Commonwealth of Massachusetts
Executive Office of Environmental Affairs ■ MEPA Office

ENF Environmental Notification Form

For Office Use Only Executive Office of Environmental Affairs
EOEA No.: 13529
MEPA Analyst Anne Canaday
Phone: 617-626- 1035

The information requested on this form must be completed to begin MEPA Review in accordance with the provisions of the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: **Proposed Completion of Stone Dike on Canapitsit (Barge) Beach for the Protection & Preservation of the Beach in order to Protect the Adjacent Federal Navigation Channel; Cuttyhunk Island; Town of Gosnold.**		
Street: **N/A**		
Municipality: **Town of Gosnold**	Watershed: Vineyard Sound & Buzzards Bay	
Universal Tranverse Mercator Coordinates:	Latitude: N 40°25' Longitude: W 70°55'	
Estimated commencement date: **2006-07**	Estimated completion date: **2007-08**	
Approximate cost: **$1,000,000**	Status of project design: **10** %complete	
Proponent: **Town of Gosnold, Selectmen**		
Street: **P.O. Box 28**		
Municipality: **Town of Gosnold, Cuttyhunk**	State: **MA**	Zip Code: **02713-0028**
Name of Contact Person From Whom Copies of this ENF May Be Obtained: **Mr. Jack Karalius**		
Firm/Agency: **U.S. Army Corps of Engineers**	Street: **696 Virginia Road**	
Municipality: **Concord**	State: **MA**	Zip Code: **01742**
Phone: **978-318-8288**	Fax: **978-318-8891**	E-mail: **Jack.Karalius@.usace.army.mil**

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☐Yes x☐No

Has this project been filed with MEPA before?
☐ Yes (EOEA No.__________) x☐No

Has any project on this site been filed with MEPA before?
☐ Yes (EOEA No.__________) x☐No

Is this an Expanded ENF (see 301 CMR 11.05(7)) requesting:
a Single EIR? (see 301 CMR 11.06(8)) ☐Yes x☐No
a Special Review Procedure? (see 301CMR 11.09) ☐Yes x☐No
a Waiver of mandatory EIR? (see 301 CMR 11.11) ☐Yes x☐No
a Phase I Waiver? (see 301 CMR 11.11) ☐Yes x☐No

Identify any financial assistance or land transfer from an agency of the Commonwealth, including the agency name and the amount of funding or land area (in acres): None

Are you requesting coordinated review with any other federal, state, regional, or local agency?
x☐Yes (Specify **NMFS, USF&WS, EPA, other State agencies**_) ☐No

List Local or Federal Permits and Approvals: **Have none presently. Will probably need CZM Approval and Order of Conditions. Assume WQC and Chapter 91 license not required.**

Which ENF or EIR review threshold(s) does the project meet or exceed (see 301 CMR 11.03):

☐ Land
☐ Water
☐ Energy
☐ ACEC
x☐ Rare Species
☐ Wastewater
☐ Air
☐ Regulations
x☐ Wetlands, Waterways, & Tidelands
☐ Transportation
☐ Solid & Hazardous Waste
☐ Historical & Archaeological Resources

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage			
New acres of land altered			
Acres of impervious area			
Square feet of new bordering vegetated wetlands alteration			
Square feet of new other wetland alteration			
Acres of new non-water dependent use of tidelands or waterways			
STRUCTURES			
Gross square footage			
Number of housing units			
Maximum height (in feet)			
TRANSPORTATION			
Vehicle trips per day			
Parking spaces			
WASTEWATER			
Gallons/day (GPD) of water use			
GPD water withdrawal			
GPD wastewater generation/ treatment			
Length of water/sewer mains (in miles)			

State Permits & Approvals

X☐ Order of Conditions
☐ Superseding Order of Conditions
☐ Chapter 91 License
☐ 401 Water Quality Certification
☐ MHD or MDC Access Permit
☐ Water Management Act Permit
☐ New Source Approval
☐ DEP or MWRA Sewer Connection/ Extension Permit
X☐ Other Permits (*including Legislative Approvals*) – Specify:
CZM Approval

Need all of the above approvals.

CONSERVATION LAND: Will the project involve the conversion of public parkland or other Article 97 public natural resources to any purpose not in accordance with Article 97?
☐Yes (Specify________________________________) x☐No

Will it involve the release of any conservation restriction, preservation restriction, agricultural preservation restriction, or watershed preservation restriction?

