

Excerpts from the text on Offshore Sand Mining  
in the September 2014 draft Ocean Management Plan update

### **Offshore Sand for Beach Nourishment**

Coastal shorelines shift continuously in response to a variety of factors. Wind, waves, tides, seasonal variations, human alterations, and sea level rise influence the movement of sediment within shoreline systems. Areas of Massachusetts coastal communities are vulnerable to erosion and flooding, which can lead to damage to property and infrastructure as well as diminished habitat and recreational values. In developed areas, especially where coastal engineering structures are used to stabilize shorelines, natural sediment transport processes can be interrupted, and under conditions of reduced sediment, the ability of coastal resource areas such as dunes and beaches to provide storm damage prevention and flood control benefits is continually reduced.

Climate change will exacerbate these issues—higher sea levels and future storm events will result in greater erosion and flooding impacts over time. Under accelerated rates of sea level rise, low-lying coastal areas will be particularly vulnerable to increased erosion, flooding, and inundation. In addition, these impacts will extend farther inland, resulting in greater loss of land and damage to development and natural resources along the coast of Massachusetts.

As options for addressing current and future erosion and flooding issues are considered and strategies developed, interest in utilizing ocean sand resources for beach and dune nourishment and restoration is expected to increase. Offshore sand resources are one of several alternatives for projects seeking to add compatible material to beaches and dunes, the others being sand sourced from upland locations and from coastal navigational and other dredging projects. While the beneficial re-use of sand from dredging projects and the use of upland sand sources is common in Massachusetts (Figure 25), offshore sand has been used in only a very small number of projects. In many other states, including New Jersey, New York, Delaware, North Carolina, and Florida, offshore sand is routinely used for beach nourishment. While there are considerable sand resources in certain areas offshore in both state and federal waters, the extraction of this material for beach nourishment must be balanced with the protection of marine ecosystems—especially impacts on spawning and juvenile habitat for commercial and another important fish species—and water-dependent uses.

Beach and dune nourishment and restoration represent “living” or “green” approaches to erosion management and storm surge protection that are appropriate in specific locations under certain conditions. As an alternative to shoreline armoring with revetments, seawalls, or similar coastal structures, beach nourishment can provide environmental benefits as coastal habitat enhancement and by restoring sediment to down drift coastal landforms. Beach nourishment can also greatly improve public access and recreational opportunities and values. Like other engineered projects, beach nourishment projects have design lives based on water levels, wave heights, and other factors. These projects will eventually need additional sediment replenishment to continue to function as planned, and depending on actual conditions, may exceed or fall short of the project design life. The 2007 guidance document, *Beach Nourishment: Guide to Best Management Practices for Projects in Massachusetts*, developed by MassDEP and CZM, contains important guidelines, specifications, best management practices, and applicable regulatory references for potential beach nourishment projects.

Updates and changes to information on offshore sand for beach nourishment since 2009 are summarized in the following bullets.

- **Massachusetts Climate Change Adaptation Report** - The state's 2008 Global Warming Solutions Act (GWSA) directed the EEA Secretary to convene an advisory committee to analyze strategies for adapting to the predicted changes in climate and develop a report. Prepared by EEA and its Climate Change Adaptation Advisory Committee, the *2011 Massachusetts Climate Change Adaptation Report* is the first broad overview of climate change for the Commonwealth. The report describes the predicted impacts of a changing climate and the vulnerabilities of multiple sectors ranging from natural resources, infrastructure, public health, and the economy. It also provides an analysis of potential strategies that could better prepare Massachusetts for anticipated changes.

The report is organized into two parts. Part I includes an overview of the observed and predicted changes to Massachusetts's climate and their anticipated impacts. It also includes key findings, a set of guiding principles, and key adaptation strategies that cut across multiple sectors. One of the 12 overarching strategies is to encourage ecosystem-based adaptation, highlighting the ability of natural ecosystems to reduce the vulnerability of the natural and built environments. The report states that "using natural habitats as 'green' infrastructure can help impede and potentially eliminate the risk posed by some climate change impacts while supporting crucial biota, enhancing quality of life, and serving as a carbon sink." Other important strategies highlighted in the report include advancing risk and vulnerability assessments, improving planning and land use practices, and supporting local communities.

