailed in recent years, and are not expected to be significant in the future. The EPA has strict regulatory power over dumping of any toxic wastes, and intends to phase out such dumping activities in the next few years. Therefore, its does not appear that ocean dumping will pose any serious threat to waters off the New Hampshire coast.

RESEARCH AND EDUCATION

The New Hampshire coastal area offers an attractive setting for marine research and educational facilities. At present, several universities, including the University of New Hampshirc, operate facilities either along the coast or on Great Bay. One private consulting firm also utilizes New Hampshire coastal resources for research purposes, having located a facility in Portsmouth Harbor. This section will examine briefly what facilities exist in and around the coast and estimate their significance.

University of New Hampshire

The University of New Hampshire has been involved with marine research since 1927, when it began operations of a marine field station on the Isles of Shoals. Since then, the program has grown steadily. At present, there are 44 regular teaching faculty and well over 100 student researchers actively participating in funded science, engineering, or socio-economic ocean research or educational programs.

The Jackson Estuarine Laboratory, completed in 1970, is located on Adams Point in Great Bay. The 8,400 square foot structure is the primary facility used by UNH for marine and estuarine research. Its vessel, the Jere A. Chase, is frequently used for field experiments in Great Bay and in ocean waters to the Isles of Shoals.

Many of the Jackson Laboratory's research activities are coordinated with the Engineering Design and Analysis Laboratory (EDAL), which was established at the main Durham campus in 1965. The combination of these two research facilities enables the university to conduct a broad range of ocean-related projects, often with the cooperative effort of various state agencies and private industries.

Most UNH marine research programs are included under the UNH Coherent Sea Grant Program (CAP) which is funded jointly by the federal government and the university. Three major efforts of the CAP program thus far include:

1. Development of engineering data and systems in anticipation of increased power plant construction and the development of offshore oil industry.
2. Cooperative efforts with the Maine Department of Natural Resources and the University of Maine to explore the feasibility of mariculture with emphasis on Coho Salmon and Blue Mussels.
3. Environmental monitoring and controls - i.e. studying the effects of dumping baled solid wastes into the ocean.

Under the CAP program, the university also provides a Sea Grant Marine Advisory Service, initiated in 1972 to provide the necessary link between research institutions and interested users. In addition, the university is involved in a joint research project with Raytheon Company studying the coastal sea floor and sub-bottom sediments along Naragansett Bay in Rhode Island.

<u>Shoals Marine Laboratory</u>

The Shoals Marine Laboratory is located on Appledore Island, in Maine, at the Isles of Shoals. It is operated during the summer only, through a cooperative agreement between Cornell University, the Sea Education Association, the State University of New York and the University of New Hampshire, and offers instruction and experience to students desiring an initial overview of Marine Science.

The Shoals Marine Lab offers two sessions per summer, accommodating approximately 40 students a session. The curriculum consists partially of lecture and laboratory work with added emphasis on field experience. Several field trips are conducted during each session to various locations along the Maine and New Hampshire coasts, including trips to Great Bay and Sagamore Creek. The Appledore Island site was chosen by Cornell University because it is the closest location available with an unspoiled marine environment sufficient for Cornell's educational purposes.

At present, the Shoals Marine Laboratory summer program employs four full-time faculty as well as approximately one to two dozen part-time lecturers. Facilities at the Shoals Marine Laboratory include two teaching laboratories, a dormitory and a dining-recreation complex. Several research vessels are used, including the R.V.'s Westward, Jere A. Chase, Wrack, and Scomber, plus a number of smaller boats. The Viking Queen carries personnel and supplies for the laboratory between Portsmouth Harbor and the Isles of Shoals.

Normandeau Associates, Incorporated

Normandeau Associates, Inc., an environmental consulting firm with home offices in Bedford, New Hampshire, operates a research laboratory in Portsmouth Harbor near Pierce Island. At full capacity, the laboratory operates with a staff of approximately 35 people. Facilities include laboratories for the processing of benthic samples, analysis of plankton and other botanical specimens, and for other biological analysis of marine organisms for their various research purposes. Normandeau Associates maintains running-sea-water tables using water from Portsmouth Harbor. They also operate two 22-foot vessels from the laboratory site and have facilities to handle several larger company boats which occasionally use the laboratory.

Normandeau Associates do private consulting work throughout the New England area, including environmental studies along the New Hampshire seacoast. For example, they are doing the environmental assessment of the Seabrook Nuclear

Power Plant for the Public Service Company of New Hampshire and are presently monitoring the environmental impact of the Newington Power Station on the Piscataqua River, also for the Public Service Company.

None of the various research and education facilities mentioned contribute significantly to navigational traffic in Portsmouth Harbor, nor do they have any noticeable conflicts with other coastal uses. No comprehensive estimate of the impact of these activities on New Hampshire has been obtained. Between these facilities, however, the capacity exists to employ approximately one hundred professionals either full or part-time. Over 150 students annually, and perhaps more, either receive instruction or financial support from the two university oriented facilities - Jackson Estuarine Laboratory and the Shoals Marine Laboratory. Additionally, such facilities have a positive impact on the seacoast region in that they serve as a clearing house for technical data pertinent to the prediction of effects of changes in coastal land and water use on the environment. The New Hampshire Coastal Zone Management program has availed itself of such information in the past and is expected to continue to do so in the future.

Cable Areas

The New England Telephone Company and the Public Service Company of New Hampshire each have a number of submarine cables located under New Hampshire coastal waters. Telephone cables cross the Piscataqua River and also extend offshore to the Isles of Shoals, principally from the Portsmouth Harbor vicinity. Three electric cables cross the Piscataqua River (each carrying 15,000 volts) to Badger's Island, and one electric cable crossing is located under Great Bay which surfaces at Adam's Point on the Durham shore (34,500 volts). No phone cables cross under Great Bay.

There are no defined restrictions on navigation in the vicinity of submerged cable areas other than those imposed by prudent navigation. For example, at the entrance to Portsmouth Harbor, primary and secondary wait areas are informally designated for vessels coming into port, and have been situated outside cable crossing regions. Signs are posted designating cable crossings to warn navigators of such areas. Mariners are advised to use caution and should not anchor there.

The cables are constructed with an armour rod for protection, as they lay exposed on the bottom. They are laid by barges, simply by dropping them overboard as the cable unwinds off a large reel. Because of this method, and the fact that the cables are subjected to movement from currents, tides and storms, they generally run along the bottom in a meandering pattern. None of the cables are inspected, but a permit must be obtained from the Army Corps of Engineers before new cable crossings are constructed.

Existing cable areas have presented few conflicts with other uses of New Hampshire waters. Dropping of heavy weights such as rocks or anchors onto cables is the main concern. Channel dredging operations have had no conflict with cable areas, and reportedly none of the cables located under New Hampshire waters have had to be relocated or removed to accommodate other activities. Very few incidents of cable breaks have occurred. The only reason for replacement was attributed to infrequent, minor accidents (3 accidents in the last 25 years). Significant change in this situation is not forseen in the near future.

