Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Office of Coastal Zone Management (CZM)

Section 309 Assessment and Five-Year Strategy for CZM Program Enhancement (FY2021-2025)

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Contents

I. Introduction

Section 309 of the federal Coastal Zone Management Act establishes a voluntary enhancement grants program that, among other things, encourages states with federally approved Coastal Management Programs (CMPs) to develop and implement program changes in one or more of the following nine coastal zone enhancement areas: Wetlands, Coastal Hazards, Public Access, Marine Debris, Cumulative and Secondary Impacts, Special Area Management Planning, Energy and Government Facility Siting, Ocean and Great Lakes Resources, and Aquaculture. The Office for Coastal Management within the National Oceanic and Atmospheric Administration (NOAA) works closely with state coastal programs in prioritizing and evaluating state program needs. The Massachusetts Office of Coastal Zone Management (CZM) developed this document, titled *Section 309 Assessment and Five-Year Strategy for CZM Program Enhancement (FY2021-2025)*, pursuant to formal guidance issued by NOAA in June 2019. The purpose of the document is to evaluate and identify CZM's program needs and outline a five-year strategy for achieving program changes and associated implementation objectives. In this case, the proposed strategy covers the federal fiscal years from 2021 to 2025 and serves as an update to the previous Section 309 Assessment and Strategy published in 2015.

After a summary of completed 309 efforts from FY2016-2020, the next section of this document contains the required characterization of issues for the nine enhancement areas ("assessment"). This characterization has been separated into two phases to allow Massachusetts to target its assessments to high priority issue areas for our CMP: Phase 1 (high-level) and Phase II (in-depth). Following the Phase 1 assessment, where an issue area is identified as a high priority for enhancement, the next sections contain an in-depth assessment (Phase II) and Strategy where one or more projects (and respective summary work plans) are developed to address the programmatic gaps and needs documented in the assessment. The prioritization of the enhancement areas is based on three main criteria: (1) the severity of problem, (2) the potential for program changes or further implementation activities to effectively address outstanding issues, and (3) the availability other sources of funds to address issues (i.e., if an issue area has another dedicated source of funds, it may not be rated as a priority for use of limited 309 funds).

For Massachusetts' 2021-2025 Section 309 Assessment and Strategy, the following areas are identified as "High" priorities for 309 funding: Wetlands, Coastal Hazards, Special Area Management Planning, and Ocean Resources. In order to expend 309 funds potentially available to state Coastal Management Programs based on annual federal appropriations and allocation formulas, projects proposed in grant applications to NOAA/OCRM must be contained in an approved Section 309 Assessment and Strategy. It should be noted that assignment of a low or medium priority rating is not an indication of the importance of an issue area for the Commonwealth; rather, it is only an indication of the relative priority of that enhancement area within the context of the Section 309 assessment. Further, it is important to understand that inclusion of a project within an approved Section 309 Assessment and Strategy does not assure funding for those proposed efforts.

For issue areas ranked high, the following table summarizes CZM's proposed projects and resource needs by enhancement area in the 2021-2025 timeframe.

Enhancement Area	Proposed Project	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Wetlands	Understanding the intersection of salt marsh ecological processes and resiliency to support informed decision making	$26,000	$74,922	$60,602	$61,208	$74,998	**$297,730**
Coastal Hazards	Enhancing natural buffers & retreat strategies	$50,000	$50,000	$150,000	$50,000	-	**$300,000**
Special Area Management Planning	Designated Port Area (DPAs) Boundary Reviews	$50,000	$75,000	$25,000	$50,000	$25,000	**$225,000**
Special Area Management Planning	Promoting Climate Resilience and Economic Development in DPAs	$112,500	$112,500	$112,500	$112,500	$50,000	**$500,000**
Ocean Resources	Advance Ocean Planning	$225,000	$150,000	$150,000	$225,000	$225,000	**$975,000**
Total funding		**$463,500**	**$462,422**	**$498,102**	**$498,708**	**$374,998**	**$2,297,730**
Note: For the purposes of this 309 Strategy budget summary, project years all begin in Year 1. The actual starting year will be dependent on 309 funding available (including Projects of Special Merit).							