Part II of the report covers five broad issue areas—including a chapter on Coastal Zone and Oceans—describing each issue area's vulnerabilities to climate change and outlining adaptation strategies that could help increase resilience and preparedness. The Coastal Zone and Oceans chapter includes recommendations for "sector" specific strategies, including the following related to beach and dune nourishment and restoration:

- Continue to advance use of soft engineering approaches that supply sediment to resource areas such as beaches and dunes in order to manage the risk to existing coastal development.
- Consider prioritizing placement of sediment on public beaches over offshore disposal.
- Promote habitat enhancement projects that would serve as green infrastructure, such as: oyster or mussel reefs for storm surge attenuation, constructed wetlands for floodwater control and storm

surge attenuation, planted coir fiber sills for erosion control and storm surge protection, and beach or dune nourishment for erosion control and storm surge protection.

Work on implementation of many of the elements of the *2011 Massachusetts Climate Change Adaptation Report* is in progress through programs and efforts across state agencies and by municipalities, non-governmental organizations, and the private sector. In January 2014, the Patrick Administration announced a coordinated plan for climate preparedness to increase resiliency across the Commonwealth, which included investments to reduce risk associated with coastal storms and sea level rise. In April 2014, \$1 million in grants was awarded to 10 cities and towns through CZM's Coastal Community Resilience Grants Program to support local climate preparedness efforts to address the effects of coastal storms, flooding, erosion, and sea level rise. In May 2014, over \$1 million was awarded to nine municipalities and non-profit organizations through CZM's Green Infrastructure for Coastal Resilience Pilot Grant Program to support community-based efforts to reduce risks associated with coastal storms, erosion, and sea level rise through natural and nonstructural approaches called green infrastructure. A second round of these grant programs was announced in September 2014.

- **Coastal Erosion Commission** - In July 2013, the Massachusetts Legislature passed the 2014 Budget Bill that included a section establishing a Coastal Erosion Commission. The commission was charged with investigating and documenting the levels and impacts of coastal erosion in the Commonwealth and developing strategies and recommendations to reduce, minimize, or eliminate the magnitude and frequency of coastal erosion and its adverse impacts on property, infrastructure, public safety, and beaches and dunes.

Among several key first steps for the commission was the development of shoreline characterization profiles for cities and towns to better understand the coastal erosion issue and the many factors involved. Using data and maps on shoreline change, presence of coastal structures, wetland resource areas, and land use, CZM developed a series of maps and summary charts for the commission that compiled information along 50-meter segments of about 1,028 miles of exposed open-water facing shoreline (excluding protected harbors, embayments, and estuaries). Organized by five regions, the shoreline characterization and change analyses profiles contain information for each of the 57 coastal communities assessed and are available on the Coastal Erosion Commission website at [www.mass.gov/eea/erosion-commission](http://www.mass.gov/eea/erosion-commission).

In terms of statewide summaries, Table 2-7 identifies and Figure 26 displays the communities with some of the highest short-term erosion rates (i.e., approximately last 30 years, from ~1970 to 2008/2009). Table 2-8 and Figure 27 contain public beaches with highest short-term erosion rates. While these summaries serve to illustrate, in part, the scope of the erosion issue, there are many additional communities and public beach areas that also have areas of concern.

Long- and short-term shoreline change information from CZM's Shoreline Change Program is available via its interactive online mapping tool, the Massachusetts Ocean Resource Information System (or MORIS), via [www.mass.gov/eea/agencies/czm/program-areas/stormsmart-coasts/shoreline-change](http://www.mass.gov/eea/agencies/czm/program-areas/stormsmart-coasts/shoreline-change). Figure 28 depicts the extent of shoreline with shore-parallel coastal structures (i.e., seawalls, revetments, and bulkheads). Figure 29 shows areas of shoreline where shore-parallel coastal structures are at or near the limit of mean high water and therefore restrict landward movement of shoreline. In these locations, there is often no dry beach at high tide. Storm impacts at these locations can be greater, as fronting beaches help to dissipate wave energy, and with an engineered structure "fixing" the shoreline in place, there is no landward migration of the shoreline to keep pace with sea level rise.