W.P.

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OFFSHORE SAND AND GRAVEL MINING

OFFSHORE SAND AND GRAVEL MINING

Introduction

Mining for deposits of sand and gravel off the coastline of New Hampshire is a possibility. Indeed, one proposal for such a venture was filed with the state by a Chicago, Illinois firm in March of 1972. It was subsequently withdrawn in the face of public opposition, however, and there are no permit requests currently being entertained for sand and gravel mining in state waters.

At the Federal level, the U.S. Department of the Interior (DOI), Bureau of Land Management, has issued a "Draft Environmental Impact Statement--Proposed Outer Continental Shelf (OCS) Hard Mineral Mining, Operating, and Leasing Regulations." The drafting of the impact statement alone stands as evidence of Federal interest in the sand and gravel resource existing beyond the three-mile territorial sea. Discussions with DOI representatives reveal that granting of leases for sand and gravel mining in Federal waters is in an "indefinite position right now." (Van Horn, oral communication). Several procedural steps must be taken before leasing can occur (a procedure similar in nature to the leasing of OCS oil tracts). However, DOI reported that "several" companies have expressed an interest in leasing tracts for sand and gravel mining, including one of the world's largest dredging firms.

Nationally the use of sand and gravel for highway and building construction has been increasing for a number of years and accounts for 96 percent of total U.S. consumption. Grant (1972) reported that the industrial consumption of sand and gravel in the United States had risen from 500 million tons in 1954 to 980 million tons in 1970. The Commission on Marine Science, Engineering, and Development (1968) has predicted levels of consumption to be 2,530 million tons by the year 2000. Other estimates range as high as 4,000 million tons (Cooper, 1970). The outward expansion of metropolitan areas has decreased the availability of nearby reserves for center city areas, causing longer and longer overland hauls from the pit to point of usage -- a fact that usually means higher costs to the consumer.

Locally, the situation is no different. The Boston metropolitan area has continued to expand - so much so that portions of Southern New Hampshire may properly be included within it. This expansion requires large amounts of sand and gravel. It also requires overland hauls of more than 20 miles to the center of Boston, since sand and gravel pits within that radius are being forced to curtail their operations, either by local ordinance or by greater value in other uses. Because overland transportation by truck is more expensive per mile than water transportation, at some point it will be cheaper to mine the material at sea, despite the higher capital costs involved. It is at this point that one can expect pressure for offshore hard mineral leasing to become heaviest. Predictions are that offshore mining will take place near existing metropolitan centers, including Boston, by 1980. Economic and legal considerations at the time offshore mining takes place, as well as resource availability, will determine dredging sites.

Sand and Gravel Deposit Map

The Strafford-Rockingham Regional Council has developed a chart detailing areas of potentially minable deposits of sand and gravel off the New Hampshire coast. It is a compendium of a number of independent estimations of bottom-type in the area, and is only intended to serve as a preliminary indication of the location of deposits. Indicated on the map is the 60-foot bottom contour recommended by Schlee (1973) as an area within which sand and gravel mining should not take place because of beach erosion. (There is some uncertainty about the exactness of this dividing line, however). Another line is drawn showing the 120-foot bottom contour, which represents an approximation to the present limit of offshore dredging technology. In waters deeper than this, costs become too high to make dredging economically feasible at the present time.

Areas of primary potential for sand and gravel mining are indicated on the map by cross-hatched areas. Most of them lie outside of the 60-foot contour. These areas represent bottom regions of high surficial sand and gravel content located where indications are that bedrock is not exposed. The deposits may range to depths of greater than 25 feet (Mills, 1975, personal communication). A conservative estimate of average deposit depths in these areas would be 10 feet. In New Hampshire waters, these areas lie directly off Hampton Beach and between North Hampton and the Isles of Shoals. North of this, bedrock outcrops become more frequent, thus reducing the areas of potentially minable deposits. Areas of high sand content off the Massachusetts coast have been indicated, but there is presently a moratorium on commercial dredging for sand and gravel in the Commonwealth, and the deposits are located in an established ocean sanctuary area. They are not of concern to New Hampshire.

Areas of secondary interest are indicated by solid lines. These are areas where commercial quantities of sand and gravel may exist, but present information is spotty or conflicting. These areas run the entire length of the coastline between Cape Ann, Massachusetts and the Maine border, with the exception of an area offshore of the Hampton-Seabrook inlet. Again, most of them are outside of the 60-foot contour. One area of special note is Jeffrey's Ledge, about 30 miles off the coast. This area is generally too deep to be economically mined with existing technology, either U.S. or foreign. However, the area may have significant deposits of sand and gravel and could conceivably be considered as a mining site should the Federal government undertake to offer leases, and should new dredging technology be introduced.

Impact on Coastal Zone

Sand and gravel dredging would have a number of impacts on New Hampshire's coastal zone--some positive, many more negative. A complicated web of interrelationships can be developed with only minimal effort. An absolute quantitative assessment of these impacts is much harder to derive.

It must be realized that offshore sand and gravel mining, while providing a potential source of aggregate for construction, also has potentially adverse impacts on other coastal uses and the marine environment as well. In order to examine some of these impacts, both positive and negative, a preliminary investigation of the resources and activities impacted by offshore sand and gravel mining has been made. Information is presented in table form and has been obtained from previously available documents and knowledge of the SRRC staff. Original research into offshore sand and gravel mining was not conducted.

Three tables have been prepared for use in this portion of the inventory effort. Table 1 is entitled "Primary Resources Affected by Offshore Sand and Gravel Mining." Table 2 is entitled "Possible Effects of Sand and Gravel Mining," and Table 3 is "Offshore Sand and Gravel Mining: Conflicts with other coastal uses and resources." Use of these tables will be made as part of the process for defining permissible water uses, for identifying water areas of particular concern, and for identifying priorities of water uses by capability area. They are purely expository and do not constitute a complete analysis of the impacts of offshore sand and gravel mining. References listed at the end of this section should be consulted for more detailed information.

Table 1, developed by SRRC staff, presents a list of resources which may be affected by sand and gravel mining. General categories are listed: land, sea floor, water column, air column, labor and capital. These are broad resource categories which are basic to all uses, both in the coastal zone and in upland areas. For example, no building can take place without utilizing many resources such as land to place the building on, labor to construct the building, and capital to purchase the materials used in construction. Preparation of the materials used in construction may have been taken from land resources (e.g., timber), used labor in their preparation, and so on. The broad resource categories have been amplified somewhat by presenting alongside of then a more specific indication of the resources potentially affected by sand and gravel mining. Further application of this table will be found in Table 3.

Table 2, "Possible Effects of OCS Mining," has been extracted from the U.S. Department of Interior draft environmental impact statement entitled "Proposed Outer Continental Shelf Hard Mineral Mining Operating and Leasing Regulations" (This document is available at offices of the Southeastern New Hampshire Regional Planning Commission, 3 Water Street, Exeter, N.H.). The table is organized by phase of the dredging operation. The two phases of dredging operations listed are as follows:

1. Survey - accomplished with a variety of techniques: bottom surface sampling (grab sampling) bottom sampling at depth (core sampling), and surveys using acoustic (sound) profiling techniques, which probe deeper beneath the bottom than the other two techniques. Sampling done by research vessels of varying size.