Summary of Stakeholder Input and Public Review

Preparation of this document began in June 2019 and involved the efforts of CZM management and a team of staff professionals with expertise and experience in their respective topics. In order to accurately prioritize issue areas, CZM sought the input of a diverse mix of state, federal, and local officials, non-profit advocacy groups, and coastal science professionals as stakeholders in this Section 309 assessment and strategy process. On January 8, 2020, CZM convened the advisory group of stakeholders to engage on the 309 process, review the draft assessments, and seek their input on prioritization, needs and gaps on coastal issues, and potential strategies. Included in this group were representatives from a mix of organizations, interests, and functions including: The Nature Conservancy, the City of Salem, the Cape Cod Commission, Mass Audubon, and the MA Division of Marine Fisheries. Further input and comments were sought directly from stakeholders in separate processes (Ocean Advisory Commission, and Ocean Science Advisory Council) which also informed this process.

Public review and comment on the draft Section 309 Assessment and Five-Year Strategy for CZM Program Enhancement (FY2021-2025) was encouraged to help prepare the final

document. The public comment period opened on May 20, 2020 and closed on June 19, 2020. Public notices of the availability of the draft document for review and comment were posted in the state's Environmental Monitor and in the Boston Globe. No comments on the draft assessment and strategy were submitted.

II. Summary of Completed Section 309 Efforts (2016-2020)

In the period covered by the previous Section 309 Assessment and Strategy (FY2016-2020), NOAA grant funds were expended on four enhancement areas, ranked as "high" priorities in the Section 309 Assessment and Strategy: Ocean Resources, Coastal Hazards, Wetlands, and Special Area Management Plans (SAMPs). The table below summaries the major accomplishments within the 309-designated enhancement areas. *Program Changes*: In addition, MA CZM is finalizing a submittal to NOAA for a routine program change in the first quarter of 2020. These changes to the *Massachusetts Office of Coastal Zone Management Policy Guide - October 2011* (Policy Guide) will update and serve as the official statement of the Massachusetts coastal program policies and legal authorities, and the Massachusetts Ocean Management Plan will be formally incorporated into the CZM program. The Policy Guide also includes specific guidance on the federal consistency review process, as well as updates to the program policies and the underlying legal authorities. Additionally, during the latter part of the FY2016-2020 period (FY2019), 309 funds supported work on this new FY2021-2025 Section 309 Assessment and Strategy.

Enhancement Area(s)	Fiscal Year Activity	Major 309 Accomplishments
Ocean Resources	FY19	**Ocean Plan: Proposed Aquaculture Permitting Standards.** The 2015 MA Ocean Plan recommends that offshore aquaculture be considered ocean development and therefore may require the development of siting and management standards. Deliberations of an interagency group resulted in a proposed MEPA Special Review Procedure (SRP) that will guide permitting and review of offshore aquaculture in the ocean planning area. The SRP is in the process of being developed with support from DMF and CZM. The results of the SRP will inform how aquaculture will be included in the Ocean Plan. CZM has also been actively engaged in the Massachusetts Shellfish Initiative which seeks to identify statewide needs for shellfish growth and aquaculture. Recommendations from the MSI will inform the SRP and future updates to the Ocean Plan.

Enhancement Area(s)	Fiscal Year Activity	Major 309 Accomplishments
	FY17-FY19	**Ocean Plan Implementation - Transmission Cable Siting.** The siting and performance standards codified in the Ocean Plan requires that cable projects in multi-use management areas address impacts to existing ocean uses – navigation and fishing - and important natural resource areas. Since the finalization of the 2015 Ocean Plan, these aspects of the MA Ocean Plan have been employed through the planning, review, and permitting for the construction of transmission cables for offshore wind energy projects proposed for the MA Offshore Wind Energy Area. The Ocean Plan siting and performance standards also informed discussions with federal agencies, fishermen and offshore wind developers. Lessons learned from these reviews will inform the ongoing review of the 2015 Ocean Plan.
	FY18-FY19	**2015 Ocean Plan Review.** The 2015 Ocean Plan is the first formal amendment of the Commonwealth's ocean plan, developed in response to the Oceans Act of 2008 which requires a review of the Ocean Plan at least every five years. Initiated in FY18, CZM is leading the review of the 2015 Ocean Plan, working closely with the Ocean Advisory Commission and Ocean Science Advisory Council. The review began with a stakeholder survey of the Ocean Advisory Commission, the Ocean Science Advisory Council, experts, and other interested parties. Survey questions focused on plan implementation and applicability as well as areas of emerging trends. The survey was used to inform discussions and draft reports of the six Ocean Plan Technical Work Groups. The work group reports will be reviewed by the Ocean Science Advisory Council and used to make recommendations to the Ocean Advisory Commission regarding necessary updates to the Ocean Plan. The review is ongoing during FY19 with plans to be published in CY20. The review will inform the need and scope of the next formal amendment to the Ocean Plan. A Plan amendment will occur if new management areas, management standards, changes to protected resource areas (Special, Sensitive, or Unique), changes to protected concentrations of water dependent uses, or other significant changes are recommended as a result of the Plan Review.