☐Yes (Specify________________________________) x☐**No**

RARE SPECIES: Does the project site include Estimated Habitat of Rare Species, Vernal Pools, Priority Sites of Rare Species, or Exemplary Natural Communities?

X☐**Yes** (Specify__Possibly Piping plovers____________) ☐No

HISTORICAL /ARCHAEOLOGICAL RESOURCES: Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

☐Yes (Specify________________________________) **X** ☐**No**

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources?

☐Yes (Specify________________________________) ☐No

AREAS OF CRITICAL ENVIRONMENTAL CONCERN: Is the project in or adjacent to an Area of Critical Environmental Concern?

☐Yes (Specify________________________________) **X** ☐**No**

PROJECT DESCRIPTION: The project description should include **(a)** a description of the project site, **(b)** a description of both on-site and off-site alternatives and the impacts associated with each alternative, and **(c)** potential on-site and off-site mitigation measures for each alternative (*You may attach one additional page, if necessary.*)

The proposed project consists of the completion of a stone dike on Canapitsit (Barge) Beach on Cuttyhunk Island. The purpose of the dike is to protect and preserve this barrier beach; which in turn protects the adjacent, and parallel, congressionally-authorized 10-foot-deep Federal navigation channel. The Federal channel now provides the only means of access to and from the Town of Cuttyhunk for delivery of critical material and equipment – including food and oil (which is used as fuel for heat, electricity, and to power water supply pumps). Air service has been recently discontinued. The proposed stone dike will be about 1,300 feet long; the top of the dike will be at approximately +10 feet MLW, with a top width of about 5 feet, and cover stone weighing from 0.5 to 2.5 tons. Actual dimensions and tonnage will be determined during the final design stage. This (second half of the) stone dike will complete the 2,600-foot-long stone dike that was authorized by Congress in 1964. The first (eastern) half of the stone dike was constructed in 1964-65. At that time it was built to protect the channel, and the second half was to be constructed at a later date, when necessary. The existing (first half) stone dike was built at a cost of approximately $200,000; the second (western) half was estimated at about $120,000 (in 1964). The existing stone dike is about 1,300 feet long; the top of the dike was designed to be at +12 feet MLW, with a top width of 6 to 10 feet, and cover stone weighing from 1 to 10 tons. The existing stone dike consists of about 12,000 tons of stone and rock. (The stone dikes and aprons were constructed on the east portion of Canapitsit Beach and the south portion of Copicut Neck Beach from July 1, 1964 to January 15, 1965. Approximately 16,427 tons of stone were placed. The stone dike on Canapitsit Beach was 1300' long while the stone dike on Copicut Neck Beach was 600' long).

The existing project site is an undeveloped low-lying barrier beach, consisting of sand, gravel, shingle, and cobble. It is subjected to overwashing and overtopping. The existing stone dike is on the east side of the beach; the proposed stone dike will be built to the west of the existing stone dike. There are also the remains of approximately 12 old wood barges along the beach.

After analyzing a number of alternatives, we believe the completion of the stone dike is the best solution for long-term protection and preservation of the Canapitsit Beach barrier beach. Preceding the construction of the stone dike in 1964, the Corps authorized a study to determine the best way to protect and preserve the beach. A number of alternatives were analyzed, and construction of stone dikes was recommended. After the study, the Corps summarized the study and analysis in a August 26, 1963 design memorandum.

The design memorandum noted that Canapitsit Beach had been subjected to breaching. It was stated that "when this barrier is breached large quantities of material are deposited in the entrance channel. Even when the beach becomes low in places, without a regular breach, the tidal and wave action from the south causes overtopping of the barrier and carries some material into the harbor." This observation – noted in 1963, and which appears to be just as true today – implies the need for something at a relatively high elevation to prevent overwash and overtopping

Some of the other alternatives which were considered – but not recommended – in the 1963 design memorandum were: low stone dike on Canapitsit Beach in combination with a low stone breakwater nearshore on the south side of the beach, low stone dike on Canapitsit Beach in combination with a low stone breakwater offshore on the south side of the beach, a high stone breakwater nearshore on the south side of the beach, a sand dike on Canapitsit Beach with additional barges, and relocation of the entrance channel.