2. Mining - accomplished by dredges of varying size and technique. Most likely, use will be made of suction dredges acting as a vacuum cleaner and lifting bottom material to the surface, where it may be washed and graded according to size. Silty water is deposited back into the ocean from the side of the dredge. The dredge will generally operate from a shore processing base which will further wash, sort, and otherwise prepare the material for delivery.

In each of the two dredging phases, certain causes of impacts from sand and gravel dredging are listed. Causes identified in the survey phase include: Light and sound, sediment removal and bottom contact and possible radiation from certain *in situ* sampling analysis activities. In the mining phase, causes of the impacts are listed as excavation, sedimentation (overboard discharge) and water mass transfer.

Following identification of the phase of operation and causes of impacts, several columns of the table are used to identify the nature of the impacts. Direct effects, such as change in bathymetry are listed, followed by columns identifying side effects such as changes in beach profile, which cause a "slumped" or lowered beach, which in turn causes a loss of recreational area. The last column is a subjective indicator identifying whether each particular effect is positive or negative. The table shows that the environmental effects of the activity are primarily negative but they vary in their intensity. For example, the survey phase creates effects such as momentary confusion of fish from light or sound, losses of a small number of individual marine organisms from the various sampling activities (acoustical profiling, core sampling, etc.) and the death or mutation of a small number of organisms from radiation caused by certain types of sampling gear. However, these effects are of a very low intensity and are not of concern to the State of New Hampshire. They are common to many scientific investigations of the ocean bottom, and these presently occur frequently along the coast.

The most severe effects on the marine environment will come from the mining phase of the operation. Of the three causes of environmental change from the mining operation: excavation; sedimentation from overboard discharge and the excavation process itself; and hydraulic water transfer which introduces new nutrients into the area, excavation and sedimentation will have the most significant effects. Introduction of nutrients through water-mass transfer is not likely to be a factor off the New Hampshire coast, as the offshore environment is quite rich to begin with.

For more detailed discussion of the information contained in Table 2, consult the "Draft Environmental Impact Statement -- Hard Mineral Mining, Operating, and Leasing Regulations," issued by the Department of the Interior.

Table 3, "Offshore Sand and Gravel Mining: Conflicts With Other Coastal Uses and Resources," was developed by SRRC staff and builds heavily upon the information available from the first two tables. Resources identified in Table 1 appear in this last table, as do many of the impacts of sand and gravel dredging which appear in Table 2. Additionally, new information relating certain impacts of the offshore dredging activity to other coastal uses has been developed, based again on the data presented in Table 2 supplemented by knowledge of the resource requirements of other coastal activities. Table 3 will be of the most value in making water use capability determinations and identification of permissible water uses and priority of uses.

The uses identified in Table 3 range from recreation and commercial fisheries to residential and commercial construction. They were chosen to represent uses potentially affected by sand and gravel mining, either through direct competition for primary resources (see Table 1) or through a number of possible side effects. The list includes both land and water uses.

The nature of effects on resources are listed in several columns across the top of the table. The first set of columns relates the primary resources potentially affected by sand and gravel dredging (see Table 1) to the other coastal uses. The table assumes dredging within New Hampshire waters. Where the possibility of direct competition for resources exists between sand and gravel dredging and other coastal uses, an X has been placed in the appropriate box. For example, ease of navigation into and out of Portsmouth Harbor requires a certain amount of geographic ocean area for maneuver. Should sand and gravel mining be accomplished within existing shipping lanes, a clear conflict would result over use of the water surface. This potential impact is indicated on the chart. (It should be noted, however, that the Department of the Interior intends to avoid such areas.)

The onshore processing systems associated with sand and gravel dredging (for washing, screening, crushing, and grading the aggregate prior to delivery) will take up perhaps ten acres or more of land (estimates vary). This is a direct (though possibly minimal) physical denial of land to other uses, uses whose potential value to society should be considered in deciding whether or not to mine sand and gravel offshore. This impact is indicated on the chart as well. On the other hand, perhaps 15-20 jobs would be provided at the processing site. This must be considered as well. The following two columns of Table 3 reflect both direct effects and secondary side effects of the dredging activity, particularly as they relate to affected coastal uses. The final column consists of remarks explaining the ultimate nature of the impacts on each affected use. These may range from non-quantifiable impacts such as loss of enjoyment in recreational activities to measurable decreases in the income of local fishermen and lobstermen.

No attempt has been made to numerically measure these affects. However, some understanding of their nature has been obtained. For example, the most significant positive effect of offshore sand and gravel dredging on other activities would be that it could reduce pressure on existing coastal and upland producers of the material. Much of Boston's supply of aggregate already comes from New Hampshire--

direct trains run from Ossipee to Boston, for example. There would be decreased inland rail and truck transpo-t, plus reduced inland air, water, and noise pollution if offshore mining took place. This would be offset to a degree by truck traffic, noise, etc. in the vicinity of any onshore sand and gravel processing facilities accompanying offshore activity, however.

It is not possible, at present, to tie the offshore mining of sand and gravel to reduced prices. The mining of offshore resources will not become economically more attractive than current sources, unless aggregate prices rise, or stay the same, and other supplies are not readily available, barring any cost breakthroughs in mining technology. New Hampshire, being a net exporter of sand and gravel, can meet its own statewide needs for the foreseeable future. Boston will be the consumer area which sand and gravel dredging would serve. There will be no pressure to develop a market structure for offshore aggregate indigenous to New Hampshire which would lower prices to state residents.

The remainder of the effects on sand and gravel mining on other coastal uses are likely to be negative. Sand and gravel dredging in state waters would most definitely destroy relatively large areas of lobster and groundfish habitat for a period of time (at least those on the dredging site itself) simply by sucking lobsters into the dredge. Diversity in the number of species in the area would be reduced. Severity of the effects would depend on geographic extent, duration, and frequency of the dredging operation. There could conceivably be some alteration of beach profile which might have negative affects on the attractiveness of New Hampshire beaches to tourists and day-trippers. Sedimentation from the activity could clog the gills of finfish and the food filters of shellfish. This could result in death or out-migration. These impacts should be kept in perspective, however, since turbidity already exists from natural causes such as currents and wave action.

Mining further offshore, in the Jeffrey's Ledge area, would not have the same effects on beach profile that inshore sand and gravel mining would have. Jeffrey's Ledge, however, is a herring spawning area, and herring use the gravel as an attachment for their eggs. There has already been some concern voiced about diminishing sizes of herring stocks from overfishing. Sand and gravel mining on the Jeffrey's Ledge would intensify that problem.