**Table 2-7. Communities with highest short-term (i.e., past ~30 year) erosion rates**

Town	Short-term rate (ft/yr)
Yarmouth**	-8.7
Eastham*	-5.7
Orleans*	-5.7
Salisbury	-3.7
Ipswich	-3.6
Rowley	-3.3
Wellfleet*	-3.1
Truro*	-3.0
Nantucket	-2.7
Edgartown	-2.4
Newbury	-2.4
Wellfleet**	-2
Weymouth	-1.9
Chilmark	-1.8
Orleans**	-1.7
Eastham**	-1.7

Town	Short-term rate (ft/yr)
Truro**	-1.6
Hull	-1.5
Provincetown	-1.4
Scituate	-1.3
* Location on Outer Cape Cod	
** Location on Cape Cod Bay	

**Table 2-8. Public beaches with highest short-term erosion rates**

Beach	Town	Short-term rate (ft/yr)
Lighthouse	Chatham	-51.0
Norton Point State Park	Edgartown	-19.0
Dyer Prince	Eastham	-7.9
Duck Harbor	Wellfleet	-6.7
Nauset	Orleans	-5.5
Egypt	Scituate	-5.0
Sandy Point Reservation	Ipswich	-5.0
Newcomb Hollow	Wellfleet	-4.8
Town Neck (Boardwalk)	Sandwich	-4.8
Sconset	Nantucket	-4.7
Cranes	Ipswich	-4.6
Coast Guard	Eastham	-4.4
Ballston	Truro	-4.2
Demarest Lloyd	Dartmouth	-4.2
Good Harbor	Gloucester	-4.1
Plum Island	Newbury	-4.1
Salisbury	Salisbury	-3.9
Nauset Light	Eastham	-3.8
Town Landing (Breakwater)	Provincetown	-3.7
Popponeset	Mashpee	-3.3

As another key part of its initial work, the commission held five regional workshops in May and June 2014 to solicit public input and feedback on a range of issues related to coastal erosion affecting residents and communities in Massachusetts. Workshop attendees identified a number of specific geographic areas of particular concern and shared suggestions about scientific, information, and mapping needs; regulations and state involvement; local assistance desired; and best management practices and approaches the commission should support. One of several themes coming from workshop participants was broad support for utilizing offshore sand

for beach nourishment as an erosion management approach, with caveats expressed about potential impacts and the need for more information.

As of the date of publication of the 2014 draft ocean plan, work by the commission is ongoing. To provide assistance in completing its charge, the commission has established three working groups: science and technical; erosion impacts; and legal and regulatory. Using information, resources, and preliminary recommendations from the working groups, the commission is working to develop a report with its findings and a series of recommended strategies and actions to better manage coastal erosion and its adverse impacts on property, infrastructure, public safety, and beaches and dunes. A draft report is expected in late 2014 for public review and comment. More background and information on the Coastal Erosion Commission is available at [www.mass.gov/eea/erosion-commission](http://www.mass.gov/eea/erosion-commission).

- **Potential Offshore Sand Resource Areas Siting** - The 2009 ocean plan called for further work to advance the identification of potential areas with suitable sand resources for beach nourishment. Since 2009, CZM has continued its long-term partnership with the U.S. Geological Survey (USGS) and other partners on a cooperative seafloor mapping program. As of 2014, the cooperative has mapped 1,393 square miles of state marine waters and has published or is preparing to release these data as USGS Open-File Reports. Geophysical data, including bathymetry, acoustic backscatter (a measure of seafloor hardness and roughness), and seismic-reflection profiles (pictures of sub-surface sediment layers), have been collected in these areas. In addition, seafloor sediment samples and photographs/videos of the seafloor were gathered to validate the geophysical data. CZM and the state Division of Marine Fisheries (*Marine Fisheries*) undertook three research surveys in 2010, 2011, and 2012 aboard the U.S. Environmental Protection Agency's Ocean Survey Vessel (OSV) *Bold*, visiting 870 stations to collect seafloor imagery and grab samples and conduct sediment and benthic infaunal analysis as part of its seafloor mapping program to inform ocean planning and management. These data have been used to create interpretive data products such as maps of surficial seafloor sediments, seafloor sediment depth to bedrock, and physiographic zones (a term used by geologists to define regions of the seafloor based on morphology and sediment types). CZM, with guidance from and in close consultation with the USGS Woods Hole Science Center, has also worked to identify areas of sand deposits based on geologic mapping by USGS, other published geologic maps, and available information from seismic data and sediment cores.