The design memorandum recommended that the stone dike on Canapitsit Beach be constructed in two phases – the first phase to prevent breaches that were imminent, and the second phase to be built when necessary.

A stone dike is similar to a rubble-mound seawall – which is essentially a rubble breakwater that is placed directly on the beach. The rock is sized in accordance with standard selection methods for stability, and the structure acts to absorb and limit wave advance up the beach. The rough surface of such structures tends to absorb and dissipate wave energy with a minimum of wave reflection and scour.

A typical cross-section might consist of an outer layer of large armor or cap stone, with an interior core of smaller stone. The armor layer provides the basic protection against wave action, while the core supports the armor and prevents the underlying soil from being washed through the armor. Sometimes an apron or toe protection may be needed to provide stability against undermining at the bottom of the structure and to prevent displacement of the seaward edge of the dike.

EM 1110-2-3301 (the Engineer Manual on the Design of Beach Fills) states that seawalls, in comparison to beach fill projects, ideally reduce long-term erosion along shorelines. A structure like a stone dike is more likely to limit runup and overtopping than sand fill on a beach. If built to the same elevation, a sand beach fill/dune/dike system is more likely to erode than a stone dike.

Large storms, especially those which coincide with higher than average tides, can cause extensive erosion to a barrier beach, and at times the entire barrier can be overwashed. When storm overwash occurs, sand eroded from the beach is carried landward by the surging water. This sand is dropped on the other side of the barrier. A stone dike is more effective in preventing this situation.

An advantage of a stone dike over some other alternatives like groins, offshore breakwaters, or the placement of cobbles over a large section of beach is that a structure above mean high water has some benefits such as: not interfering with littoral drift, allowing intertidal zone to remain, and allowing shoreline vegetation to remain.

A high structure is needed. EM 1110-2-1614, The U.S. Army Corps of Engineers Manual on the Design of Coastal Revetments, Seawalls, and Bulkheads, mentions that it is generally preferable to design shore protection structures to be high enough to preclude overtopping. On Cuttyhunk Island the mean tidal range is 3.4', and the spring range is 4.2'. In the design memorandum and study, the design tide used for 1-year frequency was 6'. Waves of 5' to 11' were allowed in design. The armor stone varied in weight for various sections of the stone dike – the maximum was 2 to 10 tons.

The stone dike should stabilize the beach. The existing stone dike has stabilized the eastern portion of the beach since it was constructed in 1964-65. While it is considered a "hard" structure, the stone dike should have little or no impacts on the project site. Construction will be done so as not to interfere with nesting piping plovers. The footprint of the proposed stone dike will be about 18,200 square feet, or less than ½ acre – about 1,300 feet long and 14 feet wide.

Alternatives, with their advantages and shortcomings, and reasons for their rejection, are discussed below.

Sand renourishment is a possible alternative, although it is generally and unfortunately only a short-term solution. Sand renourishment (also sometimes referred to as sand nourishment or sand beach fill) is a non-structural solution to stabilize, protect, or restore a beach. It can be an effective buffer against storm forces, closely simulates the effects of natural conditions, and is aesthetically more compatible with natural landforms. But sand renourishment is only a temporary solution and would be costly to maintain, since it would probably have to be done about every five years – resulting in additional expenses by the Federal government and the Town of Gosnold. Also, if placed on the beach, most of the sand would probably migrate back into the channel from southerly storms, waves, and winds. This would result in more frequent maintenance dredging.

The U.S. Army Corps of Engineers' Shore Protection Manual, and other literature, state that sand may be removed from beach and dune areas by overwashing during storms. Extreme storm activity often generates high waves and storm surges that flood coastal areas. The incoming flood waters overwash low-lying land, carrying a high concentration of sediment which moves across the beach (which in this situation would shoal the channel). Where no dunes exist or can be created, beach fill itself may not provide adequate reliable protection and recourse to the addition of hard structures may be necessary to protect lives and property. Wave run-up during extreme storm events can overtop and lower the crest height of beaches, thereby decreasing the protection provided by the beach. Replenishment of sand eroded from the beach does not in itself solve an ongoing erosion problem.