Summary

The possibility of offshore sand and gravel mining in waters adjacent to New Hampshire exists. One inquiry was made by commercial interests in March of 1972. Also, proposed federal regulations for the mining of sand and gravel beyond the three-mile limit have been promulgated, further indicating to us the potential for offshore hard-mineral mining. Preliminary maps developed by the Strafford Rockingham Regional Council from existing information indicate a number of areas of potential deposits in state waters, primarily along the southern two-thirds of the coast, off Rye and Hampton. Further offshore, Jeffrey's Ledge is known to have deposits of sand and gravel, though it apparently cannot be economically mined with existing U.S. or foreign technology.

Any offshore sand and gravel operation will bring with it certain possible and negative effects. On the positive side, offshore mining would result in decreased pressure on upland sources of aggregate, along with decreased noise, air pollution and truck traffic in areas surrounding the upland activity.

On the negative side, offshore sand and gravel mining does require onshore support, processing and handling facilities. This might take ten acres or more of coastal land (estimates vary). Truck traffic, noise, air, and water pollution would simply be transferred from any displaced upland production areas to the coast. There is no indication that any decrease in sand and gravel prices would ensue as a result of the activity. Additionally, it appears that offshore sand and gravel mining would have adverse impacts on the New Hampshire lobster fishing industry if it is accomplished within state waters. A dredge removes all bottom material, including creatures that live there such as lobsters. Potential deposits of sand and gravel are located in identified lobster habitat areas. Conflict is unavoidable. Also, and again depending upon location of the activity, alteration in wave refraction patterns, and beach erosion, could occur as a result. Proper siting of the activity could reduce this effect, however. Environmental effects, in toto, will apparently be direct and significant, though, impacts will be site specific. Again, locally severe alterations in certain areas of the environment will occur, depending on location of the activity. For example, Jeffrey's Ledge, which contains deposits of sand and gravel, is used as a herring spawning area. The eggs, which are attached to gravel, would be destroyed were mining exercises to be conducted there during the autumn (August-December) spawning season.

TABLE 1

PRIMARY RESOURCES AFFECTED BY

OFFSHORE SAND AND GRAVEL MINING

I. Land

   A. Coastal Zone - geographic area

   B. Inland - geographic area

II. Sea Floor - finfish, shellfish, crustaceans, other minerals, geographic area

III. Water Column - finfish, water quality

IV. Air Column - air quality

V. Labor - number of persons available for employment

VI. Capital - money available for investment

Table 2.

POSSIBLE EFFECTS OF SAND AND GRAVEL MINING

OPERATION PHASE	CAUSE	DIRECT EFFECTS	SECONDARY SIDE EFFECTS	OTHER SIDE EFFECTS		+ or −
Survey	Light & Sound	Momentary confusion of light or sound sensitive species				?
	Sediment removal and bottom contact	Loss of a small number of individual marine organisms				−
	Radiation	Death or mutation of small number of organisms				−
Mining	Excavation	Obtain resource	Reduce pressure on upland producers	Improve upland esthetics, air, water and noise pollution		+
			Hold cost of mineral down	Curb inflation		+
		Destroy benthos	Destroy corals & algae	Alter wave refraction and/or wave energy	Coastal erosion	−
			Destroy spawning grounds	Inhibit repopulation	Harm fisheries	−
			Benthic organisms die or leave area	Harm fisheries	Impair economic opportunity	−

After: U.S. Department of the Interior, Proposed Outer Continental Shelf Hard Mineral Mining Operating and Leasing Regulations.

[redacted] [redacted]

Table 2

POSSIBLE EFFECTS OF SAND AND GRAVEL MINING

OPERATION PHASE	CAUSE	DIRECT EFFECTS	SECONDARY SIDE EFFECTS	OTHER SIDE EFFECTS		+ or
Mining	Excavation	Expose boulders and debris	Foul trawl nets	Damage fishing industry		-
			Provide hiding & attachment for organisms	Increase and/or diversify marine organisms	Enhance fisheries	+
		Change Bathymetry	Alter wave refraction and wave energy	Coastal erosion	Loss of wetlands & other high value areas	-
			Alter beach profile	Slumped beach	Loss of Rec. Areas	
		Cut into aquifers	Discharge of fresh water into marine environment	Seawater intrusion into the acuifer	Loss of groundwater reserves	-
	Sedimentation	Introduce nutrients	Increase productivity	Enhance fisheries		+
		Introduce organics	Reduce O_2 by oxidation	Reduce marine animals	Harm fisheries	-
		Introduce heavy metals into water column	Kill marine organisms	Harm fisheries		-
			Concentrate heavy minerals in marine organisms	Potential harmful effects on marine organisms	Potential harmful effects on humans consuming affected marine organisms	-
		Reduce photosynthesis	-Reduce productivity	Harm fisheries	Impair economic opportunity	-
		Clog gills	Finfish and some shellfish die or leave area	Harm fisheries	Impair economic opportunity	-
		Abrasion by particles	"	"	"	

[redacted]le 2

POSSIBLE EFFECTS OF SAND AND GRAVEL MINING

OPERATION PHASE	CAUSE	DIRECT EFFECTS	SECONDARY SIDE EFFECTS	OTHER SIDE EFFECTS		+ or −
Mining	Sedimentation	Turbid appearance	Unpleasant for recreation	Loss of economic opportunity for tourism sector		−
		Smother benthos	Benthic organisms die or leave area	Harm fisheries		−
			Destroy or impair coral and algae	Loss of habitat and productivity		−
				Alter wave refraction and wave energy	Coastal erosion	−
				Sediment instability	Redistribution of sediment	−
			Destroy spawning grounds	Inhibit repopulation	Harm fisheries	−
		Deposition in unwanted area	Alter coastline and/or channels	Change wave refraction and energy	Coastal erosion	−
				Expense of channel clearance		−
	Water mass transfer (hydraulic)	Introduce nutrients	Increase productivity	Enhance fisheries		+

TABLE 3

OFFSHORE SAND AND GRAVEL MINING: CONFLICTS WITH OTHER COASTAL USES AND RESOURCES

NATURE OF EFFECTS ON RESOURCES / COASTAL USES AFFECTED	RESOURCES WHERE POTENTIAL FOR DIRECT COMPETITION EXISTS: LAND							DIRECT EFFECTS	SECONDARY AND OTHER SIDE EFFECTS	REMARKS
	COASTAL	UPLAND	SEA FLOOR & SURFACE	WATER COLUMN	AIR COLUMN	LABOR	CAPITAL			
A. RECREATION										
1. Swimming	X		X	X	X			Turbid waters; dusty air	Unpleasant swimming conditions	Uniformly results in loss of enjoyment by public. May lead to loss of income in recreational areas.
2. Fishing (on & off shore)	X		X	X	X			Same; disturb bottom	Fish abandon area or die	
3. Boating	X		X		X			Same	Unpleasant boating conditions	
4. Tourism	X	X	X		X		X	Same	Other areas more suitable	
B. COMMERCIAL FISHERIES										
1. Finfishing	X		X	X		X	X	Turbid waters; dusty air	Fish abandon area or die	Loss of income to fisheries
2. Lobstering	X		X			X	X	Same; disturb bottom	Fish abandon area or die	
3. Processing	X				X	X	X	Same		
C. NATIONAL DEFENSE										
1. Portsmouth Naval Shipyard	X		X	X	X	X		Dusty air	Degraded working conditions	Possible loss of productivity due to dust from onshore processing
2. U.S. Coast Guard New Castle	X		X	X	X			Same	Same	

