CONNECTICUT RIVER FLOOD CONTROL PROJECT

HOLYOKE, MASS.

CONNECTICUT RIVER, MASSACHUSETTS

ANALYSIS OF DESIGN FOR LOCAL PROTECTION WORKS

FISCAL YEAR 1939 DIKE SECTION, ITEM H1.2
INCLUDING PUMPING PLANTS – CONTRACT

APPENDIX A

APRIL, 1939

CORPS OF ENGINEERS, U.S. ARMY

U.S. ENGINEER OFFICE PROVIDENCE, R.I.

NEDED-R (13 Sep 65) 2nd Ind
SUBJECT: Detailed Project Report for Small Navigation Project, Andrews River, Harwich, Massachusetts

U. S. Army Engineer Div., New England, Waltham, Mass.

TO: Chief of Engineers, ATTN: ENGCW-PD 7 April 1966

1. The plan and report have been revised in accordance with the comments contained in the preceding indorsement.

2. In view of the changes involved, 10 copies of the complete report, as revised, have been assembled and are submitted herewith.

3. The Governor of Massachusetts has been informed of the proposed project and his comments endorsing the project are included in the report. The Governor's letter is printed as part of Appendix A.

Incl (10 Cys)
as

REMI O. RENIER
Colonel, Corps of Engineers
Acting Division Engineer

ENGCW-PD (13 Sep 65) 1st Ind
SUBJECT: Detailed Project Report for Small Navigation Project, Andrews River, Harwich, Massachusetts

DA, CofEngrs, Washington, D. C. 20315 23 December 1965

TO: Division Engineer
New England Division

1. The plan and report should be revised in accordance with the review comments provided herein. After revision, the comments of the Governor of Massachusetts may be obtained and the report submitted for final approval and adoption of the project.

2. The need and justification for the 3-acre maneuvering and anchorage basin is not established. No benefits have been accredited to it. In view of the demand for marina space, it would appear preferable that the area be used for additional marina facilities.

3. It is indicated that serious accretion problems would occur at the entrance to Andrews River without provision of stabilization. The analysis of littoral processes as presented in paragraphs 18, 19 and 21 appears somewhat questionable. More likely the supply of littoral material from the west is completely cut off by the Wychmere Harbor breakwater and the accretion west of Andrews River is caused by westward movement resulting from waves from the southeast and southerly waves diffracted by the breakwater. The bar trailing in a SW direction is consistent with this analysis. Under these conditions it is probable that the existing jetty west of the river mouth would suffice for protection on that side of the river. If another west jetty or extension of the existing one is included, it should be supported by actual analysis of incident waves expected to determine probable effects at the shore using refraction and diffraction analysis. The proposed bank revetment might well be connected to that jetty. As the westward littoral movement east of the river mouth is probably quite small, a somewhat shorter, possibly to the low-water line, jetty may be adequate on the east side of the river. In view of the modified analysis outlined above, it is believed that construction of jetties at the mouth of Andrews River would result in minor accretion to the shore for a short distance east thereof, but would have no effect on the shore to the west.

a. Par. 22-23. As the Andrews River area is protected by Monomoy Island against waves from the Atlantic Ocean, the hindcast data for Nauset Beach are not considered applicable to the study area without considering effects of refraction, diffraction and shoaling.

b. Par. 23. It would have been desirable to state the design water level, frequency of occurrence thereof and depth assumed in obtaining the breaking depth of the design wave with height of 6.4 feet.

c. Par. 24. The stone weights derived are inconsistent with the assumptions in that a K_Δ of 2.5 with a 1 on 2 slope would give a lesser weight than a K_Δ of 3.0 with a 1 on 1½ slope. Clarification is suggested in deriving the design of stone sizes to be specified.

d. Par. 36. The proposal to place part of the dredge spoil north of the Route 28 highway bridge is noted. It would be desirable from the viewpoint of beach improvement to place all sandy material on the shore east of the mouth of Andrews River to alleviate to some degree the adverse effect of the Wychmere Harbor breakwater.

4. Paragraph 16 states that serious overcrowding exists in Allen and Wychmere Harbors. However, the benefit evaluation assumes that only 10 boats would transfer and assumes 40 new boats and 20 transient boats for a total of 70 boats. It would seem more reasonable to assume a greater transfer of boats to alleviate overcrowding.

5. The requirement for local interests furnishing lands, easements and rights-of-way should read as follows: "Provide without cost to the United States all lands, easements and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads and embankments therefor or the costs of such retaining works."

6. The Fish and Wildlife Service recommends special handling of the spoil. The report should indicate how their request will be handled.

FOR THE CHIEF OF ENGINEERS:

Incl
3 cys w/d

CRAWFORD YOUNG
Colonel, Corps of Engineers
Assistant Director of Civil Works
for Atlantic Divisions

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASS. 02154

ADDRESS REPLY TO:
DIVISION ENGINEER

REFER TO FILE NO. NEDED-R

13 September 1965

SUBJECT: Detailed Project Report for Small Navigation Project, Andrews River, Harwich, Massachusetts

TO: Chief of Engineers
ATTN: ENGCW-PD

1. In accordance with EM 1165-2-107, there is submitted for review and comment an advance draft of the subject report.

2. Responsible officials of the State of Massachusetts and Town of Harwich concur in the recommended project and have given firm indications that the requirements of local cooperation would be met. Formal assurances of participation will be obtained from the State and Town during preparation of final design of the project.

3. The plans and specifications will be prepared in accordance with the Detailed Project Report as approved. Funds in the amount of $5,000 for preparation of the plans and specifications and $141,000 for the Federal share of construction will be required. The local share will be $166,000 or 50% of the estimated project cost.

4. Formal comments of the Governor of Massachusetts will be requested after approval of the advance draft.

Incl
(12 Cys)

E. J. RIBBS
Colonel, Corps of Engineers
Acting Division Engineer

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASS. 02154

ADDRESS REPLY TO:
DIVISION ENGINEER

REFER TO FILE NO. NEDED-R

13 SEP 1965

DETAILED PROJECT REPORT
SMALL NAVIGATION PROJECT
ANDREWS RIVER, HARWICH, MASSACHUSETTS

PERTINENT DATA

1. Purpose. - To provide a channel protected by two jetties, and anchorage of sufficient depth to alleviate over-crowded conditions at existing Harwich harbors and to provide adequate room, through provision of a self-liquidating marina, for the increasing recreational fleet.

2. Location. - Situated 85 highway miles southeast of Boston.

3. Existing Project. - There is no existing Federal project at Andrews River.

4. Improvement Desired. - A channel 100 to 250 feet wide, a short jetty on the east side of the harbor entrance, a 4-1/2 acre anchorage and a 102 slip marina.

5. Recommended Improvement. - A channel 6 feet deep, 75 feet wide, from deep water in Nantucket Sound to the vicinity of the marina, two jetties on the east and west sides of the harbor entrance, and a 3-acre maneuvering and anchorage basin subject to the condition that local interests construct a 50-slip marina.

6. Estimated Project Cost.

50-Slip Marina

Federal	Federal	Non-Federal	Total
Channel, jetties, & anchorage	$166,000*	$166,000*	$332,000*
Navigation Aids	25,000	-	25,000

R 4/66

Non-Federal	Federal	Non-Federal	Total
50-Slip marina & attendent facilities	-	$178,000	$178,000
	$191,000	$344,000	$535,000
100-Slip Marina			
Federal			
Channel, jetties & anchorage	$166,000*	$166,000*	$332,000*
Navigation Aids	25,000	-	25,000
Non-Federal			
100-Slip marina & attendent facilities	-	304,000	304,000
	$191,000	$470,000	$661,000

*Cost apportioned as 50% Federal and 50% non-Federal in accordance with proportion of general and local benefit to total benefits.

7. Comparison of Benefits and Costs

a.	Total Federal Project Cost		$357,000
b.	Total Annual Charges		23,550
		50-Slip marina	100-Slip marina
c.	Benefits	$28,400	$48,000
d.	B/C Ratio	1.2 to 1	2.0 to 1

8. Requirements of Local Cooperation. -

a. Contribute 50 percent of the first cost of construction of the Federal project, said contribution currently estimated at $166,000.

b. Assume full responsibility for all project costs in excess of the $500,000 Corps of Engineers' limitation under Section 107 of the 1960 River and Harbor Act, as amended.

c. Construct and maintain a public marina of 50 slips, a public landing with berths commensurate with the channel depth, access roads, parking areas and other public use facilities open to all on equal terms. All slips and berthing facilities are to be provided outside the limits of the Federal project.

d. Hold and save the United States free from damages which may result from construction and maintenance of the project.

e. Provide without cost to the United States, all lands, easements and rights-of-way required for construction and

subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required, in the general public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads and embankments therefor or the costs of such retaining works.

f. Regulate the use, growth and development of the harbor facilities with the understanding that they will be open to all on equal terms.

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PHOTOGRAPH

Aerial View - Andrews River, Harwich, Massachusetts

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U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASS. 02154

ADDRESS REPLY TO:
DIVISION ENGINEER

REFER TO FILE NO. NEDED-R

13 SEP 1965

DETAILED PROJECT REPORT
SMALL NAVIGATION PROJECT
ANDREWS RIVER, HARWICH, MASSACHUSETTS

AUTHORITY

1. This report is submitted under the authority of Section 107 of the 1960 River and Harbor Act. Request for this study was made by the Board of Selectmen, Town of Harwich, Massachusetts, by letter dated 24 September 1962. Specific authorization to investigate the possibility of developing a small navigation project at Andrews River, Harwich, Massachusetts, was provided by 1st Indorsement, dated 16 October 1962, from the Chief of Engineers.