In addition, an investigation by the Coastal & Hydraulics Laboratory of the U.S. Army Engineer Research & Development Center (in Vicksburg, Mississippi) indicates that a sand dike or a sand-nourished beach will not be as effective as a stone dike for the protection and preservation of Canapitsit Beach.

Both recent and previous investigations and studies estimate that a sand dike with a top elevation of around +10 to 12 feet MLW and a top width of about 50 feet or possibly more would probably be required to stabilize the beach, withstand a major storm attack, and prevent overtopping.

Placement of cobble and/or gravel is another possible alternative. (Cobble is stone ranging from 3 to 12 inches). It is probably more permanent than sand renourishment, although not as permanent as a stone dike. Similar to sand, cobble and gravel could be deposited in the channel from severe southern storms and waves. This would subsequently render the use of a special-purpose "hopper" dredge like the *Currituck* (or any hydraulic dredge) – which has been used for maintenance dredging the past four times – ineffective.

The Corps' in-house coastal engineering staff agrees with the Corps' Coastal & Hydraulics Laboratory that a cobble beach/berm alone will not be adequate to prevent material from entering the channel and causing maintenance/navigation issues. It has been documented that on beaches where a high percentage of cobble exists, that the cobble has a tendency to move up the beach during large wave events. This normally results in a cobble berm that forms along a coastal bluff/dune, a seawall/revetment, or along the higher beach elevations. The cobble berm is beneficial since it armors the beach and limits erosion. However, given the narrow spit formation that is being considered a cobble beach/berm option could be problematic since there is no feature to prevent the cobble from being overwashed into the channel. It would be possible to construct a cobble beach/berm high enough in elevation and larger enough in volume to prevent this overtopping, but the volume of material is likely to be prohibitively large.

Cobble was actually placed on Canapitsit Beach in 1939. Five years later the portion of the beach where the cobble was placed was breached. This is in contrast to the existing stone dike which is still functional after 40 years. The cobble placed in 1939 was part of a dike consisting of cobble, stone, shingle, and fill. The dike had a top elevation of +7.0 feet MLW, was 80 feet wide along the top, had side slopes of 1 vertical: 4 horizontal, and a length of 785 feet. It consisted of 22,000 cubic yards of cobble, stone, and fill in a length of 785 feet. The existing stone dike consists of about 8,000 cubic yards in a length of 1,300 feet.

Since the initial improvement dredging in 1938, about 250,000 cubic yards of sand, gravel, cobbles, shingles, and small stones have been placed on Canapitsit Beach – yet erosion, breaching, and/or overwashing has still occurred, and the stability of the beach is in jeopardy. Although the placing of stone, such as cobble-size stone, on the beach and/or in the intertidal area would dissipate wave energy, it is more of a short-term solution, and would be ineffective against major storms. As mentioned above, cobble, gravel, sand, shingle, and stone has been placed on Canapitsit Beach over the years, but has not been a long-term solution. Cobble on the beach would be able to resist erosion more than sand nourishment, but unless an exceptionally great quantity was used, the beach would still be subjected to wave runup and overtopping, and the possible washing of sand, gravel, and cobbles into the channel. Cobble in the intertidal area or on the beach would act similar to a lightweight revetment – effective against small waves but ineffective against large waves and storm surges. If in the intertidal area, it may also adversely affect littoral and longshore drift. Aside from the one failed attempt to protect Canapitsit Beach by placement of cobble, research, studies, and other practical applications of cobble on beaches are minimal.

The alternative of placing stone in a nearshore area was considered. This is similar to an offshore, or detached, breakwater.

This method has been used as beach erosion control structures as well as for harbor protection. Detached breakwaters are linear offshore structures generally oriented more or less parallel to the shoreline to which they have no solid connection. They are usually located in relatively shallow water and are often segmented to allow some of the wave energy to reach the shore and maintain longshore processes.

Advantages of placing stone in a nearshore area include the dissipation of wave energy and the probable enhancement of fisheries habitat. An offshore breakwater may reduce offshore losses of material, and may also protect the beach by trapping and holding littoral material moving alongshore – although this would be at the expense of loss of material of an adjacent shoreline.

There are a number of disadvantages to the placing of stone in a nearshore area. Any material deposit or structure in a nearshore area – such as an offshore, or detached, breakwater, or groin – may interfere with littoral and longshore drift and change wave patterns. Offshore breakwaters reflect or dissipate incident wave energy and alter wave direction and height by diffraction, thereby modifying local longshore transport.