TABLE 3

OFFSHORE SAND AND GRAVEL MINING: CONFLICTS WITH OTHER COASTAL USES AND RESOURCES

NATURE OF EFFECTS ON RESOURCES / COASTAL USES AFFECTED	RESOURCES WHERE POTENTIAL FOR DIRECT COMPETITION EXISTS: LAND: COASTAL	LAND: UPLAND	SEA FLOOR & SURFACE	WATER COLUMN	AIR COLUMN	LABOR	CAPITAL	DIRECT EFFECTS	SECONDARY AND OTHER SIDE EFFECTS	REMARKS
C. NATIONAL DEFENSE (Continued)										
3. Pease Air Force Base	X				X	X		Dusty air	Degraded working conditions	Possible loss of productivity due to dust from onshore processing. Depends on location of processing facilities.
D. TRANSPORTATION										
1. Piscataqua River oil terminals, piers	X				X	X	X	Dusty air	Degraded working conditions	Possible loss of productivity due to dust from onshore processing.
2. General navigation			X							Competition for limited offshore surface area.
3. Roads and highways	X	X			X	X	X			Positive benefit through increased supplies of aggregate.
E. COMMUNICATIONS										
1. Cable areas			X							Direct potential for damage to cables.

TABLE 3

OFFSHORE SAND AND GRAVEL MINING: CONFLICTS WITH OTHER COASTAL USES AND RESOURCES

NATURE OF EFFECTS ON RESOURCES / COASTAL USES AFFECTED	RESOURCES WHERE POTENTIAL FOR DIRECT COMPETITION EXISTS: LAND: COASTAL	LAND: UPLAND	SEA FLOOR & SURFACE	WATER COLUMN	AIR COLUMN	LABOR	CAPITAL	DIRECT EFFECTS	SECONDARY AND OTHER SIDE EFFECTS	REMARKS
F. WASTE DISPOTAL TREATMENT										
1. Sewage	X	X				X	X			Minor effects
2. Solid waste	X	X				X	X			Minor effects
3. Off-shore dumping			X			X	X			Ocean dumping may preclude dredging of sand and gravel in some areas.
G. ENERGY										
1. Petroleum:										Possible conflicts with related shipping.
a. Onshore terminals	X					X	X			
b. Refineries and tank farms	X	X				X	X			
c. Petrochemical complexes	X	X				X	X			Potential heavy requirements for aggregate as fill and for construction.

TABLE 3

OFFSHORE SAND AND GRAVEL MINING: CONFLICTS WITH OTHER COASTAL USES AND RESOURCES

COASTAL USES AFFECTED / NATURE OF EFFECTS ON RESOURCES	RESOURCES WHERE POTENTIAL FOR DIRECT COMPETITION EXISTS: LAND							DIRECT EFFECTS	SECONDARY AND OTHER SIDE EFFECTS	REMARKS
	COASTAL	UPLAND	SEA FLOOR & SURFACE	WATER COLUMN	AIR COLUMN	LABOR	CAPITAL			
G. ENERGY (Continued)										
2. Electricity:										
a. Onshore-conventional	X					X	X			
b. Nuclear	X					X	X			
c. Offshore nuclear			X			X	X			
H. RESEARCH AND EDUCATION										
1. Shoals Marine Lab (Maine)	X		X	X				Turbid water	Loss of value as study area	Potentially serious effect.
I. MISCELLANEOUS										
1. Registered historical landmarks										
a. Isles of Shoals (Maine)	X							Turbid water	Reduced attractiveness	Loss of value as a historical site.
2. Wildlife refuge (Mass)	X			X	X			Turbid water; dusty air	Adversely affect wildlife and marine biota	Loss of value as a preserve.
3. Ocean sanctuary (Mass)			X	X	X			Same	Same	

TABLE 3

OFFSHORE SAND AND GRAVEL MINING: CONFLICTS WITH OTHER COASTAL USES AND RESOURCES

NATURE OF EFFECTS ON RESOURCES / COASTAL USES AFFECTED	RESOURCES WHERE POTENTIAL FOR DIRECT COMPETITION EXISTS: LAND							DIRECT EFFECTS	SECONDARY AND OTHER SIDE EFFECTS	REMARKS
	COASTAL	UPLAND	SEA FLOOR & SURFACE	WATER COLUMN	AIR COLUMN	LABOR	CAPITAL			
I. MISCELLANEOUS (Continued)										Potential Benefits:
4. Residential construction:										
a. Coastal	X				X	X	X	Dusty air	Degraded living & working conditions	-increased supply of aggregate for construction.
b. Inland		X			X	X	X	Same	Same	-less truck traffic from inland areas.
										-improved upland aesthetics.
5. Commercial construction:										Same as residential construction, Page 4.
a. Coastal	X				X	X	X	Dusty air	Degraded living & working conditions	
b. Inland		X			X	X	X	Same	Same	

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AQUACULTURE

AQUACULTURE

Aquaculture is the commercial farming of various marine, estuarine, and fresh water species, both plants and animals. The industry is in its infancy in the United States, but has been developed extensively in parts of Europe and Asia. For example, there has been the culture of oysters, shrimp, and some species of fish in Japan and the raft-culture of blue mussels in Spain. United States efforts have included, among others, trout farming in Idaho, catfish farming in the Southwest, salmon farming in the Northwest and oyster farming in Long Island Sound.

Regionally, aquaculture efforts have been sporadic, with efforts presently at the academic level or the pilot-commercial stage. A conference, "Aquaculture: A New England Perspective" was held in Durham in October of 1970 and again in the fall of 1974. Discussed were a number of technological, economic, and legal perspectives on aquaculture. A refined list of species which possibly might be farmed in New England was also developed. Among those listed were the Atlantic salmon, the European oyster, the eastern oyster, hard-shell clams, bay scallops, coho or silver salmon, and American lobster. Not included on the list, but subject to some interest since are the blue mussel and the winter flounder.

Current aquaculture efforts in the state of New Hampshire are largely at the academic level or have been conducted on a trial basis only. The University of New Hampshire is increasingly involved with the mariculture of blue mussels, coho salmon, seaweeds and flounder. The New Hampshire Department of Fish and Game has been attempting the introduction of coho salmon into New Hampshire waters, and in the past has investigated the possibility of oyster seed production in Greay Bay.

The potential for large-scale commercial aquaculture activities in the state appears limited, primarily due to lack of adequate areas for culture. Smaller family-type operations are a strong possibility, however. Much of Great Bay is unsuitable for culture using rafts with suspended ropes (for shellfish) or with suspended pens (for salmon) due to depth and temperature limitations. It might be possible to use the area for the culture of bay scallops, though the technology for this species has not been completely worked out yet. Existing pollution levels may also play a part in making Great Bay unsuitable at the present time and ice is also a problem during severe winters.