Enhancement Area(s)	Fiscal Year Activity	Major 309 Accomplishments
Ocean Resources	FY16-FY20	**Designated Port Area Boundary Reviews.** Through the state's regulatory review process (301 CMR 25.00) CZM's initiative to update and modernize Designated Port Area (DPA) boundaries included the conclusion of two boundary reviews: one for the portion of the Chelsea Creek DPA in Chelsea (2016) and another for the area south of the Reserved Channel in the South Boston DPA (2018). Both processes included extensive community engagement efforts, site visits, and reviews of available plans, permits, and licenses applicable to the DPA review area, all of which were considered in the context of the policy and regulatory framework that guides the review. The boundaries were modified in areas of the DPA that did not meet the designation criteria of 301 CMR 25.00, while areas that met the criteria were maintained within or added to the respective DPA. CZM is currently completing a minor administrative update to the Mystic River DPA boundary as a result of legislation. In preparation for an expected request for a boundary review from the City of Boston for the East Boston DPA, CZM conducted initial site visits, collected and analyzed relevant information, including GIS resources, and held preliminary discussions with the City regarding the process and schedule for a review. CZM also supported initial queries from a community interested in establishing a new DPA.
Special Area Management Planning	FY16-FY18	**DPA Regulatory Revisions.** CZM supported the promulgation of regulatory revisions that provide greater flexibility in the location of allowable non-water-dependent uses on project sites in DPAs, allow recreational boating slips in specific circumstances, and clarify the DPA boundary review criteria. CZM convened a DPA Working Group, conducted a public engagement process, and completed state-level administrative rule-making procedures. This CZM-led stakeholder process resulted in changes to DPA, MHP, and Chapter 91 regulations.
Special Area Management Planning	FY17-FY19	**Estuarine Wetlands and Sea Level Rise: Resilient Coastal Habitats**. CZM proposed and matched with 2017-2019 NOAA Fellow support a project assessing risk and resiliency of coastal habitats in critical areas, including salt marshes. The completed assessment identifies and prioritizes restrictions to flow within the Barnstable Great Marsh and the Sandy Neck Barrier Beach System Area of Critical Environmental Concern. The final report is available with data and recommendations for flow restoration opportunities. The repeatable and broadly applicable framework developed for this area will be used by CZM in partnership with other stakeholders to guide assessments and inform management elsewhere along the coast.