PURPOSE AND EXTENT OF STUDY

2. Detailed engineering and economic studies were undertaken to determine whether a Federal navigation improvement at Andrews River was feasible and economically justifiable. Data on the use of nearby harbors was studied to determine the adequacy of present facilities and the need for harbor improvements in the area. Hydrographic surveys, including soundings, probings and borings, and topographic surveys provided information as to the character and quantities of materials to be dredged from the harbor. Additional information was obtained from local and State officials, other agencies and from a public hearing held in Harwich on 18 April 1963. Available maps, charts and aerial photographs were studied and field trips were made to observe present conditions.

DESCRIPTION

3. The Town of Harwich is a growing community located on the south side of the Cape Cod peninsula along the south shore of Massachusetts. It has access to the sea through three presently developed harbors, Herring River, Allen Harbor and Wychmere Harbor. Available, but presently undeveloped, are two additional waterways at Andrews

River and Red River. Facilities at the 3 existing waterways are overtaxed and local interests have indicated a desire to develop Andrews River to provide room for the rapidly expanding recreational fleet. Andrews River is a small stream which drains 2-1/2 square miles of tidal marsh in an area immediately east of Wychmere Harbor. Situated on Nantucket Sound, Andrews River is within easy driving distance of Boston some 85 miles over limited access highway to the northwest. The area under consideration for improvement is undeveloped and consists of approximately 15 acres of sandy tidal marsh at elevations ranging from 2 to 5 feet above mean low water. The mean rage of tide is 3.7 feet. According to the U. S. Fish and Wildlife Service, there are no significant shellfish to be found at Andrews River. Deposition of spoil in the upper reaches will have no significant effects upon fish and wildlife resources.

TRIBUTARY AREA

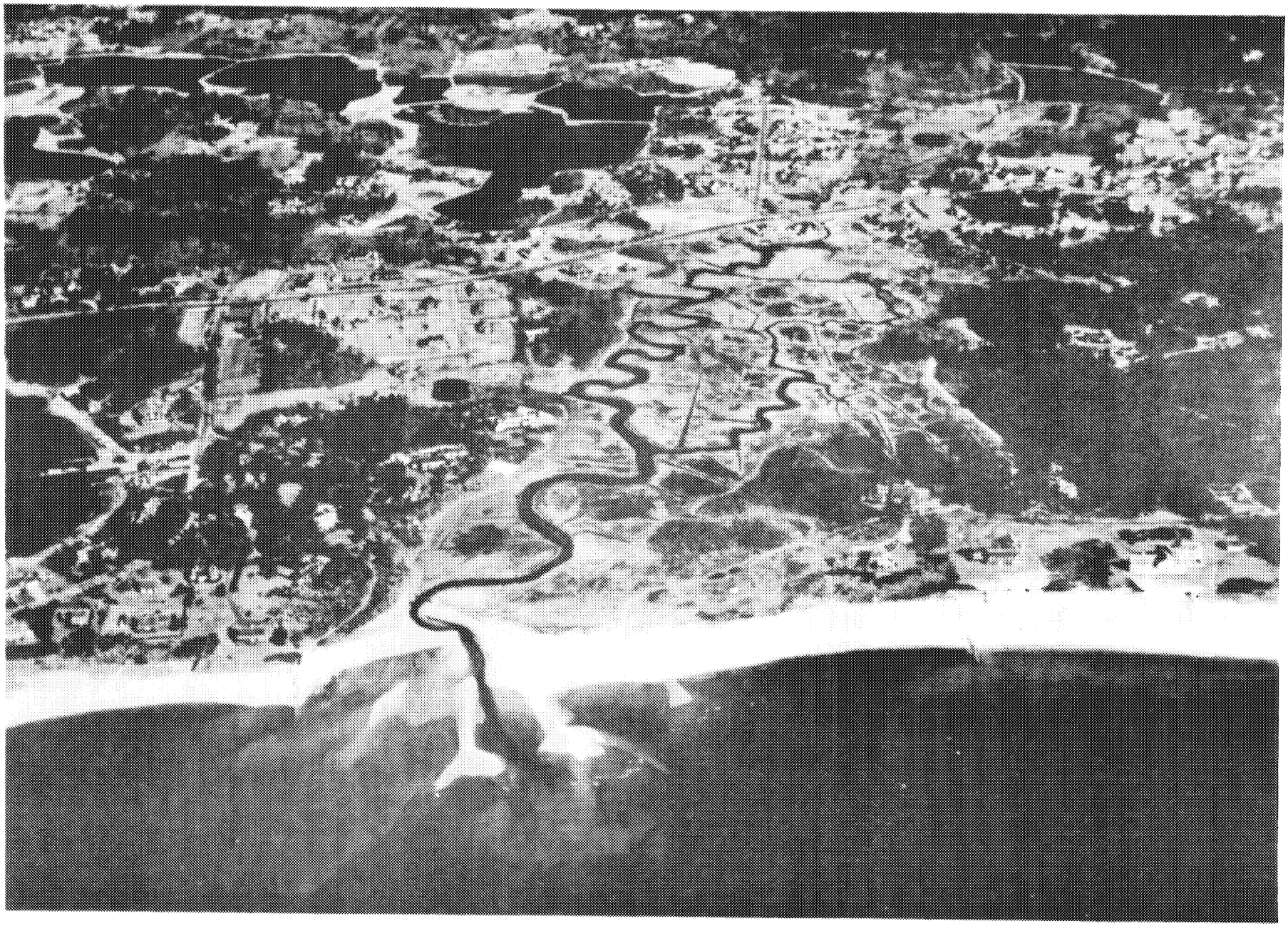
4. The area immediately tributary to Andrews River includes the Towns of Harwich, Chatham and Dennis. Like other Cape Cod communities bordering on Nantucket Sound, Harwich is largely dependent upon the summer tourist trade for its livelihood. In addition to catering to summer residents, the principal industries and occupations include food processing, fabricating metals, and instrument manufacturing. The permanent population in Harwich remained relatively stable until 1950 when improved road conditions from Boston started an influx of new summer and permanent residents. In 1960, the population was reported at 3,747 an increase of 41 percent over the 1940 census. Since 1950, Harwich has grown at a rate paralleling that of Barnstable County, and exceeding that of the State. The number of new dwellings constructed since 1950 has shown an equivalent rate of growth. A large percentage of the dwellings in the Town are owned by summer residents, although year-round use of homes by retired people is increasing.

BRIDGES AFFECTING NAVIGATION

5. There are no bridges that pass directly over any portion of the area under consideration for improvement. In the upper reaches beyond the proposed project, the Route 28 highway bridge crosses over Andrews River.

PRIOR REPORTS

6. Andrews River has not been the subject of a previous Federal navigation report.



Andrews River, Harwich, Massachusetts

EXISTING CORPS OF ENGINEERS PROJECT

7. There are no Federal projects in the immediate vicinity of Andrews River. The nearest Federal projects are located five miles east at Stage Harbor in Chatham and 10 miles west at Hyannis. Nearby Wychmere and Allen Harbors, and Herring River have been improved by the Commonwealth of Massachusetts and the Town of Harwich.

OTHER IMPROVEMENTS

8. No improvements at Andrews River have been initiated by local or State interests prior to this report.

TERMINAL AND TRANSFER FACILITIES

9. The present facilities at the existing 3 harbors are filled to capacity. Accommodations between both Allen and Wychmere Harbors include 5 commercial and 3 public landings, and a recreational landing for dinghies only. Other facilities at both harbors include boatyards that can service craft up to 60 feet in length, launching equipment with capacity up to 20 tons, and storage for 200 small boats. The two yacht clubs at Wychmere and Allen Harbors have docking and mooring facilities for 197 recreational craft. Some 275 transient boats make use of these facilities annually. In addition to the recreational fleet, there is a small fishing fleet based in Harwich. This fleet consists of 7 small trap boats, 2 gill net boats, 1-40' trawler, 2-40' seiners and 1-6-' dragger.

IMPROVEMENT DESIRED

10. A public hearing was held at the Harwich Elementary School, Harwich, Massachusetts on 18 April 1963 to determine the nature and extent of improvements desired by local interests. A plan, presented by the Harwich Waterways Study Committee, would provide for a 102-slip marina, a 4-1/2 acre anchorage, a channel 100 to 250 feet wide and a short jetty on the east of the channel entrance. No other plans of improvement were proposed.

11. Local interests stated that overcrowded conditions at Allen and Wychmere harbors and the rapid growth of recreational boating in recent years revealed a definite need for additional docking and mooring facilities in Harwich. It was further stated that the chief advantages in developing the Andrews River project are:

a. It is conveniently located near the Town's business section.

b. Its development will cause minimum inconvenience to abutting neighboring residents.

c. Its natural outlet to Wychmere Outer Harbor and Nantucket Sound means lowest cost of development.

d. As a conservation feature, the marsh area is of minimal value.

e. Its careful development can preserve and enhance its scenic value. Much perimeter marsh land will remain in its natural state.

f. Its north end, where the public facilities will be located is within a business zoned area which will be a town maintained operation with direct access to a state highway (Route 28) requiring no road construction or increased traffic on residential streets.

In general, the attitude of local interests at the hearing was in favor of the improvement proposed by the committee. Objections were raised by several property owners to any perimeter roads adjacent to the proposed improvement. By a show of hands, 56 people at the hearing favored the improvement against 11 opposed and with 9 abstaining.

EXISTING AND PROSPECTIVE COMMERCE

12. The combined fleet of 13 fishing vessels locally based in Harwich, caught in the past 5 year period an average of 232 tons of mixed fish. Twelve transient fishing vessels also make use of the facilities at these harbors.

13. Primarily a resort area, major activities on the waterways are centered around the recreational fleet. The estimated value of the 270 boats moored at Wychmere and Allen Harbors is $1, 500, 000. On peak summer weekends the fleet is augmented by transient craft plying the protected waters of Nantucket Sound. Local interests estimate that as many as 1600 transient craft visit Harwich during the season. With the rapid growth of recreational boating in New England, a new harbor such as proposed at Andrews River, is assured of maximum use.