The most likely areas for raft or pen culture of shellfish and salmon would be in the vicinity of Portsmouth Harbor, Little Harbor, or possibly the Isles of Shoals. Here, the deep, clean water necessary for raft or pen culture exists. There are no bad ice conditions and the water is relatively well sheltered. In fact, the University of New Hampshire has placed a salmon rearing pen adjacent to the U.S. Coastal Guard station in New Castle for use in their studies. Also, an attempt is currently being made to gain permission to farm lobsters commercially in the heated effluent of the Newington power plant, a location frequently used as an open-laboratory for aquaculture related projects by University of New Hampshire researchers.

One other possibility for New Hampshire aquaculture would consist of open-range culture of anadromous species such as salmon. Efforts by the University of New Hampshire in salmon rearing and release, assisted by the New Hampshire Fish and Game Coho project, are a start in this direction. The fish could be raised in captivity to smolt size, released in tributaries of Great Bay, allowed to roam freely, and then return to the point of release for harvest. Trial release of coho salmon was to be accomplished this spring by the University of New Hampshire.

This complements pre-existing efforts by the New Hampshire Department of Fish and Game, which is attempting to establish a coho salmon sport fishery.

One may expect a number of identifiable conflicts between the various methods of aquaculture and other uses of New Hampshire coastal waters. Stationary facilities such as rafts or pens (all of which vary in size - 20 meter X 20 meter rafts exist in Europe today) will present some obstruction to free navigation in the area of the aquaculture facility. Shoreside support areas, including dockage facilities, hatcheries and rearing areas, and perhaps ponds, will compete for limited coastal land space. In France, for example, mussel and oyster growers are forced to compete with beachfront hotels and casinos. In the case of open range culture, the problem of who can catch whose fish is bound to crop up. Poaching and protection against predators and disease are also likely to be a problem. Land ownership at water's edge, the question of who controls the bottom of Great Bay as well as the surface, and legal problems of a similar nature will almost certainly appear.

To summarize, large-scale commercial aquaculture activites are not likely to occur in New Hampshire, due primarily to the nature of its coastal areas. Any activities likely to arise will probably be confined to relatively small scale enterprises for mussels, lobsters, or salmon located in the lower Piscataqua River, the outer Portsmouth Harbor area, and Little Harbor. The possibility of open-range salmon culture originating in tributaries to Great Bay exists, and is presently being investigated. Direct conflicts with current water uses such as boating are likely to occur, though they are not expected to be overly significant. In any event, commercial aquaculture activity in the state appears to be perhaps five years away, the first attempt at establishing such an industry only being made at the present time.

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FUTURE USES

FUTURE USES

DEEP WATER PORTS

The possibility that a deep-water port might be located in waters off of New Hampshire continues to exist. The Deepwater Port Act of 1974, which authorizes, in waters under Federal jurisdiction, the planning, licensing, construction, and operation of ports handling very large crude carriers was signed by President Ford on January 4, 1975. This act complements the existing potential for siting a deepwater port facility in New Hampshire-controlled waters.

For purposes of this analysis, deepwater port facility is assumed to include the following components: 1) a terminal for mooring; 2) pipelines of varying sizes; 3) booster pump platform; 4) tank farm for onshore storage; 5) products distribution facilities; and 6) home-port facilities for vessels servicing the terminal (tugs, launches, etc.). Consideration of the environmental and economic impacts of a coastal refinery per se will not be dealt with. Refineries will be considered primarily as their siting relates to the siting of a deepwater port.

Within the New Hampshire coastal zone planning program, the primary concern is to identify the large scale effects of a deepwater port on New Hampshire's coastal zone planning area. Economic and environmental effects are of most immediate concern.

The objectives of this inventory effort is to obtain background knowledge which will aid in the determination of water-use capability classifications, permissible water-uses, and priority of water-uses as well as contribution to an operational definition of direct and significant impact. It is not the intention of this inventory report to present a fully-detailed analysis of deepwater port siting and related impacts. Such an analysis would necessarily have to be situation-specific and site specific.

Numerous studies have been undertaken which serve to provide background information on the effects of a deepwater port on the environment, on other activities offshore, and on the economy of regions adjacent to it. Some of these references are listed at the end of this section. For more detailed information on deepwater ports, these should be consulted. The University of New Hampshire, completed a study on the impacts of an oil refinery in Southeastern New Hampshire which included work on a deepwater port located in the New Hampshire coastal area. Reference is made to this and other related studies as appropriate.

At the present time, it is difficult to assess the chances of a deepwater port locating in or adjacent to New Hampshire waters. Deepwater port location is inexorably tied to the presence of refineries onshore, and the variables associated with refinery siting are manifold. The following are some of the variables which enter the New England-wide refinery (and, by definition, the deep-water port) siting picture: location of peak areas of petroleum demand size of tariffs on imported crude and refined petroleum products, would market prices of crude petroleum, and regional petroleum consumption trends.

Some general comments can be made relative to the current potential for siting references and, therefore, deepwater ports in New England in general and New Hampshire in particular. Professor J. W. Devanney of the Massachusetts Institute of Technology, co-author of the Georges Bank Petroleum Study, stated in a presentation at the Massachusetts Institute of Technology (Offshore Installations: Legal, Technical, Policy Considerations, held April 30, 1975), that any New England refinery will be dependent upon foreign crude oil, even in the event that significant quantities of oil were found on Georges Bank. His judgment was that a New England refinery, and therefore a deepwater port, will depend upon foreign oil. The amount of foreign oil imported depends on the price of domestic and foreign crude oil and their relative availability, the world political situation, and differential tariffs between imported crude and refined products. The uncertainty in each of these areas makes it extremely difficult to predict the likelihood of a New England or New Hampshire refinery.

A Federal Energy Administration spokesman (Pecoraro, oral communication) stated that it appears "inevitable" that New England will have a refinery sometime in the near future. Whether or not it would necessarily be linked to a deepwater port is uncertain. Neither was the potential for siting in New Hampshire indicated. The FEA spokesman was also unsure about the existence of a relationship between oil tariff and refinery siting, mentioning that they did not appear to be a deterrent to the proposed Pittston facility in Eastport, Maine.

Within New Hampshire, a spokesman for the Department of Resources and Economic Development (Allen, oral communication), reports no official oil company activity concerning refinery or deepwater port siting within the state. Further, he stated that a Georges Bank oil find need not influence the situation.

Any major oil company finding oil on Georges Bank would likely ship the oil to the mid-Atlantic states for refinery, their facilities there being expanded if necessary. (The additional cost to ship oil from Georges Bank to a mid-Atlantic refinery and back to New England would total 15 to 20 cents per barrel, according to the Georges Bank Petroleum Study.) Independent producers making a find on Georges Bank, Allen felt, might find the construction of a refinery in New England more attractive, however, and this could spur pressure for a deepwater port.