The scope for the update of the 2009 ocean plan called for work to advance the planning for and identification of appropriate potential locations for offshore sand areas, taking into account important criteria including compatible sand resources, potential environmental impacts, interactions with existing water-dependent uses, and consideration of other key factors. Responding to this scope and building on the work and approaches in the 2009 ocean plan, the 2014 draft ocean plan employs a compatibility assessment and screening analysis to identify offshore areas for further characterization, investigation, and assessment work, with the goal of advancing a few pilot projects in the next five years.

To implement this approach, a preliminary map of sand resources that encompasses state waters and extends seven nautical miles seaward of the planning area was developed. First, deposits composed primarily of sand, formed by reworking of glacial deposits, were identified based on geologic mapping by USGS and other published geologic maps, and were then refined using available surficial sediment data, seismic sub-bottom profiles, and sediment cores characterizing the deposits as medium- to coarse-grained sand (Appendix 3). Figure 30 depicts the preliminary map of sand resources from this process.

Areas to avoid were then identified based on potential biological and physical environmental impacts, incompatibility and/or adverse interactions with existing uses and sites, and limitations and specifications of dredging operations. Table 2-9 lists the areas to avoid and Figure 31 depicts a map of these areas overlain on the sand resources. Appendix 4 contains maps of all of the designated areas to avoid.

**Table 2-9. Areas to avoid for siting of potential offshore sand areas**

Category	Areas to avoid
Prohibited and Protected Areas	Cape Cod Ocean Sanctuary
	Stellwagen Bank National Marine Sanctuary
SSU Resource Areas	North Atlantic right whale core habitat*
	Humpback whale core habitat*
	Fin whale core habitat*
	Roseate Tern core habitat*
	Hard/complex seafloor
	Eelgrass
	Intertidal flats
Critical Fisheries Management Areas	Important fish resources**
	Winter Cod Conservation Zone
	Spring Cod Conservation Zone



Category	Areas to avoid
Depth of Closure and Shoals	Areas of water depth <30 ft
Transportation and Navigation Uses	Anchorage areas (C, D, L, and M) Pilot boarding areas
Infrastructure Uses	Cable areas and existing cables with 250-m buffers Pipeline areas and existing pipelines with 500-m buffers Liquefied natural gas deepwater ports
Aquaculture Uses	Aquaculture sites
Sites to Avoid	Nomans Danger Zone Cape Wind project footprint U.S. Army Corps of Engineers disposal sites
Areas of Operational Limitation	Water depth <16 ft (minimum draft of dredge when loaded) or >125 ft (maximum operating depth of dredge)
* Avoidance of these SSU areas could be met by the enforceable application of time of year controls (TOY) such that the activity will not occur when the SSU resource is present or may be adversely affected.	
** Areas of two delineated important fish resources SSU areas have been designated as provisional, subject to further analysis and consultation with <i>Marine Fisheries</i> , the National Marine Fisheries Service, and the fisheries work group.	

Among the areas to avoid are four SSU resource areas for North Atlantic right whale core habitat, humpback whale core habitat, fin whale core habitat, and Roseate Tern core habitat. The ocean plan and its implementing regulations allow for proponents to demonstrate compliance with siting standards by incorporating measures to avoid resources and impacts through TOY controls such that offshore sand project will not occur when the SSU resource is present or may be adversely affected. As described below as part of the 2014 draft ocean plan's management standards, enforceable TOY preclusions for the North Atlantic right whale core habitat, humpback whale core habitat, fin whale core habitat, and Roseate Tern core habitat resource areas will be mandatory for potential offshore sand areas, based on consultations with *Marine Fisheries*, the Department of Fish and Game's Natural Heritage and Endangered Species Program, and federal agencies. Additional provisions to avoid, minimize, and mitigate impacts to concentrations of water-dependent uses will also apply.