VESSEL TRAFFIC

14. There is no complete record of vessel traffic at Harwich. Based on information furnished by local interests, the 13 fishing vessels make 90 trips per year per vessel. It is difficult to determine the number of trips recreational craft make in and out of Harwich. However, experience shows that recreational craft will average at least 2 trips per week during a season. On that basis, recreational craft average (2 x 17 weeks x 270) 9,180 trips per season.

DIFFICULTIES ATTENDING NAVIGATION

15. The problems confronting the Town of Harwich are similar to those at shorefront communities throughout southern New England. Construction of moorings and slips have failed to keep pace with the growth of recreational boating. In a recent nation-wide study made by the National Association of Engine and Boat Manufacturers, it was reported that of 417 marinas contacted 279 had turned people away and 233 had waiting lists. Local authorities at Harwich reported that more than 300 boat owners were denied facilities of any kind in 1962.

16. Lack of space and facilities have resulted in serious overcrowding in Allen and Wychmere Harbors. Potentially, the boats are subject to serious storm damage due to short scope moorings. New berthing and mooring areas would help relieve the present overcrowded conditions and provide additional space needed for the expanding recreational fleet, and which cannot be provided in the existing improved harbor due to lack of space.

WATER POWER AND OTHER SPECIAL SUBJECTS

17. The waterway under consideration is tidal. There is no problem involved in this study concerning water power or flood control. The Fish and Wildlife Service has reported (see App. B) that deposition of material in the areas considered would have no adverse effects to fish and wildlife resources.

PLAN OF IMPROVEMENT

18. Analysis of the Problem. - Consideration was given to the plan of improvement proposed by local interests. Detailed studies of littoral processes at the inlet to Andrews River revealed that serious shoaling problems could occur without stabilization. The ebb and flow of tidal currents has resulted in the formation of a small delta

at the mouth of the river. Observation of the flowing current disclosed a constant movement of material. The shape of the delta is complicated by wave patterns during rising and falling tides which combine with these tidal currents resulting in a predominant gravelly bar trailing in a southwest direction. The coarse material which forms the bar is evidence of a lack of sand supply predominantly from the west which is retained by the jetty at Wychmere Harbor. Also waves break on the bar causing a steepening of the slopes and a sorting out of the coarse material in the surf zone.

19. The jetty and breakwater at Wychmere Harbor, although being effective in preventing movement of a large supply of littoral material past it from the west causes some detrimental effects to the Andrews River entrance. Long period waves from the south through the east tend to move in a clockwise direction after reflecting from the jetty. This results in accretion and widening of the beach immediately west of the proposed Andrews River Inlet. Also, during southwest storms, diffraction of waves around the jetty results in a small amount of fine material settling out in this natural settling basin. Thus, the critical littoral currents even from southeasterly storms are reversed to cause accretion west of the inlet.

20. Consideration was given to providing a waterway from the existing Wychmere Harbor to Andrews River so as to provide one common inlet and thereby limit shoaling problems. This could be accomplished by a channel across interior marshland, but land taking and road relocation costs would be prohibitive.

21. Serious accretion problems would occur at the entrance to Andrews River without provision of stabilization. In order to limit shoaling problems, two jetties are proposed which would terminate at seaward elevations of 4 feet and 2 feet on the west and east sides respectively, of the harbor entrance. Construction of the west jetty would be deferred until experience established the necessity therefor due to accretion west of the harbor entrance and channel shoaling.

22. Design Factors. - The proposed protective jetties are designed to provide protection against wave attack during ordinary weather conditions of comparatively frequent occurrence and to provide a stabilized entrance. Specific design factors are described in the following subparagraphs.

a. Design Tide. - The design tide is the maximum elevation which occurs once a year. Although statistics are meager,

it is estimated that the elevation of design tide is 5.7 feet above mean low water. (Mean range plus 2.0 feet)

b. Design Wave. - The maximum fetch across Nantucket Sound from south-southeast is 25 nautical miles. Using wave forecasting curves, the various wave heights possible to attain with varying wind speeds for a fixed fetch of 25 nautical miles are listed below:

WIND SPEED	DURATION	WAVE HEIGHT	PERIOD
80 MPH	2.3 Hrs.	18'	9.0 Sec.
70 MPH	2.5 Hrs.	15.5'	8.5 Sec.
60 MPH	2.7 Hrs.	13'	7.8 Sec.
50 MPH	2.8 Hrs.	10.3'	7.4 Sec.
40 MPH	3 Hrs.	8'	6.5 Sec.

23. From the tabulations, waves 13 feet high could be generated by 60 MPH winds across this limited fetch. Checking the depth of water at the outer structure to determine if a wave of this height could be sustained without breaking, by using the solitary wave formula H - d/1.28 with an average depth of 8.2 feet, it was determined that waves would break at a height of 6.4 feet. The design wave of 6.4 feet was therefore considered.

c. Stone Sizes. - The minimum size and the slopes of cover stones in a protective structure were computed using the United States Army Waterways Experiment Station Formula $W - \frac{WrH^3}{K_\Delta (S_r - 1)^3 \cot \alpha}$

Where W = Weight of stone in pounds
W_r = Unit weight of stone in pounds/cu. ft.
K_Δ = A coefficient; 3.0 for the trunk, 2.5 for the head
S_r = Specific gravity $Wr/Ww = \frac{\text{Unit wt. of stone}}{\text{Unit wt. of water}}$
$\cot\alpha$ = Angle of slope to the horizontal
H = Wave ht of structure

24. Minimum weights of armor stone and slopes were determined as tabulated below:

Wave Ht.	Slope	K_Δ	Min. Weight
6.4'	1 on 2	2.5	1 - 1-1/2 tons
6.4'	1 on 1-1/2	3.0	1 - 1-1/2 tons

The core would consist of quarry run stone with sufficient fine material to make it sand tight. The jetty would have a top width of 5 feet. The top elevation of the two jetties would be 9.0 feet above mean low water at the shore than drop to 6 feet, which is above still water levels of most frequent storms. Although overtopping could occur, the frequency of occurrence would be not critical. Because of the shallowness of the area, no problems are contemplated on the construction or maintenance of the jetties. Revetment through the sand dunes at the north end of the jetties would be provided.

25. In view of the existing widths of other channels in nearby harbors, it is considered that a channel 75' in width would be sufficient to meet the needs of the existing and prospective recreational fleet.

26. The natural attractions of Nantucket Sound draw thousands of visiting craft from neighboring states each summer season. At Harwich, local officials estimate that 1,600 transient craft visit or make use of public launching areas during an average season. Because of limited facilities, many of these craft which request overnight accommodations, have to be turned away. The eventual development of the marina will provide for a little over 100 boats. With this large number of boats in a limited area, sufficient room has to be provided for maneuvering or else heavy boat traffic would negate the effective use of the marina. It is considered that a minimum of 3 acres be provided for this purpose. In the initial development of the 50-boat marina, the area would serve in part as anchorage for the transient fleet. The 3-acre area was not considered incrementally, since it is considered essential to the overall development of the project.

27. In summary, the plan of improvement that would best meet the needs of the existing and prospective recreational fleets would provide: (a) a 6' x 75' channel from deep water in Nantucket Sound to the site of the proposed marina; (b) a 3-acre maneuvering and anchorage area; (c) two protecting jetties at the harbor entrance; the west jetty to be constructed only when and if needed; and (d) a 100-slip marina. The marina would be self-liquidating and would be built in two stages. Initially, 50 slips would be construction and then dependent upon the demand and available financing, the remainder would be completed. Other self-liquidating facilities would include a public launchway, parking lot, harbormaster building, and attendant utilities.

ESTIMATE OF BENEFITS

28. Improvement of Andrews River would result in substantial benefits to the existing and prospective recreational fleets. Benefits to the existing fleet would accrue as a result of alleviation of overcrowded conditions in Allen, Wychmere Harbor, and Herring River and the prospective fleet would benefit by allowing sufficient room for the eventual expansion of the fleet.

29. Recreational benefits have been computed on the basis of the amount of net annual return to the owners, if the boats were for hire. The net annual return is expressed as a percentage of the boats' average depreciated value. An estimate was made of the present annual return by taking into consideration such factors as shallow depths, lack of available berthing and mooring facilities, and other deficient navigational conditions. Then an estimate was made of the percent of optimum use which could be received under the proposed improvements. The difference or gain between the two conditions was considered the benefit. Evaluated benefits accruing to the existing and attracted transient fleets amount to $5,700 and to new boats purchased as a result of the improvement $42,300. Total benefits amount to $48,000. No significant benefits would be realized by the fishing fleet or by the smaller rowboats. No significant land enhancement benefits are anticipated, as diking costs are estimated about equal to added land values resulting from disposal of dredged material.

30. The existing recreational fleet consists of 273 boats excluding 60 rowboats. These craft range in size from 10' for the inboard and outboard class to 60' in the larger auxiliary sailboat and cruiser class. The total depreciated value of the fleet is estimated to be $1,500,000.

31. Located in a summer resort area, the Town of Harwich has enjoyed a considerable growth of recreational boating activity. Although statistics are unavailable to determine the rate of growth in the past decade, from the demands made on existing mooring and docking facilities, it is expected that the initial 50 slips will be fully utilized immediately after construction by boats transferring from the existing overcrowded harbors and by new boats purchased because of the improvements. Derivation of benefits for the transferred boats and the new boats amount to $24,900 and are shown on Table I & II.