The location of any deepwater port facility along the New Hampshire coast would depend heavily on a variety of technological, environmental, economic and political factors. Community acceptance, interference with commercial and recreational fishing and boating, incidence of economic impact from construction, and availability of feasible sites all play a part in the location of a deepwater port. Given the complex interplay between all of these factors, it is difficult to identify a unique spot off the New Hampshire coast where a port might be sited. Some general considerations can be related, however.

From a technological point of view, the University of New Hampshire suggested three potential areas where different types of deepwater ports could be located off the coast of New Hampshire: 1) A sea island facility located to the west of the Isles of Shoals (about five miles east of Rye Harbor); 2) a single mooring (SPM) facility located two miles south to southwest of the Isles (six to seven miles east of Little Boar's Head) and 3) an SPM facility even further south of the Isles and perhaps 10 miles out to sea off Hampton Beach.

Proximity to shoreside support facilities such as tank farms, service areas, or refineries, plus a number of other factors including construction cost and environmental damage potential would determine the relative superiority of one or another of the above locations. An example of how these factors relate to siting can be drawn from a Massachusetts Port Authority study which addresses, among others, a deepwater port ten miles off Cape Ann, Massachusetts. The study report stated that the construction of 48-inch pipelines in greater than 150 feet of water (necessary for the construction of a facility in such a location) had not been undertaken before and would require new and advanced technology, which can be risky and costly as well. Nearby tank farm sites were found lacking. Adjacent towns were opposed to it. Another site, ten miles out but further north (off Newburyport), ranked much higher, with better proximity to tank farms, decreased down-time due to weather conditions, and less damaging environmental impacts cited as reasons. Local residents were also less opposed to the idea.

No such analysis has been attempted for New Hampshire sites. Experience, however, leads to the conclusion that, due to the shortness of New Hampshire's coast, lateral variation in location of a deepwater port is likely to make little difference from the point of view of the residents of the coastal zone planning area. Generally speaking, however, the further from shore a deepwater port is located, the less chance of shoreline damage from an oil spill, and less chance of impact on other coastal activities, and the greater the cost of construction and operations. In New Hampshire, distance from shore, then, is the important siting variable. The table, Qualitative Summary Comparisons extracted from the report (Table 4, "The Impacts of an Oil Refinery located in South Eastern New Hampshire: A Preliminary Study," UNH, 1974) has been included for reference. It details some of the comparative aspects of a sea-island (with and without products distribution facilities) five miles offshore near the Isles of Shoals versus a single point mooring (monobuoy) located about 10 miles offshore beyond existing shipping lanes to and from Portsmouth Harbor. The table analyzes a number of comparative aspects of the various deepwater ports options including environmental risks, susceptibility to damage, capital and operating costs, and employment. Of the information presented in the table, damage from oil spills, visual impacts, geographic area denied to other uses, and economic impacts of the port facility are of most concern to the New Hampshire Coastal Zone planning program.

Returning to the important siting variable of distance from shore, a few points can be made. First, the chance of an oil spill reaching shore decreases the further out one goes. For instance, the Council on Environmental Quality has suggested that the probability of oil from spills coming ashore in general (once they occur) from a spill less than five miles is 90 percent. For a spill 5-15 miles offshore, it is 50 percent, and for a spill greater than 15 miles offshore, only 20 percent. The probability of a spill occurring in the first place are decreased, as the chances of tankers grounding are sharply reduced in the deeper water farther offshore. Second, the visual impact of a deepwater port decrease with distance from shore. A sea island facility near the Isles of Shoals (about

Qualitative Summary Comparisons

	Terminal Crude Receipt Only With Onshore Product Pipeline Distribution		Product Distribution Terminal and Crude Terminal
Environmental Risks	I. Sea Island Near Shoals	II. Offshore Monobouys (not in traffic lanes)	III. Sea Islands near Shoals
Likelihood of Oil Spills:			
A. Large spills from tanker groundings	Estimate 2-3 times greater than amount spilled at offshore SPM's.	Least likelihood because of distance from tanker grounding hazards.	Estimate over 10 times more oil likely to be spilled because of proximity to hazards & greatly increased number of port calls.
B. Chronic spills at "terminal operations" only	.5 ppm estimated upper limit. Comparative statistics at Milford Haven were .6 ppm, but transfers there include product and thus there are far more transfer operations per thousand tons of oil transferred than at a crude terminal only.	.5 ppm based on historical data.	.5-1 ppm. (terminals are in semi-exposed locations). Throughput roughly 50% higher than Case I.
Ease of Containment & Clean-up, fate of oil (Note: Biological impacts reported elsewhere)	Spills are easier to control but more difficult to clean up if they reach nearby Isles. Containment booms* considered ineffective in seas greater than 3'. Small spills of crude oil can be dealth with effectively in protected waters if clean-up response is rapid. Near Isles, spills may spread around islands depending on winds. Otherwise they may float to mainland. Dispersants can effect marine life if used near shore but they are the better alternative than allowing oil to come ashore.	Efforts to contain & clean up open seas have had little success, but oil can be dispursed with less damage far from land and the oil is given greater time to weather from offshore location.	Product spills spread faster than crude spills & are difficult to contain. Fire hazard.

* There are active efforts in industry & government to develop booms or higher capability. Some claim they exist now but we do not know if EPA or USCG has tested them.

Source: University of New Hampshire (1974).

Qualitative Summary Comparisons (Con't)

	Terminal Crude Receipt Only With Onshore Product Pipeline Distribution		Product Distribution Terminal and Crude Terminal
Environmental Risks	I. Sea Island Near Shoals	II. Offshore Monobouys (not in traffic lanes)	III. Sea Islands near Shoals near Shoals
Visual	The introduction of sea island terminals and support facilities such as tug & work-boat harbors will forever change the character and natural scenery of the Isles of Shoals.	Least important depending upon distance of facility from shore.	Much greater than in first Case.
Space Removed from other uses	About 100 water acres plus harbor requirements of tugs, work-boats, equipment storage, etc. would be denied to recreational boaters & fishermen. This does not include tanker turning areas (about 3000' diameter circles) or tanker traffic lanes.	Less conflict with fishermen and boaters in offshore location. Area required: 150 acres mooring circle not including 4000' diameter approach and area.	About 200 water acres plus concommittant harbor facilities. Compounds conflicts of Case I.
Construction Aspects:			
Terminal	Effects of drilling & blasting unknown. Am't of marine life attracted by pilings of sea island is small compared to what's there now.	Substantially less. Construction activity at sea.	Presently unknown, but greater than Case I.
Pipeline	Blasting required in all cases - the extent of which depends upon site location. Effects unknown.		Extent of blasting greater to accomodate mutiple product pipelines.