In the last part of the sand source analysis, the areas of sand resources outside of areas to avoid were identified and resulting polygons were put onto a 250-meter grid and smoothed. Shown in Figure 32, the output of the analysis results in 12 areas identified for further investigation: areas that are designated as preliminary sand resource areas and those designated as provisional sand resource areas. In total, these areas constitute seven percent

of the planning area. The provisional sand resource areas are areas adjacent to two of the preliminary sand resource areas with apparent deposits of medium- to coarse-grained sand that fall within the mapped important fish resources SSU area. Given the mapping methodology for the important fish resources SSU area, which utilizes data from the *Marine Fisheries* long-term resource assessment surveys based on sampling “strata” designed and defined for the survey, and understanding that within individual important fish resources SSU areas there are variations in species composition, abundance, and potential vulnerability to dredging, these provisional areas will be subject to further analysis and consultation with *Marine Fisheries*, the National Marine Fisheries Service (NMFS), and the fisheries work group. Based on these consultations, areas within the provisional sand resource areas will either be designated as preliminary sand resource areas or eliminated as potential sites.

There are also sections of three of the preliminary sand resource areas that fall within federal waters. BOEM has recently initiated a comprehensive study to acquire geophysical and geological data to support the identification, characterization, and delineation of sand resources on the Outer Continental Shelf (OCS) for future coastal restoration, beach nourishment, and/or wetland restoration efforts. As described in Chapter 1, the Northeast Regional Planning Body (Northeast RPB) is working on the development of a regional ocean plan and associated products to guide agency decision making, consistent with existing authorities. A stated goal in the Northeast RPB’s regional ocean planning framework, which identifies the goals, objectives, actions, and products to build a regional ocean plan by early 2016, is to identify opportunities to enhance inter-agency coordination for review of certain ocean-based projects, including offshore sand for beach nourishment. Coordination and integration with these efforts will advance the further investigation and consultation called for in the 2014 draft ocean plan.

It is critical to emphasize that these areas are being further characterized with the goal of finding sites within them that would support a few pilot beach and dune nourishment projects over the next five years, in order to evaluate the efficacy, effects, and performance of this allowed activity. Pilot beach nourishment projects would be community-based projects ranging from ~100,000 to 500,000 cubic yards (yd<sup>3</sup>) and would have to meet the standards and conditions described in the Management Standards section below. The inset in Figure 32 illustrates three project footprints: 100,000 yd<sup>3</sup>, 250,000 yd<sup>3</sup>, and 500,000 yd<sup>3</sup>. These footprints assume a one yard deep dredge area,

which is the benchmark minimum for operational planning, and in most cases the depth would range from one to about three yards, reducing the footprint accordingly.

The actual placement of sand on the beach and dune would be outside of the jurisdiction of the ocean plan. Thus the prioritization, evaluation, and determination of the pilot beach nourishment projects will be a separate but parallel process to the ocean plan update and amendment process. As mentioned above, the Coastal Erosion Commission is working on developing strategies and recommendations to address coastal erosion management, and commission discussions to date, as well as feedback received during public workshops, have included the concept of using pilot projects to evaluate certain types of coastal erosion management practices. It is anticipated that the commission will provide recommendations to the EEA Secretary as to options for integrating the ocean plan work on potential offshore sand resources with an approach to determine the pilot community-based sites to demonstrate and evaluate beach and dune nourishment projects with offshore sand sources.

Two phases are anticipated to further investigate the preliminary and provisional sand resource areas. More detail on this proposed work is provided in the Science Framework section in Volume 2 of this document. Key elements in phase one will include: consultation with *Marine Fisheries*, NMFS, and the fisheries work group to examine the sections of the important fish resources SSU area within the provisional sand resource areas to identify species of concern and initial survey work via seismic-reflection profiling and core sampling to verify geologic conditions. Phase two will include finer-scale core sampling and biological surveys, as necessary. Based on the data and information resulting from the investigation and characterization work, preliminary sand resource areas are subject to change under future updates to the ocean plan.

- **Management Standards** - The 2009 ocean plan allows offshore sand projects for beach nourishment in the Multi-use Area, subject to the siting and performance standards for SSU resources and for areas of concentrations of water-dependent uses described in the Management Areas section above, additional standards detailed below, and other applicable law. The SSU resources and concentrations of water-dependent uses to be addressed for offshore sand projects for beach nourishment are contained in Table 2-10.