32. It is expected that the demand for additional spaces will be such, that the remaining 50 slips will be constructed within 10 years of initial construction and that they would be fully utilized within a short period of time. The total benefit for these new boats discounted to present worth amount to $19,600. (Table III)

TABLE I BENEFITS TO RECREATIONAL BOATING-NEW BOATS

HARBOR: ANDREWS RIVER 120 Day Season

Type of Craft	Length (feet)	No. of Boats	Depreciated Value Average $	Depreciated Value Total $	Ideal	Percent Return % of Ideal Pres.	Percent Return % of Ideal Ftr.	Gain	Value $	On Cruise Avg. Days	On Cruise % of Season	On Cruise Value $
Recreational Fleet												
Outboards	10-20	7	3,000	21,000	12	-	100	12	2,500			
Inboards	10-20	8	4,000	32,000	10	-	100	10	3,200			
Cruisers	15-30	3	8,000	24,000	8	-	100	8	1,900	10	8	150
	31-50	3	12,000	36,000	8	-	100	8	2,500	10	8	200
	51-60	1	20,000	20,000	7	-	100	7	1,400	20	16	200
Aux. Sail	15-30	6	7,000	42,000	8	-	100	8	3,400	10	8	300
	31-40	3	12,000	36,000	8	-	100	8	2,500	10	8	200
	41-60	1	20,000	20,000	7	-	100	7	1,400	20	16	200
Sailboats	10-20	6	1,000	6,000	11	-	100	11	700			
	21-30	3	3,000	9,000	10	-	100	10	900			
	31-40	1	8,000	8,000	9	-	100	9	700			
Charter Boats												
Cruisers	21-35	1	20,000	20,000	14	-	100	14	2,800			
TOTALS		40		274,000					$23,900			1,250
									- 1,250			
									$22,650	Say $22,700		

TABLE II, BENEFITS TO RECREATIONAL BOATING-EXISTING TRANSFERRED FLEET

HARBOR: ANDREWS RIVER, HARWICH — 120 Day Season

Type of Craft	Length (feet)	No. of Boats	Depreciated Value Average $	Depreciated Value Total $	Ideal	Percent Return % of Ideal Pres.	Percent Return % of Ideal Ftr.	Gain	Value $	Avg. Days	On Cruise % of Season	Value $
Recreational Fleet												
Outboards	10-20											
Inboards	10-20											
Crusiers	15-30	4	6,000	24,000	8	80	100	1.6	400	10	8	30
	31-50	4	10,000	40,000	8	75	100	2.0	800	10	8	65
	51-60											
Aux. Sail	15-30	4	5,000	20,000	8	80	100	1.6	300	10	8	25
	31-40	4	10,000	40,000	8	75	100	2.0	800	10	8	65
	41-60											
Sailboats	10-20											
	21-30	4	2,000	8,000	10	85	100	1.5	100	10	8	10
	31-40											
	41-60											
TOTALS		20		132,000					2,400			200
									- 200			
									$2,200			

R 4/66

TABLE III BENEFITS TO RECREATIONAL BOATING-NEW BOATS-GROWTH

HARBOR: ANDREWS RIVER, HARWICH

Type of Craft	Length (feet)	No. of Boats	Depreciated Value Average $	Depreciated Value Total $	Ideal	Percent Return % of Ideal Pres.	Percent Return % of Ideal Ftr.	Gain	Value $	On Cruise Avg. Days	On Cruise % of Season	On Cruise Value $
Recreational Fleet												
Outboards	10-20	8	3,000	24,000	12	-	100	12	2,900			
Inboards	10-20	8	4,000	32,000	10	-	100	10	3,200			
Crusiers	15-30	4	8,000	32,000	8	-	100	8	2,600	10	8	200
	31-50	4	12,000	48,000	8	-	100	8	3,800	10	8	300
	51-60	1	20,000	20,000	7	-	100	7	1,400	20	16	200
Aux. Sail	15-30	4	7,000	28,000	8	-	100	8	2,200	10	8	200
	31-40	4	12,000	48,000	8	-	100	8	3,800	10	8	300
	41-60	2	20,000	40,000	7	-	100	7	2,800	20	16	450
Sailboats	10-20	8	1,000	8,000	11	-	100	11	900	5	4	50
	21-30	5	3,000	15,000	10	-	100	10	1,500	10	8	100
	31-40	1	8,000	8,000	9	-	100	9	700	10	8	50
Charter Boats												
Cruisers	21-35	1	20,000	20,000	14	-	100	14	2,800			
TOTALS		50							$28,600			1,850
									- 1,850			
									$26,750 x .735 =$19,600			

TABLE IV BENEFITS TO RECREATIONAL BOATING-ATTRACTED TRANSIENT BOATS

HARBOR: ANDREWS RIVER, HARWICH — 120 Day Season

Type of Craft	Length (feet)	No. of Boats	Depreciated Value: Average $	Depreciated Value: Total $	Ideal	Percent Return: % of Ideal Pres.	Percent Return: % of Ideal Ftr.	Gain	Value $	On Cruise: Avg. Days	On Cruise: % of Season	On Cruise: Value $
Recreational Fleet												
Outboards	10-20											
Inboards	10-20											
Cruisers	15-30	5	6,000	30,000	8	70	90	1.6	480			
	31-50	5	10,000	50,000	8	70	90	1.6	800			
	51-60	2	20,000	40,000	7	55	90	2.5	1,000			
Aux. Sail	15-30	4	5,000	20,000	8	70	90	1.6	320			
	31-40	3	10,000	30,000	8	70	90	1.6	480			
	41-60	1	20,000	20,000	7	60	90	2.1	420			
Sailboats	10-20											
	21-30											
	31-40											
	41-60											
Charter Boats												
Cruisers	21-35											
	36-50											
	51-100											
TOTALS		20		200,000					$3,500			

$3,500 Benefit to attracted transient fleet

33. Upon completion of the project, at least 600 boats will remain in the harbor for periods up to 4 days apiece. This is equivalent to 20 locally based boats for a full boating season of 120 days. Benefits to transient craft amount to $3,500 and are shown on Table IV.

SHORELINE CHANGES

34. Shoreline changes would be observed after construction of the east jetty. From these observations, the need and justification of the west jetty would be determined.

REQUIRED AIDS TO NAVIGATION

35. The United States Coast Guard has been consulted on the need for additional aids to navigation, should improvement be effected. This agency has indicated that two jetty lights and three small buoys will be required. The lights are estimated to cost about $25,000 initially with an annual maintenance cost of $750.

ESTIMATE OF FIRST COST

36. An estimate of first cost for construction of the proposed plan of improvement has been made on the basis of soundings, probings and borings taken during March 1965. The materials to be dredged would be primarily medium to fine sand with some organic matter. Unit prices are based on prices prevailing in July 1965, and on the removal of the material by hydraulic methods with spoil disposal within one mile of the job site. Spoil areas are located in the area north of the Route 28 Highway bridge as approved by the U. S. Fish and Wildlife Service (see Appendix B). Excess sandy material would be placed on the shore east of the mouth of Andrews River as far as the public beach at Red River as requested by local interests. Dredging quantities are in terms of in-place measurement and provide for dredging to depths 6 feet below mean low water, plus an allowance for one-foot overdepth with side slopes one vertical to three horizontal.

Project Cost Estimate

Cost Acct. No.	Item		Estimated Cost
09	Dredging (ordinary materials)		July 1965 Prices
	75' channel	76,000 c.y.	
	3-acre Anchorage	63,800 c.y.	
		139,800 c.y.@ $1.25	$175,000

Project Cost Estimate (Cont'd)

Cost Account No.		Item		Estimated Cost
20		Structures		
	700'	E. Jetty	2,360 tons	
	850'	W. Jetty	4,800 tons	
		Revetment	540 tons	
			7,700 tons @ $8	62,000
				$237,000
			Contingencies	35,000
				$272,000
30		Engineering & Design		25,000*
31		Supervision & Administration		35,000
		Total Construction Cost		$332,000
		Aids to Navigation		25,000
		50-Slip Marina (local interests)		178,000
				$535,000

*Includes $20,000 for project study costs.

APPORTIONMENT OF COST AMONG INTERESTS

37. The first cost of construction of the proposed improvement have been apportioned between Federal and Non-Federal interests in proportion to the general and local benefits derived. The apportionment is as follows:

Item	Estimated Total Cost	Cost Apportionment Federal	Cost Apportionment Non-Federal
Cost Sharing		50%	50%
Federal Project	$332,000	$166,000	$166,000
Aids to Navigation	25,000	25,000	0
Total Federal Project	$357,000	$191,000	$166,000
Total Non-Federal Project	$178,000	0	$178,000
Total Project	$535,000	$191,000	$344,000

Summary of Apportioned Cost

Federal	Total Cost	$191,000
	Aids to Navigation	- 25,000
	Corps of Engrs. Cost	$166,000
Non-Federal	Cash Contribution	$166,000
	50-Slip Marina and attendant facilities*	178,000
		$344,000

*Self-liquidating

ESTIMATE OF ANNUAL CHARGES

38. Annual charges for the improvement have been estimated on the basis of a 50-year project life with Federal and non-Federal interest rates of 3-1/8 percent. Additional average annual maintenance charges are based on past experience with other harbors of similar size. However, since initial dredging will take place in shallow depths and in elevations above mean low water, it is estimated that initial shoaling in the inner channel and anchorage will be high but will reduce as the slopes stabilize. The average rate of shoaling is estimated at 3,800 c.y. per year. The annual maintenance of the two jetties is estimated at $700 per year. The average annual charges are computed as follows:

Federal Investment

Corps of Engineers	$166,000
Coast Guard	25,000
Total	$191,000

Non-Federal Investment

Cash Contribution	$166,000*
Total Investment	$357,000

*Exclusive of 50-Slip Marina and attendant facilities.