The design of an offshore breakwater is a complex problem involving a number of design parameters. There are no simple explicit techniques for designing highly effective and efficient offshore breakwaters, due to the complexity of the problem and to the scarcity of data and field experience. Many of the physical processes involved are not thoroughly understood, and it may be awhile before a comprehensive understanding of these complex processes is realized. A thorough understanding of littoral processes, bathymetry, and wave conditions is essential.

A stone structure can be constructed with less difficulty on the beach and the quality of construction would be better with respect to foundation, sand-tightness, density, and stone-interlocking than an offshore breakwater. Future maintenance of a structure located on land would also be easier. Other disadvantages of offshore breakwaters include possible downdrift erosion and a potential hazard to watercraft and swimmers. Detached breakwaters are more expensive than shore structures – generally twice as expensive to build as a revetment alone.

Replacement of barges with additional barges, or similar structures, was considered. This method had short-term success. However the barges, which were placed from 1949 through 1955 deteriorated to the extent that by 1960 it was evident that a more permanent solution was needed. The placement of barges was an emergency measure, and was not meant to be a long-term solution.

Additional barges, which had been placed on the east portion of Canapitsit Beach with sand and cobble fill in about 1951, were mostly destroyed by Hurricane Carol in August 1954. Even before Hurricane Carol struck, the barges began deteriorating.

Groins were considered as an alternative. Groins are low wall-type structures sited perpendicular to the shoreline that are erected to trap and hold sand moving in the littoral stream. They can be used to build or widen a beach by trapping longshore drift.

The several wood barges which are perpendicular to the shoreline act as groins. Groins can also be constructed of concrete, stone, or steel.

Groins can only be used to interrupt longshore transport. Groins would interfere with littoral drift. A groin field can create serious sediment deficiencies in, and result in erosion of, downdrift areas. Sand trapped and retained on the updrift side of a groin is sand that would normally nourish the downdrift beach. Preventing this sand from reaching the downdrift beach causes a sand deficit there. The beach that is gained in one area is most likely at the expense of an adjacent shoreline.

If there is inadequate longshore movement of sand, then a groin may not accumulate enough sand to prevent erosion adjacent to the groin. If the groin loses its trapped beach, it cannot, by itself, protect the shoreline from direct wave attack. Other structures may be necessary to fulfill that function.

Rip currents induced by groins can carry large quantities of sand seaward, and this sand may be lost to the littoral system. There are several mechanisms that can cause rip currents to develop adjacent to groins – for example, the deflection seaward by the groin of the shore-parallel longshore current may cause a rip current.

Groins do not appear to present a solution to protecting and preserving Canapitsit Beach. Therefore this alternative was rejected.

Other "hard" structures such as coastal revetments, seawalls, and bulkheads were considered. In areas subject to wind-driven waves and surge, structures such as revetments, seawalls, and bulkheads are commonly employed either to combat erosion or to maintain development at an advanced position from the natural shoreline.

A revetment is a facing of erosion resistant material, such as stone or concrete, that is built to protect a scarp, embankment, or other shoreline feature against erosion. Revetments serve the same purpose as seawalls but are of lighter construction and suited to withstand relatively low-energy waves.

The terms bulkhead and seawall are often used interchangeably. However a bulkhead is primarily intended to retain or prevent sliding of the land, while protecting the upland area against wave action is secondary. Seawalls, on the other hand, are more massive structures whose primary purpose is interception of waves.

Revetments, bulkheads, and seawalls mainly protect only the upland area behind them. All share the disadvantage of being potential wave reflectors that can erode a beach fronting the structure. This problem is most prevalent for vertical structures that are nearly perfect wave reflectors and is progressively less prevalent for curved, stepped, and rough inclined structures that absorb or dissipate increasing amounts of wave energy.

Revetments and bulkheads were considered, but rejected. Concrete or steel seawalls were likewise rejected.

The "No Action" alternative was considered. In this alternative, no work would be done to protect and preserve Canapitsit Beach; regular maintenance dredging of the channel would be continued. While regular maintenance dredging has been generally effective during the past ten years to keep the channel open, a sudden major storm or hurricane could breach the beach, shoal the channel, and possibly close it.