Enhancement Area(s)	Fiscal Year Activity	Major 309 Accomplishments
Wetlands	FY16-FY20	**Estuarine Wetlands and Sea Level Rise: Identifying At-Risk Resources and Supporting Climate Change Adaptation Responses.** This project is complete. The data and information generated from the project will result in more accurate and informed forecasting of coastal wetland changes—including areas of forecasted loss, areas where marsh migration (transgression) may be supported, and areas that are predicted to undergo changes in wetland types—which will be communicated to managers, decision-makers, and others. An ArcGIS Online project viewer is available to the public to access the data.
	FY17-FY20	**Greater freeboard for high-hazard development.** CZM regularly works with the Department of Conservation and Recreation (DCR), Department of Environmental Protection, Massachusetts Emergency Management Agency, and Federal Emergency Management Agency (FEMA) on improving State Building Code requirements, wetlands regulations, and best practices for building and retrofitting homes and other buildings in coastal high-hazard areas. Implementation of higher standards at the local level to address coastal storm impacts requires maps that identify vulnerable areas. One area of interest is the Coastal A flood zone or Limit of Moderate Wave Action (LiMWA) where waves of 1.5 to 3 feet break over land. CZM hired a consultant to produce a coast-wide LiMWA for Massachusetts. After reviewing and revising mapped LiMWA for effective and preliminary Flood Insurance Rate Maps (FIRMs), the consultant delineated LiMWA for 15 coastal communities. FEMA formally reviewed and approved the changes to the LiMWA and sent letters to all coastal communities in 2017. FEMA's National Flood Hazard Layer has been revised to show a LiMWA consistent with current FEMA Policy Guidance. These data are currently informing discussions regarding proposed requirements for new or substantially improved buildings in the Coastal A Zone to be elevated 2' above the Base Flood Elevation and supported on piles, or similar foundations.
Coastal Hazards	FY18-FY20	**Coastal Resilience: Shoreline erosion forecasting.** In 2018, CZM and the U.S. Geological Survey's (USGS) Woods Hole Science Center agreed to renew and expand cooperative efforts to advance shoreline change mapping and erosion forecasting. USGS scientists are working to extract a new present-day shoreline from 2018-2019 Lidar data for inclusion in CZM's Shoreline Change Project. USGS is also testing a beta tool in the Digital Shoreline Analysis System (DSAS) to validate 10- and 20-year erosion forecasts based on historical trends and wave data.

Enhancement Area(s)	Fiscal Year Activity	Major 309 Accomplishments
	FY16-FY20	**Nature-based approaches (or living shorelines).** CZM primarily supports the application of nature-based shoreline stabilization approaches through the Massachusetts Coastal Resilience Grant program. Local projects include suitability assessments, planning, construction, monitoring and community engagement. Between 2016-2020, CZM funded the design, permitting, and construction of dune, fringing salt marsh, and cobble berm projects in the communities of Duxbury, Kingston, Salem, and Winthrop. CZM also works with partners in the New England region on NOAA-funded resilience projects to advance living shorelines. One project with the Northeastern Regional Association of Coastal Ocean Observing Systems and a team of partners focused on prediction and mapping of coastal storms to support suitability assessments. CZM and peers at other state coastal programs in the region, The Nature Conservancy (TNC), and Northeast Regional Ocean Council (NROC) also developed a state-of-the-practice report and workshops on living shorelines. CZM and NROC are continuing to work with TNC to increase the effective use of living shorelines to address coastal erosion and flooding through implementation and monitoring of a range of projects. The project team presented at the 9th National Summit on Coastal and Estuarine Restoration and Management in 2018.

III. Assessment (Phase I)

A. Wetlands

Section 309 Enhancement Objective: *Protection, restoration, or enhancement of the existing coastal wetlands base, or creation of new coastal wetlands. §309(a)(1)*
Note: For the purposes of the Wetlands Assessment, wetlands are "those areas that are inundated or saturated at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." [33 CFR 328.3(b)]. See also pg. 174 of the CZMA Performance Measurement Guidance for a more in-depth discussion of what should be considered a wetland.

Phase I (High-Level) Assessment:
Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.

Resource Characterization:

1. Extent, Status, and Trends of Wetlands in Massachusetts

Current State of Wetlands in 2016[1]		
System	**Class**	**Acres**
Estuarine	Emergent Wetland	45,854
	Forested Wetland	69
	Scrub/Shrub Wetland	403
Palustrine	Emergent Wetland	43,055
	Forested Wetland	271,851
	Scrub/Shrub Wetland	30,608
Total		391,840

Coastal Wetlands Status and Trends[2]		
Change in Wetlands	**from 1996-2010**	**from 2006-2010**
Percent net change in total wetlands (% gained or lost)	-1.46%	-0.20%
Percent net change in freshwater (palustrine wetlands) (% gained or lost)	-1.46%	-0.17%
Percent net change in saltwater (estuarine) wetlands (% gained or lost)	-0.01%	-0.02%

How Wetlands Are Changing[2]		
Land Cover Type	**Area of Wetlands Transformed to Another Type of Land Cover between 1996-2010 (Sq. Miles)**	**Area of Wetlands Transformed to Another Type of Land Cover between 2006-2010 (Sq. Miles)**
Development	9.39	1.39
Agriculture	0.26	0.04
Barren Land	0.41	0.34
Water	0.24	0.19

2. Additional state- or territory-specific data or reports on the status and trends of coastal wetlands

[1] 2016 C-CAP Land Cover data were summarized by CZM for Massachusetts coastal counties (Essex, Middlesex, Suffolk, Norfolk, Plymouth, Barnstable, Nantucket, Dukes, and Bristol); county data were downloaded in September 2019 from https://coast.noaa.gov/htdata/raster1/landcover/bulkdownload/hires/ma.