Annual Charges

Interest & Amortization (.03979 x 357,000)	14,500

Annual Charges (Cont'd)

Maintenance Dredging (3,800 c.y. @ $2 per c.y.)	7,600
Repairs to Jetty	700
Aids to Navigation	750
	$23,550

COMPARISON OF BENEFITS AND COSTS

39. A comparison of evaluated benefits and cost for the Federal improvement is as follows:

	1st Stage Development with 50-Slip Marina	Ultimate Development of 100-Slip Marina
Total Annual Benefits	$28,400	$48,000
Total Annual Charges	$23,550	$23,550
B/C Ratio	1.2	2.0

OPERATION AND MAINTENANCE

40. Maintenance of the channel, anchorage and jetties will be the responsibility of the United States. All other facilities will be maintained and operated by local interests. It is estimated that periodic dredging will be required every 10 years. The annual cost for maintenance dredging for the channel and anchorage and for repairs to the jetties is estimated at $7,600 and $700 respectively. Maintenance of the jetty lights and the 3 buoys will cost $750 a year, based on an estimate by the U. S. Coast Guard.

PROPOSED LOCAL COOPERATION

41. The benefits to be derived from improvement of Andrews River are entirely recreational in nature. Local interests would be required to:

a. Contribute 50 percent of the first cost of construction of the Federal project, said contribution currently estimated at $166,000.

b. Assume full responsibility for all project costs in excess of the $500,000 Corps of Engineers' Limitation under Section 107 of the 1960 River and Harbor Act, as amended.

c. Construct and maintain a public marina of at least 50 slips a public landing with berths commensurate with the channel depth, access roads, parking areas and other public use facilities open to all on equal terms. All slips and berthing facilities are to be provided outside the limits of the Federal project.

d. Hold and save the United States free from damages which may result from construction and maintenance of the project.

e. Provide without cost to the United States all lands, easements and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads and embankments therefor or the cost of such retaining works.

f. Regulate the use, growth and development of the harbor facilities with the understanding that they will be open to all on equal terms.

42. Local interests have been consulted on the plan of improvement and the indicated requirements of local cooperation and have by letter dated 6 July 1965 from the Town of Harwich and by letter dated 28 February 1966 from the Governor of the Commonwealth of Massachusetts provided reasonable assurances that these requirements will be met. These letters are included in Appendix A.

COORDINATION WITH OTHER AGENCIES

43. All Federal and local agencies that might have an interest in the improvement at Andrews River were notified of the public hearing. Representatives of Harwich, the State of Massachusetts, the U. S. Coast Guard and U. S. Fish and Wildlife Service have been consulted. concerning the effects of the proposed improvements on their activities. The Fish and Wildlife Service anticipates no significant adverse effect on commercial fishery resources as a result of the proposed improvements, and recommends that excess spoil be placed in an area north of the Route 28 bridge. They also recommend that this alternate area be suitably diked to prevent seepage of sediments into adjacent waterways and marshes. Coordination will be made with the Fish and Wildlife Service at the time of plans and specifications to fulfill this requirement.

SCHEDULE FOR DESIGN AND CONSTRUCTION

44. It is estimated that preparation of contract plans and specifications for the project will require 4 months. The estimated cost is $5,000. Construction of the project can be accomplished under a single contract to be completed in 1 year. Estimated expenditures are as follows:

(a) Allocated to date:	
Reconnaissance Report	$ 3,000
Detailed Project Report	17,000
(b) Required to Complete:	
Plans and Specifications	5,000
Construction, Engineering during Construction, Supervision & Administration	141,000
Total Cost (Corps of Engineers)	$166,000

CONCLUSIONS

45. The present and prospective needs of the rapidly expanding recreational fleet at Harwich Massachusetts would be met by a Federal navigation project at Andrews River which would provide a channel 6 feet deep, 75 feet wide from deep water in Nantucket Sound to the vicinity of the proposed marina, a 3-acre maneuvering and anchorage basin, and two protective jetties. This improvement would result in benefits to recreational boating that would yield a ratio of annual benefits to annual costs of 1.2 provided the Federal improvement is augmented by a 50 slip marina construction by local interests and 2.0 when the marina is increased in capacity to 100 slips. Local interests are willing and able to meet the requirements of local cooperation. At a Town Meeting held at Harwich on 5 March 1964, voters approved a $150,000 bond issue for use in development of a new harbor at Andrews River. By letter dated 28 February 1966 (see Appendix A) the Governor of the Commonwealth of Massachusetts indicated that funds for the Commonwealth's share of the Andrews River project were appropriated by the Massachusetts legislature.

RECOMMENDATIONS

46. In view of the foregoing, the Division Engineer recommends a Federal navigation project at Andrews River, Harwich, Massachusetts, to provide a channel 75 feet wide, 6 feet deep from deep water in Nantucket Sound to the vicinity of the proposed marina, a 3-acre maneuvering and anchorage basin, and two protecting jetties at the harbor entrance; at a Federal first cost of $191,000 for construction and an estimated $9,050 for future maintenance. Construction of the west jetty would be deferred until its need can be definitely established. This recommendation is made subject to the conditions that local interests (a) contribute 50 percent of the first cost of construction of the Federal project, currently estimated at $166,000; (b) assume full responsibility for all project cost in excess of the $500,000 Corps of Engineers' limitation under Section 107 of the 1960 River and Harbor Act; (c) construct and maintain a public marina of at least 50 slips, a public landing with berths commensurate with the channel depth, access roads, parking areas, and other public use facilities open to all on equal terms. All slips and berthing facilities are to be provided outside the limits of the Federal project; (d) hold and save the United States free from damages which may result from construction and maintenance of the project, (e) provide without cost to the United States all lands, easements and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of spoil and also necessary retaining dikes, bulkheads and embankments therefor or the costs of such retaining works, (f) regulate the use, growth and development of the harbor facilities with the understanding that they will be open to all on equal terms.

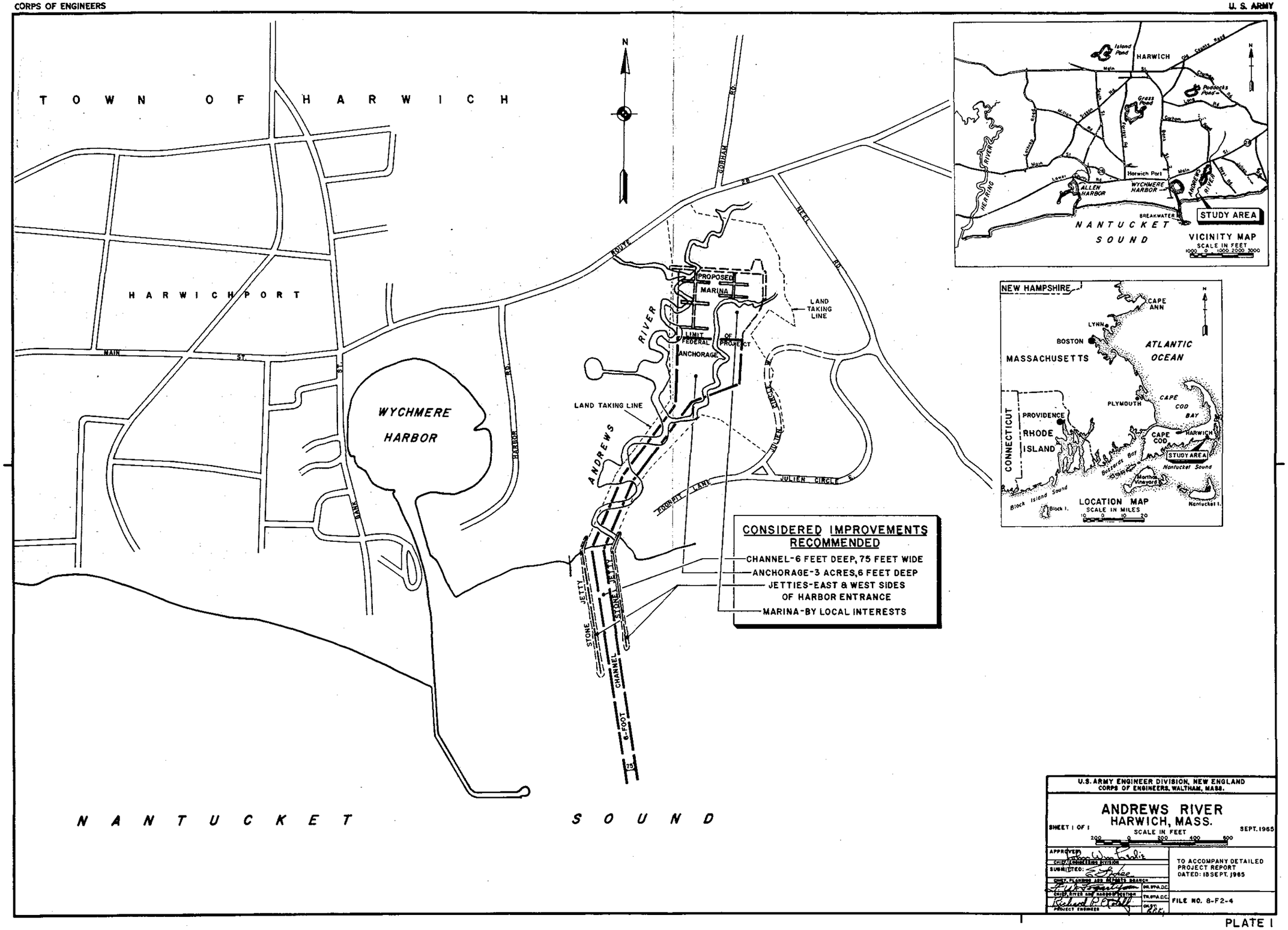
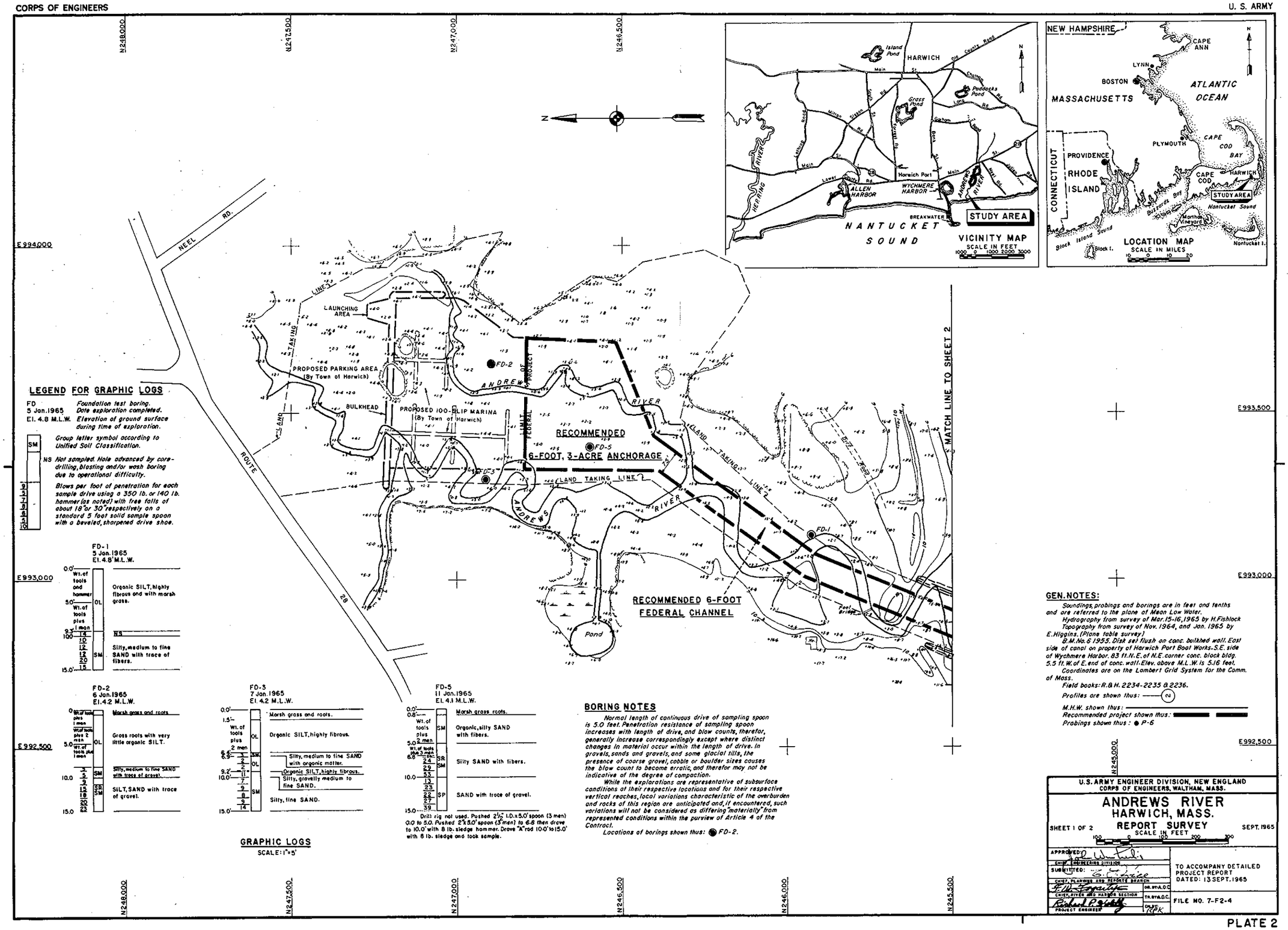