Qualitative Summary Comparisons

Technical and Economic Characteristics	Crude Receipt Terminal Only; 13-35 million tons/year with onshore product pipeline distribution: I. Sea Island	II. Single Port Mooring	Crude Receipt Terminal and Prod. Distrib. 19-45 mm ton/y: III. Sea Islan
Technical:			
Berth availability	Moderate depending on amount of protection and wave refraction. Limiting seas 3-4' (significant waves)	Lost days fewer due to weather. Limiting seas 6-8' (significant waves).	Same as Case
Susceptibility to Damage	Mod. to high depending on protection.	Mod. to low. Damage to hawsers & hoses require relatively short time to repair. Technology rapidly advancing.	Same as Case
Flexibility	More expensive to modify or design sea island terminal to accomodate variety of tankers - a necessity if Georges Banks are developed.	Can accept broad range of tankers. Add't SPM's can be installed in a relatively short time (6-7 months)	Same as Case
Siting Considerations	Generally restricted to protected or quiescent waters.	SALM* designed specifically for moderate to severe seas and deeper water.	Same as Case
Transfer Rates	Highest: 100-200,000 bbl/hr.	Lowest: 75-125,000 bbl/hr.	Loading produ involves high pressures. Mor valving & eas overflowed tankers.
Resupply	Easiest if marine bunker lines are laid to berth.	Difficult and costly	Ballast water pumped ashore for treatment

* Single Anchor Leg Mooring - an advanced SPM system.

Qualitative Summary Comparisons (Con't)

	Crude Receipt Terminal Only; 13-35 million tons/year with on-shore product pipeline distribution		Crude Receipt Terminal and Product Distribution 19 - 45 million tons/year
echnical and conomic Characteristics	I. Sea Island	II. Single Point Mooring	III. Sea Islands
conomic:			
Capital Investment & Operating Costs	Although sea islands are generally more costly to construct than SPM's, there are cost differences between major components of the two systems which can only be balanced by a thorough analysis of the entire tanker, terminal, and distribution system as a whole. These include the costs of possible break-waters and control platforms, pipeline and refuel-ing systems at SPM's.		The same is true for the onshore pipeline versus tanker distribution systen
mployment:			
Construction	Most components of either system would be pre-fabricated in large units out-of-state. Construc-tion is therefore not labor extensive for New Hampshire.		Onshore pipeline may emplc more New Hampshire labor than coastal distribution system in construction.
Operation	Sea Islands employ somewhat more operating labor than SPM systems, but neither is labor intensive (60-96 men).		

five miles offshore) could conceivably obliterate portions of the Isles from view from shore while an empty 250,000 DWT tanker was berthed. A monobuoy offshore, say 10 to 15 miles, would not by itself be visible from shore, and the visual impact of the tankers would be much less. A facility further offshore would have the added advantage of being positioned away from areas of heavy recreational boating and existing lobstering areas. It would also interfere less with other shipping entering Portsmouth Harbor.

The geographic area of water surface unsurped from other activities by a deepwater port is large. A study for the Massachusetts Port Authority revealed that a single point mooring facility had a typical mooring radius of 1,500 feet, and would require a maneuvering radius of perhaps 6,000 feet (exact radius would vary with location), certain portions of which would be used by a mooring tanker, depending on weather conditions. The circle with a 1,500 foot radius (about 160 acres) would be denied to all other uses. The area enclosed in the 6,000 foot radius circle (about 2,560 acres) would be denied to other users a portion of the time. The further offshore the port is located, the less interference with existing coastal activities, most of which take place within three to five miles off New Hampshire's coast, could be expected to occur. Offsetting these advantages would be the cost of pipelines to a facility 10 miles offshore and the increased severity of operating conditions, both of which might make any such site unattractive to industry, especially if sites costing less to develop were found elsewhere in the Northeast.

The economic impacts of a deepwater port facility would most likely be significant. They are site and situation specific, however, and only rough numbers can be given and there only in selected cases. A single-point mooring facility (the only type for which detailed data is available) would require a total constructive workforce of perhaps 1,000 men, including 250 project management types employed for two to three years and 750 construction workers, employed

Table 5

Estimated Construction Labor Factors For Deepwater Crude Oil Terminal

	Est. Avg. Work Force	Est. Constr. Duration (Months)	Est. Employees Temporarily Relocated[3]	Est. '72 Avg. Yrly. Salary/ Wage Level
Total Construction Force	1,000	12-36	115	$12,000
Project Management	250	36	15	$14,000
Management	20	36	15	$20,000
Administrative Support	30	36	--	$10,000
Engineering/Design[2]	200	24	--[2]	$14,000
Construction	750	12	100	$11,600
Skilled	300	12	100	$14,000
Semi-skilled	450	12	--	$10,000
Unskilled	---	--	--	---

[1]Monobuoy design

[2]Major portion of this work would be done outside New Hampshire

[3]Based upon Massachusetts site; New Hampshire numbers likely to be higher

Sources: Shell Oil Company
Arthur D. Little, Inc.
DRED (1973)

for perhaps 12 months each. Table 5 gives a listing of these jobs, numbers of employees, numbers of relocations into the construction area necessary, and average 1972 wages by job-type. Operation of the port might require 75 men for a 500,000 barrel per day facility with a gross payroll upwards of $1,000,000 annually (See Table 6). This employment level includes jobs at a booster pumping station and the terminal tank farms. Numbers employed could run 50% higher depending on the type of facility. (Note: all above information appeared in "Economic Impact of Oil Refinery Location in New Hampshire," Department of Resources and Economic Development, December 1973).

In addition to the above direct employment increases, indirect employment increases must be considered. These indirect effects include increases in employment in service industries which provide inputs of materials, power, transportation, etc., that support the actual construction or operation of a deepwater port. Additionally, the presence of a deepwater port might stimulate the introduction of related industries such as petrochemical industries. These new industries, in their turn, would have direct and indirect effects upon the employment picture in the coastal zone planning area. The establishment of a deepwater port would also impact some existing coastal industries. It is beyond the scope of this paper to quantify these impacts. However, the expectation is that they would be negative, deepwater ports being a competing use. The major coastal industries which might be expected to feel the impact are: the $1.4 million fishing industry off the New Hampshire coast (see "Domestic Commercial Fishing and Lobstering" inventory); the $10 to $20 million beach recreation industry, (see "Economic Impact of Beach Recreation on the New Hampshire Coastal Zone"); and the estimated $5 million per year sport saltwater finfish and shellfish industry (see "Recreational Fishing and Boating" inventory).

TABLE 6

ESTIMATED EMPLOYMENT FACTORS FOR OPERATION OF A DEEPWATER CRUDE OIL TERMINAL[1]

	Estimated Employment	Estimated Employees Relocated	Estimated 1972 Average Yearly Salary/ Wage Level
Total Employment[2]	75	20[3]	$12,000
Administrative	20	5	$11,750
Executive	5	2	$20,000
Support	15	3	$ 9,000
Operative Employment[4]			
Skilled	55	15	$12,100
Semi-skilled	45	15	$13,000
Unskilled	--	--	--

[1] Monobuoy design

[2] Employment for fixed or floating pier could be about 50% higher

[3] Assumes 6 month training program before operations begin

[4] Includes employment at the booster pump station and the terminal tank farm

SOURCES: Shell Oil Company
U.S. Army Corps of Engineers
Arthur D. Little, Inc.
DRED (1973)

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