[2] These data were also reported in the 309 Assessment and Strategy for 2016-2020. They were derived by GIS-processing of C-CAP Regional Change data covering the nine Massachusetts coastal counties, from 1996-2010 and 2006-2010. Data were acquired from the C-CAP FTP download page: http://coast.noaa.gov/ccapftp. They exclude the C-CAP class Unconsolidated Shore, which is categorized under Barren Land in the C-CAP Land Cover Classification Scheme, and include all palustrine and estuarine wetland classes.

Several wetland mapping datasets with coverage in Massachusetts have been published since the previous assessment, but none of these offer a reasonable means for change analysis at the time of this writing. Known datasets on the extent and distribution of wetlands include the following:

- Salt Marsh Habitat Avian Research Program (SHARP) Salt Marsh Habitat/Community Types (released in 2017)
- National Wetland Inventory (NWI) Wetlands, Region 5, Rapid Update (released in 2014)
- Massachusetts Department of Environmental Protection (MassDEP) Wetlands, 2005 (released in 2017)
- MassGIS 2016 Land Cover/Land Use (released in 2019 and developed by NOAA OCM as High-Resolution Land Cover, C-CAP)

CZM is working to develop a tidal marsh change analysis program for long-term monitoring sites, with the intent to expand the program statewide, if feasible.

Management Characterization:

1. Indicate if there have been any significant changes at the state or territory level (positive or negative) that could impact the future protection, restoration, enhancement, or creation of coastal wetlands since the last assessment.

Management Category	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	(1) Yes, in 2016, Governor Baker's Executive Order 569 on climate change was adopted.
Wetlands programs (e.g., regulatory, mitigation, restoration, acquisition)	(2) Yes, changes to CZM wetland program work.

2. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:

a. Describe the significance of the changes;
b. Specify if they were 309 or other CZM-driven changes; and
c. Characterize the outcomes or likely future outcomes of the changes.

Executive Order 569 includes actions to develop an Integrated Climate Change Strategy for the Commonwealth. As a result of this legislation, The State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) for the Commonwealth was adopted on September 17, 2018. The plan includes an emphasis on nature-based solutions, including wetlands, in hazard mitigation and climate adaption. Subsequently the Commonwealth has also begun to provide funds to municipalities for climate adaptation actions through a new grant program (MVP Action Grants), including restoration of wetlands and acquisition of lands for marsh migration. The changes were not driven by 309, but they did have the support and participation from CZM staff during development of the SHMCAP and the public review and comment period. CZM staff

also provide review, comment, and scoping input on MVP Action Grants. In addition CZM, implemented the Coastal Resilience Grant Program (CR) which makes funding available to municipalities and non-profits to support coastal resiliency, including nature-based storm-damage protection techniques—coastal green infrastructure or living shoreline projects that evaluate project suitability, design, permit, construct, and/or monitor non-structural approaches to enhance or create natural erosion and flood protection services provided by salt marshes and other habitat types. Support from CR and MVP Action Grants will enhance the ability for municipalities and others within the Commonwealth to prioritize and implement restoration and protection actions to support the resiliency of coastal wetlands.

CZM Wetlands Program work has shifted to increased attention on the nexus between climate change and coastal wetlands, particularly tidal marshes. Under a project of special merit award and a Wetland Program Development Grant from the United States Environmental Protection Agency (EPA), CZM applied the Sea Level Rise Affecting Marshes Model (SLAMM), along with the Marsh Equilibrium Model (MEM) where feasible, to develop statewide predictions of the future extent and distribution of coastal wetlands, including tidal marshes, in response to sea level rise; from these data we are characterizing wetland migration potential. CZM's approved Section 309 Assessment and Five-Year Strategy for Program Enhancement (FY2016-2020) (as amended in October 2016) includes tasks to research and track case studies for long term resilience of coastal marshes. A project to develop a strategic plan for salt marsh resiliency in Massachusetts, *the Blueprint for Tidal Marsh Resilience*, is currently underway. CZM has also implemented a long-term monitoring program to track changes in marsh habitat structure in Massachusetts salt marshes. CZM wetlands program work is driven from priorities outlined in 309, as well as CZM overall strategy goals and through support from EPA Wetland Program Development Grants. The Blueprint will provide new guidelines and procedures for improving tidal marsh resilience and will also lead to options for updated Coastal Management Program enforceable policies. SLAMM model products and derivatives support enhanced technical assistance to stakeholders and partners on predicted risk to tidal marshes with sea level rise impacts, including areas where marshes may be able to migrate.