TOWN OF HARWICH
HARWICHPORT
MAIN ST.
WYCHMERE HARBOR
HARBOR RD.
SAND HILL LANE
ROUTE 28
GORHAM RD.
NEW RD.
ANDREWS RIVER
PROPOSED MARINA
LAND TAKING LINE
LIMIT OF FEDERAL PROJECT
ANCHORAGE
LAND TAKING LINE
JULIEN CIRCLE
FOOD PIT LANE
JETTY
STONE
CHANNEL
6-FOOT
NANTUCKET SOUND
CONSIDERED IMPROVEMENTS RECOMMENDED
CHANNEL-6 FEET DEEP, 75 FEET WIDE
ANCHORAGE-3 ACRES, 6 FEET DEEP
JETTIES-EAST & WEST SIDES OF HARBOR ENTRANCE
MARINA-BY LOCAL INTERESTS
HARWICH
Island Pond
Old County Rd.
Main St.
Grass Pond
Paddocks Pond
Lower Road
Gorham Rd.
Herring River
Main St.
Lower Road
Horwich Port
ALLEN HARBOR
WYCHMERE HARBOR
ANDREWS RIVER
BREAKWATER
STUDY AREA
NANTUCKET SOUND
VICINITY MAP
SCALE IN FEET
NEW HAMPSHIRE
CAPE ANN
LYNN
BOSTON
MASSACHUSETTS
ATLANTIC OCEAN
PLYMOUTH
CAPE COD BAY
CONNECTICUT
PROVIDENCE
RHODE ISLAND
CAPE COD
HARWICH
STUDY AREA
Nantucket Sound
Buzzards Bay
Martha's Vineyard
Block Island Sound
Block I.
Nantucket I.
LOCATION MAP
SCALE IN MILES
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS, WALTHAM, MASS.
ANDREWS RIVER
HARWICH, MASS.
SHEET 1 OF 1
SCALE IN FEET
SEPT. 1965
APPROVED:
CHIEF, ENGINEERING DIVISION
SUBMITTED:
CHIEF, PLANNING AND REPORTS BRANCH
CHIEF, RIVER AND HARBOR SECTION
PROJECT ENGINEER
DR. STA. D.C.
TR. STA. D.C.
CH. STA. D.C.
TO ACCOMPANY DETAILED PROJECT REPORT DATED: 18 SEPT. 1965
FILE NO. 8-F2-4

PLATE I



LEGEND FOR GRAPHIC LOGS

FD — *Foundation test boring.*
5 Jan. 1965 — *Date exploration completed.*
El. 4.8 M.L.W. — *Elevation of ground surface during time of exploration.*

SM — *Group letter symbol according to Unified Soil Classification.*

NS — *Not sampled. Hole advanced by core-drilling, blasting and/or wash boring due to operational difficulty.*

Blows per foot of penetration for each sample drive using a 350 lb. or 140 lb. hammer (as noted) with free falls of about 18" or 30" respectively on a standard 5 foot solid sample spoon with a beveled, sharpened drive shoe.

GRAPHIC LOGS

SCALE: 1" = 5'

BORING NOTES

Normal length of continuous drive of sampling spoon is 5.0 feet. Penetration resistance of sampling spoon increases with length of drive, and blow counts, therefor, generally increase correspondingly except where distinct changes in material occur within the length of drive. In gravels, sands and gravels, and some glacial tills, the presence of coarse gravel, cobble or boulder sizes causes the blow count to become erratic, and therefor may not be indicative of the degree of compaction.

While the explorations are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the overburden and rocks of this region are anticipated and, if encountered, such variations will not be considered as differing materially from represented conditions within the purview of Article 4 of the Contract.

Locations of borings shown thus: ● *FD-2.*

GEN. NOTES:

Soundings, probings and borings are in feet and tenths and are referred to the plane of Mean Low Water.

Hydrography from survey of Mar. 15-16, 1965 by H. Fishlock

Topography from survey of Nov. 1964, and Jan. 1965 by E. Higgins. (Plane table survey)

B.M. No. 6 1955. Disk set flush on conc. bulkhead wall. East side of canal on property of Harwich Port Boat Works. S.E. side of Wychmere Harbor. 83 ft. N.E. of N.E. corner conc. block bldg. 5.5 ft. W. of E. end of conc. wall. Elev. above M.L.W. is 5.16 feet.

Coordinates are on the Lambert Grid System for the Comm. of Mass.

Field books: R.&H. 2234-2235 & 2236.

Profiles are shown thus: —— (N)

M.H.W. shown thus: ——

Recommended project shown thus: ▬ ▬

Probings shown thus: ● *P-6*

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS, WALTHAM, MASS.