**Table 2-10. SSU resources and concentrations of water-dependent uses to be addressed with offshore sand projects for beach nourishment (see Figure 33)**

Allowed Use	SSU Resource
Offshore sand projects for beach nourishment	<ul style="list-style-type: none"> <li>• North Atlantic right whale core habitat</li> <li>• Humpback whale core habitat</li> <li>• Fin whale core habitat</li> <li>• Roseate Tern core habitat</li> <li>• Hard/complex seafloor</li> <li>• Eelgrass</li> <li>• Intertidal flats</li> <li>• Important fish resources</li> </ul>
	<b>Concentrations of Water-Dependent Use Area</b>
	<ul style="list-style-type: none"> <li>• High commercial fishing effort and value</li> <li>• Concentrated recreational fishing</li> </ul>

These management standards are proposed as part of the 2014 draft ocean plan:

- Pilot projects proposed in the preliminary sand resource areas are subject to review under the ocean plan via a mandatory EIR and other applicable law.
- Pilot projects proposed in the preliminary sand resource areas are in presumptive compliance with the siting standards of the ocean plan, provided that:
  1. Investigations and surveys confirm the presence of sand-dominated sediments (e.g., medium- to coarse-grained sand are dominant fractions) in deposits that exceed one yard in sediment depth.
  2. TOY controls are in place such that operations and dredging will avoid damage and cause no significant alteration to the following SSU resources:
    - North Atlantic right whale core habitat,
    - Humpback whale core habitat,
    - Fin whale core habitat, and
    - Roseate Tern core habitat.
  3. Potential impacts to the following concentrations of water-dependent uses are avoided, minimized, and mitigated to the maximum extent practicable:
    - High commercial fishing effort and value, and
    - Concentrated recreational fishing.

4. Public benefits associated with the proposed project outweigh public detriments, such that:
  - Sand resources must be for a community-based project on a public beach that protects public infrastructure, natural resources, and other public interest factors, such as increased access and recreation; and
  - Alternative sand sources from beneficial re-use associated with navigational or other dredging projects are not reasonably practicable, taking into consideration cost, geographic proximity, timing, and other logistics.
- o Pilot projects proposed in the preliminary sand resource areas must develop and implement a biological and physical monitoring plan for the sand source area and beach nourishment site, in consultation with EEA agencies and subject to the Secretary's approval.

The 2014 draft ocean plan does not preclude potential project proponents from exploring and advancing offshore sand projects outside of the designated preliminary sand resource areas within the Multi-use Area. Any proposed project would have to meet the siting and performance standards for SSU resources and for areas of concentrations of water-dependent uses described in the Management Areas section above, the management standards detailed above, and other applicable law.

### **Cables and Pipelines**

Cables and pipelines are important infrastructure components for the transmission and distribution of electricity, fuels, and telecommunications. The provision of these particular goods and services is connected to national energy and communication supply and security matters. With the development of high-bandwidth fiber-optic cables, these technologies are now replacing traditional wire cabling for communications networks. This linear infrastructure has several installations already in Massachusetts waters including electric and telecommunication connections between both Nantucket and Martha's Vineyard and the mainland (Cape Cod) as well as the Hibernia cross-Atlantic communication cable system connected in Lynn. More recently, a combined fiber-optic communications and electric cable bundle from Falmouth to Tisbury by Comcast and NSTAR was installed in spring 2014. This project was the first to complete review and permitting and found to be consistent with the ocean plan.

4. Public benefits associated with the proposed project outweigh public detriments, such that:
  - Sand resources must be for a community-based project on a public beach that protects public infrastructure, natural resources, and other public interest factors, such as increased access and recreation; and
  - Alternative sand sources from beneficial re-use associated with navigational or other dredging projects are not reasonably practicable, taking into consideration cost, geographic proximity, timing, and other logistics.
- o Pilot projects proposed in the preliminary sand resource areas must develop and implement a biological and physical monitoring plan for the sand source area and beach nourishment site, in consultation with EEA agencies and subject to the Secretary's approval.

The 2014 draft ocean plan does not preclude potential project proponents from exploring and advancing offshore sand projects outside of the designated preliminary sand resource areas within the Multi-use Area. Any proposed project would have to meet the siting and performance standards for SSU resources and for areas of concentrations of water-dependent uses described in the Management Areas section above, the management standards detailed above, and other applicable law.