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

Wetlands are a high priority for CZM due to the significant ecological services salt marshes and other wetlands provide to the Commonwealth. Concern is growing about the fate of Massachusetts marshes given sea level rise and other pressures. Predictions from model results indicate there could be significant losses to tidal marshes and other wetlands in Massachusetts in the future, with irreversible habitat changes. There is a critical need for CZM to continue to

provide science-based technical assistance to a wide array of stakeholders and to strategically guide actions to support the protection, restoration, and resilience of tidal marshes across Massachusetts.

Ongoing stakeholder input and cooperative work with MassDEP Wetlands, Massachusetts Division of Ecological Restoration, Mass Audubon, Trustees, Massachusetts Bays National Estuary Program, and Buzzards Bay National Estuary Program informs this assessment and strategy. This prioritization level was supported by input from a stakeholders advisory group convened to review draft enhancement area priorities and plans. Topics of interest and concern raised included: salt marsh migration, land conservation and the impacts of climate change.

B. Coastal Hazards

Section 309 Enhancement Objective: *Prevent or significantly reduce threats to life and property by eliminating development and redevelopment in high-hazard areas, managing development in other hazard areas, and anticipating and managing the effects of potential sea level rise and Great Lakes level change. §309(a)(2)*
Note: For purposes of the Hazards Assessment, coastal hazards include the following traditional hazards and those identified in the CZMA: flooding; coastal storms (including associated storm surge); geological hazards (e.g., tsunamis, earthquakes); shoreline erosion (including bluff and dune erosion); sea level rise; Great Lake level change; land subsidence; and saltwater intrusion.

Phase I (High-Level) Assessment:
Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.

Resource Characterization:

1. *In the table below, indicate the general level of risk in the coastal zone for each of the coastal hazards. The following resources may help assess the level of risk for each hazard. Your state may also have other state-specific resources and tools to consult. Additional information and links to these resources can be found in the "Resources" section at the end of the Coastal Hazards Phase I Assessment Template:*

    a. *The state's multi-hazard mitigation plan.*
    b. *Coastal County Snapshots: Flood Exposure*
    c. *Coastal Flood Exposure Mapper*
    d. *Sea Level Rise Viewer/Great Lakes Lake Level Change Viewer*
    e. *National Climate Assessment*

General Level of Hazard Risk in the Coastal Zone

Type of Hazard	General Level of Risk[3] (H, M, L)
Flooding (riverine, stormwater)	H
Coastal storms (including storm surge)	H
Geological hazards (e.g., tsunamis, earthquakes)	L
Shoreline erosion	H
Sea level rise	H
Great Lakes level change	n/a
Land subsidence	L
Saltwater intrusion	M
Other (please specify) – Strong winds/thunderstorms	L

2. If available, briefly list and summarize the results of any additional data or reports on the level of risk and vulnerability to coastal hazards within your state since the last assessment. The state's multi-hazard mitigation plan or climate change risk assessment or plan may be a good resource to help respond to this question.

Statewide

Massachusetts State Hazard Mitigation and Climate Adaptation Plan (2018): The Massachusetts State Hazard Mitigation and Climate Adaptation Plan was adopted in 2018 in fulfillment of Governor Baker's Executive Order 569 on climate change. This plan comprehensively integrates climate change impacts and adaptation strategies with hazard mitigation planning and complies with current federal requirements for state hazard mitigation plans. The risk assessment (Chapter 4) evaluated many hazards including inland flooding, coastal flooding/sea level rise, nor'easters, hurricanes, tsunamis, earthquakes, coastal erosion, and strong winds.