ANDREWS RIVER
HARWICH, MASS.
REPORT SURVEY

SHEET 1 OF 2 — SCALE IN FEET (100 0 100 200 300) — SEPT. 1965

APPROVED: [signature]
CHIEF, ENGINEERING DIVISION

SUBMITTED: [signature]
CHIEF, PLANNING AND REPORTS BRANCH

[signature]
CHIEF, RIVER AND HARBOR SECTION

[signature]
PROJECT ENGINEER

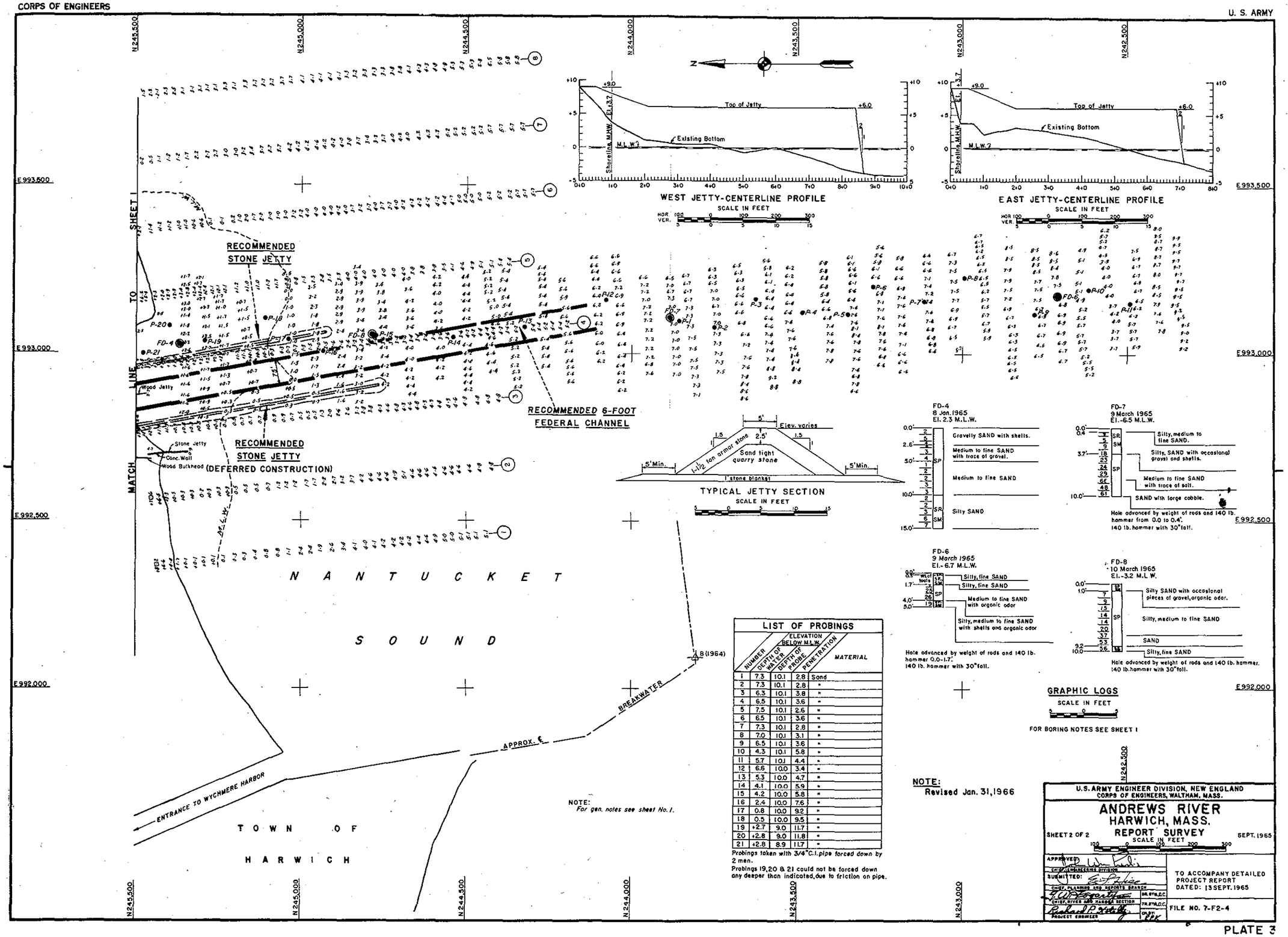
DR. BY: A.O.C.
TR. BY: A.O.C.
CHKD. BY: J.C.P.K.

TO ACCOMPANY DETAILED PROJECT REPORT DATED: 13 SEPT. 1965

FILE NO. 7-F2-4

CORPS OF ENGINEERS

U. S. ARMY



NOTE:
For gen. notes see sheet No. 1.

LIST OF PROBINGS

NUMBER	ELEVATION BELOW M.L.W. DEPTH OF WATER	DEPTH OF PROBE	PENETRATION	MATERIAL
1	7.3	10.1	2.8	Sand
2	7.3	10.1	2.8	"
3	6.3	10.1	3.8	"
4	6.5	10.1	3.6	"
5	7.5	10.1	2.6	"
6	6.5	10.1	3.6	"
7	7.3	10.1	2.8	"
8	7.0	10.1	3.1	"
9	6.5	10.1	3.6	"
10	4.3	10.1	5.8	"
11	5.7	10.1	4.4	"
12	6.6	10.0	3.4	"
13	5.3	10.0	4.7	"
14	4.1	10.0	5.9	"
15	4.2	10.0	5.8	"
16	2.4	10.0	7.6	"
17	0.8	10.0	9.2	"
18	0.5	10.0	9.5	"
19	+2.7	9.0	11.7	"
20	+2.8	9.0	11.8	"
21	+2.8	8.9	11.7	"

Probings taken with 3/4" C.I. pipe forced down by 2 men.
Probings 19, 20 & 21 could not be forced down any deeper than indicated, due to friction on pipe.

NOTE:
Revised Jan. 31, 1966

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS, WALTHAM, MASS.

ANDREWS RIVER
HARWICH, MASS.
REPORT SURVEY

SHEET 2 OF 2 — SCALE IN FEET — SEPT. 1965

APPROVED: CHIEF, ENGINEERING DIVISION
SUBMITTED: CHIEF, PLANNING AND REPORTS BRANCH
CHIEF, RIVER AND HARBOR SECTION
PROJECT ENGINEER

TO ACCOMPANY DETAILED PROJECT REPORT
DATED: 13 SEPT. 1965

FILE NO. 7-F2-4

PLATE 3

The Commonwealth of Massachusetts
Department of Public Works
Division of Waterways
100 Nashua Street, Boston 02114

July 2, 1965

Brigadier General R. R. Ploger
Division Engineer, U.S. Army,
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Reference: NEDED-R

Dear General Ploger:

This is a reply to your letter dated June 28, 1965, concerning the Federal navigation project at Andrews River, Harwich.

We have been working with the engineers of your staff for over a year on the plans for this project and consider it to be most worthwhile. There is no question of the local demand for this improvement and for the added development which is proposed for the future.

We have made budget requests--as yet unacted upon--to the General Court for the State's cost participation in the Federal project and for funds to finance additional work at Andrews River on a State-Town basis. As you know, we are not in a position to forecast the deliberations of the General Court, but in the past the legislature has been most co-operative in providing participating funds for Federal projects.

This could be the basis for a reasonable assumption of legislature co-operation in providing the required State funds for the Andrews River project.

It is our understanding that the Town of Harwich has authorized the expenditure of $150,000.00 toward the cost of this project and is prepared to fulfill the obligations required of local interests.

Very truly yours,

John T. Hannon

JOHN T. HANNON
Deputy Chief Engineer

JTH/kll

TOWN OF HARWICH

Office of Selectmen • Assessors • Boards of Health and Public Welfare

Milton H. Welt • Douglas Rockwood • Ralph U. Brett

HARWICH, MASSACHUSETTS

July 6, 1965

R. R. Ploger, Brig. Gen., USA
Division Engineer
Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Dear General Ploger: Re: File No. NEDED-R

This will acknowledge receipt of your communication of June 28, 1965, summarizing the situation in regard to the proposed harbor and marina at Andrews River meadow in Harwich.

In answer to your requirement for statements from the Board of Selectmen at this time as set forth in your letter, we would state that, in our opinion, the project, as proposed, would serve a very useful purpose in this community and would contribute in a very substantial way to the Town's economy from the standpoint of commercial and recreational boating, and to the convenience and safety of the public. We feel that the Town has indicated by its vote in support of the $150,000 bond issue for the project that it will support and provide for the facilities necessary for its completion.

In answer to the specific requirements as listed in your letter, may we state the following:

a. It is our opinion that with the present appropriation voted by the Town together with the anticipated State and County contribution, the Town will contribute 50% of the first cost of the Federal project, said project currently estimated at $173,000.

TOWN OF HARWICH

Office of Selectmen • Assessors • Boards of Health and Public Welfare

Milton H. Welt • Douglas Rockwood • Ralph U. Brett

HARWICH, MASSACHUSETTS

b. The Town will assume full responsibility for all project costs in excess of the $200,000 Corps of Engineers limitation under Section 107 of the 1960 River and Harbor Act.

c. The Town will construct and maintain a public marina of 50 slips, a public landing with berths commensurate with the channel depth, access roads, parking areas and other public use facilities open to all on equal terms.

d. The Town will hold and save the United States free from damages which may result from construction and maintenance of the project.

e. The Town will provide, without cost to the United States all necessary lands, easements and rights of way needed for the construction and maintenance of the project.

f. The Town will regulate the use, growth and development of the harbor facilities with the understanding that they will be open to all on equal terms.

We hope that the above will be helpful in the orderly progress toward completion of this worthy enterprise.

It has been a pleasure to work with all of the representatives of the Army Engineers with whom we have come in contact and we look forward to a continuance of this relationship in the future.

Respectfully yours,

A-3 Milton H. Welt

Ralph U. Brett

Douglas Rockwood

Board of Selectmen

MHW/h

JOHN A. VOLPE
GOVERNOR

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE DEPARTMENT
STATE HOUSE, BOSTON

February 28, 1966

File Reference: NEDED-R

Colonel Remi O. Renier
Acting Division Engineer
U. S. Army Engineer Division, New England
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Renier:

Your letter of January 19, 1966, in reference to the Andrews River, Harwich project, was received and referred to the Department of Public Works for review and comment.

The Department has conferred with local officials of Harwich, and the Department and local parties are in full accord that the project proposed by the Corps of Engineers is desirable and the design secures the maximum benefits to the community at a reasonable economic outlay.

The General Court, in its recent session, appropriated funds for the Commonwealth's share (Chapters 788 and 834 of the Acts of 1965).

The Commonwealth and the town of Harwich are both prepared to fulfill all conditions outlined on Page 2 of your letter, paragraphs a to e, inclusive.

Under present planning of the Department, the Commonwealth expects to have design plans for its part of the project prepared by early Fall, 1966.

Sincerely,

Governor

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
59 Temple Place
Boston, Massachusetts 02111

October 6, 1964

Division Engineer
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Sir:

This is our conservation and development report on the study of navigation improvements at Andrews River, Harwich, Barnstable County, Massachusetts. The study is being made under authority of Section 107 of the Rivers and Harbors Act adopted July 14, 1960. This report was prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-666 inc.), in cooperation with the Massachusetts Division of Marine Fisheries and Division of Fisheries and Game. Those agencies concur in the report as indicated in their letters of September 18, 1964 and September 21, 1964, respectively.

The plan of improvement being considered consists of a channel 3,000 feet long, six feet deep, and 100 feet wide in the outer harbor and a channel 1,000 feet long, six feet deep and from 100-150 feet wide in the inner harbor with a protective revetment. A four and one-half acre anchorage area will be dredged at the inland terminus of the inner channel. A 400-foot jetty will be constructed on the east side of the harbor mouth. We understand that local interests desire disposal of spoil at the head of the harbor south of Route 28 for use in construction of marina facilities as shown on plate I. The disposal area is about five acres in extent. It is our understanding that this five acre area will be suitably diked to prevent the return of spoil material into the adjacent waterways and marshes.