- Inland flooding: Essex and Norfolk Counties have experienced the most Federal Emergency Management Agency (FEMA) flood disaster declarations. Based on historical disaster declarations, the Commonwealth experiences a substantial flood event once every three years.
- Coastal flooding (*including sea level rise*): The entire Massachusetts coastline is exposed to this hazard and coastal flooding occurs frequently. The highest concentration of coastal flooding events has occurred in the coastal zone of Plymouth County. The Commonwealth has experienced an average of six coastal flooding events per year over the past decade.
- Nor'easters: East-facing coastal areas, including Salisbury Beach, Revere, Nahant, Scituate, and Marshfield as well as parts of Cape Cod and Nantucket, experience nor'easters most strongly. Although there is significant inter-annual variability in the frequency and severity of winter storms, a notable winter storm generally occurs at

[3] Risk is defined as "the estimated impact that a hazard would have on people, services, facilities and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage." *Understanding Your Risks: Identifying Hazards and Estimating Losses. FEMA 386-2. August 2001*

least once every winter and some years bring up to four nor'easter events. This is currently the most frequently occurring natural hazard in the state.

- Hurricanes/tropical storms: The entire Commonwealth is vulnerable to hurricanes and tropical storms. The coastal areas are more susceptible to damage due to the combination of both high winds and tidal surge as depicted on the SLOSH maps. The average number of hurricane or tropical storm events is one every two years. Storms severe enough to receive FEMA disaster declarations occur every nine years on average.
- Tsunami: All of the coastal areas of Massachusetts are exposed to the threat of tsunamis, but the probability is relatively low. The historical frequency of tsunami events on the East Coast of the U.S. is approximately one event every 39 years. A significant tsunami has never struck the Massachusetts coast.
- Earthquakes: Earthquakes can occur throughout Massachusetts. The probability of a magnitude 5.0 or greater earthquake centered somewhere in New England in a 10-year period is about 10-15%.
- Coastal erosion: The highest rates of erosion occur on Cape Cod in Eastham, Orleans, and Yarmouth.
- Strong winds/thunderstorms: While the entire Commonwealth experiences thunderstorms (on 20-30 days each year), the coastal zone is most frequently impacted by these high-wind events. The average annual frequency of high wind events is 43.5.

Report of the Massachusetts Coastal Erosion Commission (2015): The Massachusetts Coastal Erosion Commission (CEC) was established in 2014 as part of the FY 2014 Budget Bill. This 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. Specifically, the Commission was asked to evaluate erosion levels since 1978 and assess the resulting financial damage to property, infrastructure, and beach and dune resources—and to also estimate the likely cost of damages over the next 10 years under current conditions, regulations, and laws.

- State inventories of coastal engineered structures (e.g., seawalls and revetments) provide a comprehensive assessment of shoreline armoring coast-wide and results indicate that 27% of the exposed coastal shoreline is armored by some form of coastal protection.
- A shoreline change analysis was conducted using information from the Massachusetts Shoreline Change Project. The CEC report provides both the long- and short-term average change rates for each community, with the highest twenty erosion rates identified. Average short-term (approximately 30-year) erosion rates for these top twenty communities range from 8.70 feet per year in Yarmouth along the Cape Cod Bay shoreline to 0.99 feet per year in West Tisbury.
- Coastal storm damage reports collected by the Massachusetts Rapid Response Coastal Storm Damage Assessment Team were reviewed to identify several "hot spot" locations where the combination of erosion, storm surge, flooding, and waves have caused significant damage to buildings and/or infrastructure.

- FEMA payments for federal disaster declarations for events in Massachusetts with coastal impacts (e.g., flooding and erosion) since 1978 total more than $600 million. The data show that the major events in 1978 (Blizzard of '78) and 1991 (Hurricane Bob) far outweigh the costs of the more recent, and more frequent and less damaging events declared in the Commonwealth.
- The total cost from FEMA's National Flood Insurance Program (NFIP) claims for all coastal events since 1978 was nearly $370 million. Communities with northeast-facing shorelines are more susceptible to significant damage on a frequent basis (sometimes more than once in a given year) from nor'easters, while communities with shorelines that do not face northeast may be subject to damage only from a specific subset of storms, particularly hurricanes.