This small wetland area supports limited waterfowl use for nesting and feeding.

Andrews River is a small stream with limited flows. There is a spring run of small striped bass which enter the lower end of the river but the numbers of fish are limited. There is some

shore-based fishing for striped bass and other species from shores adjacent to the river mouth, from the existing Witchmere Harbor Breakwater, and along the entrance to Witchmere Harbor. The extensive sand flat at the mouth of Andrews River supports a moderate population of hard clams. There are no shellfish of significance in Andrews River.

Dredging of the outer and inner channels and the anchorage would have insignificant effects upon fish and wildlife resources. Deposition of spoil upon the area designated for marina facilities or upon the alternate spoil area shown on plate I also would have insignificant effects upon fish and wildlife resources. The alternate spoil area should also be suitably diked to prevent seepage of sediments into the adjacent water ways and marshes.

The outer 300 feet of the jetty would extend into the water at high tide levels. The bottom around the jetty will be exposed at low tide levels. Since the mean tide range is about 3.5 feet, the maximum depth at the seaward end of the jetty might be as much as 3.5 feet. Water depths would be less than 3.5 feet along the jetty towards the shore line. It is expected that shore-based sport fishing benefits would not be significant in view of the shallow waters in the vicinity of the jetty.

The adjacent Witchmere Harbor is now used to capacity for anchoring small boats including those used for offshore sport fishing. It is expected that the new anchorage in Andrews River will provide additional space for anchoring boats, some of which will be used for sport fishing.

The project will have no significant adverse effect on commercial fishery resources.

We recommend--

1. That excess spoil be placed on the alternate spoil area shown on plate I.

2. That this alternate area be suitably diked to prevent seepage of sediments into adjacent waterways and marshes.

Sincerely yours,

Fred L. Jacobson

Fred L. Jacobson
Acting Regional Director
Bureau of Sport Fisheries & Wildlife

John T. Gharrett

John T. Gharrett
Regional Director
Bureau of Commercial Fisheries

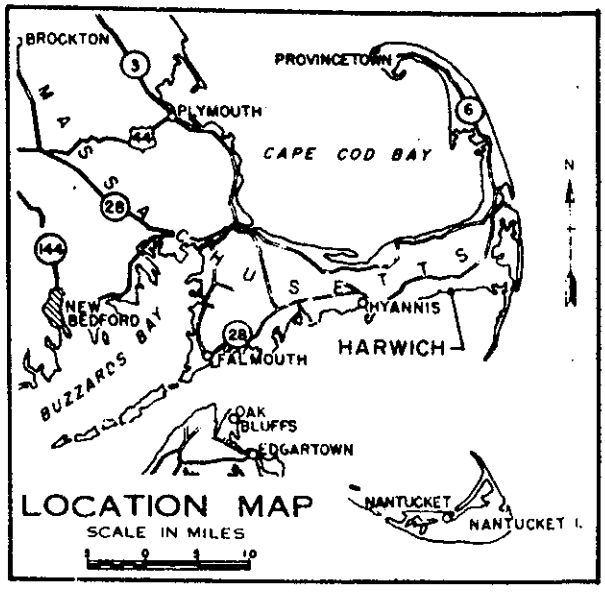
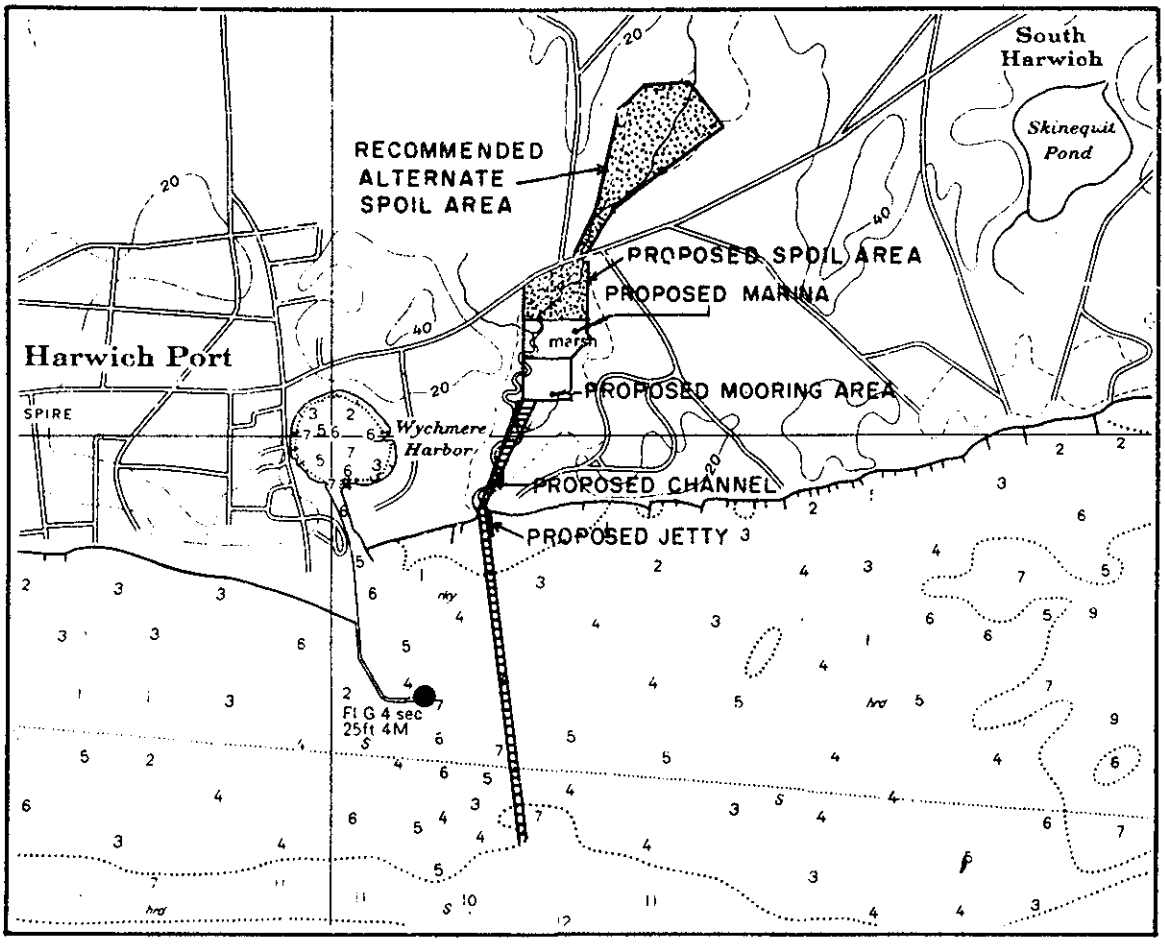


PLATE - I
ANDREWS RIVER
HARWICH, MASS.



Nautical Miles

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
U. S. POST OFFICE AND COURTHOUSE
BOSTON, MASSACHUSETTS 02109

August 23, 1965

Division Engineer
New England Division
U. S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Sir:

This is a supplement to our October 6, 1964 conservation and development report on the study of navigation improvements for Andrews River, Harwich, Barnstable County, Massachusetts. Your study is being made under authority of Section 107 of the Rivers and Harbors Act of July 14, 1960. This report was prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-666 inc.), with the Massachusetts Division of Fisheries and Game and Division of Marine Fisheries. This report has the concurrence of these agencies as indicated by letters dated August 17, 1965 and August 25, 1965, respectively.

Mr. Leslie's letter of June 28, 1965 informed us that the present plan under consideration would provide for (a) a channel six feet deep, 100 feet wide from deep water in Nantucket Sound to the vicinity of a proposed public marina, (b) a 3-acre anchorage and maneuvering basin, and (c) two protective jetties 950 and 600 feet long on the west and east sides, respectively, of the river mouth.

The proposed plan for dredging the channel and the anchorage and maneuvering basin is essentially the same as reported in our October 6, 1964 report; however, the anchorage and maneuvering basin has been reduced from four-and-one-half acres to three acres. Subsequent to the release of our previous report, the length of the east jetty has been increased from 400 feet to 600 feet and the 950-foot west jetty has been added.

Mr. Leslie requested information as to whether any shore-based sport fishing benefits would accrue to the modification of project planning involving jetties. He noted that there is no public access to either of the jetties presently available or contemplated.

No significant shore-based sport-fishery benefits are expected to accrue from the addition of the west jetty and the increased length of the east jetty; neither will they adversely affect the sport or commercial fisheries.

Sincerely yours,

Richard E. Griffith

Richard E. Griffith
Regional Director
Bureau of Sport Fisheries & Wildlife

John T. Gharrett

John T. Gharrett
Regional Director
Bureau of Commercial Fisheries

TREASURY DEPARTMENT
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (o)
1ST COAST GUARD DISTRICT
1400 CUSTOMHOUSE
BOSTON, MASS. 02109

11400
30 June 1965

From: Commander, First Coast Guard District
To: U. S. Army Engineer Division, New England Corps of Engineers, 424 Trapelo Road, Waltham, Massachusetts

Subj: Plan of Improvement under Consideration for Andrews River, Harwich, Massachusetts

Ref: (a) C of E ltr NEDED-R of 28 JUN 65

1. The plan has been reviewed for navigation aids which would be required. It has been determined that two jetty lights and three small buoys will be required as indicated on the plan enclosed herewith.

2. The first cost is estimated at $25,000 with an annual maintenance cost of $750.

B. E. KOLKHORST
By direction

Encl: (1) Chart (file # 7-F2-4)

Copy to:
COMDT (OAN) w/encl

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