Management Characterization:

In the tables below, indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred that could impact the CMP's ability to prevent or significantly reduce coastal hazards risk since the last assessment.

Significant Changes in Hazards Statutes, Regulations, Policies, or Case Law

Topic Addressed	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Elimination of development/redevelopment in high-hazard areas[4]	Y	Y	N
Management of development/ redevelopment in other hazard areas	Y	Y	Y
Climate change impacts, including sea level rise or Great Lakes level change	Y	Y	Y

Significant Changes in Hazards Planning Programs or Initiatives

Topic Addressed	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Hazard mitigation	Y	Y	Y
Climate change impacts, including sea level rise or Great Lakes level change	Y	Y	Y

[4] Use state's definition of high-hazard areas.

Significant Changes in Hazards Mapping or Modeling Programs or Initiatives

Topic Addressed	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Sea level rise or Great Lakes level change	Y	Y	Y
Other hazards: coastal change/erosion	Y	Y	Y

1. *Briefly state how "high-hazard areas" are defined in your coastal zone.*
   Although Massachusetts has not formally adopted a coastal "high-hazard area" definition, developed areas subject to high velocity wave action, coastal flooding, and erosion have been the focus of policies, regulations, planning, and other coastal hazards initiatives. These areas include FEMA Velocity Zones and Coastal A Zones, low-lying areas subject to frequent inundation, beaches, dunes, and coastal banks.

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
   a. *Describe the significance of the changes;*
   b. *Specify if they were 309 or other CZM-driven changes; and*
   c. *Characterize the outcomes or likely future outcomes of the changes.*

Management of development: Massachusetts State Building Code (update and enhancement). The 9th edition of the state building code became effective in 2017. It is based on the 2015 International Code Cancel's recommend codes (I-Codes), and contains a series of requirements for flood-resistant design and construction that are in accordance with the American Society of Civil Engineers (ASCE) 24 standard, which incorporates (and often exceeds) FEMA's NFIP construction standards. Highlights of ASCE 24 that complement the NFIP minimum requirements include flood-damage-resistant materials, utilities, and siting considerations. CZM provided technical support to the State Board of Building Regulations and Standards focused on elevating buildings in coastal high-hazard areas above the Base Flood Elevation and using pilings in coastal dune areas. Elevated buildings, especially those on open pilings, better accommodate storm surge and allow for the movement of beach and dune sediments, reducing coastal storm damages. New and substantially improved buildings in Velocity Zones also must have utilities elevated above the Base Flood Elevation further protecting buildings and people.

Climate change impacts/hazard mitigation: Executive Order 569 (integrated climate change strategy). In 2016, Governor Baker signed Executive Order 569, which laid out a comprehensive approach to further reduce greenhouse gas emissions, safeguard residents, municipalities and businesses from the impacts of climate change, and build a more resilient Commonwealth. CZM helped EEA launch the Municipal Vulnerability Preparedness program in 2017 to provide funding to cities and towns to complete a community-driven process to identify hazards and

develop strategies to improve resilience. CZM also supported EEA and Executive Office of Public Safety and Security efforts to create the first Massachusetts State Hazard Mitigation and Climate Adaptation Plan (2018), a five-year blueprint for Massachusetts' efforts to prepare for natural hazards and adapt to the impacts of climate change. A $2.4 billion Environmental Bond Bill (2018) also authorized capital investments to safeguard residents, municipalities and businesses from the impacts of climate change, protect environmental resources, and improve recreational opportunities. This investment continues to support CZM's Coastal Resilience Grant Program and other local climate adaptation efforts.

Sea level rise: Coastal inundation/flood risk modeling. The Massachusetts Department of Transportation (MassDOT) is working to finalize results of a Massachusetts Coast Flood Risk Model, which models climate change and produces coastal flood depths and exceedance probabilities. The dynamic model includes the impacts of tides, waves, wave run-up and overtopping, storm surge, winds, and currents. CZM staff assisted with the selection of sea level rise scenarios and will support the dissemination and application of the high-resolution maps and GIS data. Projections for present day, 2030, 2050, 2070, and 2100 support many coastal resilience efforts including more detailed vulnerability assessments, building designs and retrofits, and policy development.

Coastal change/erosion: Shoreline change analysis, shoreline erosion forecasting, and coastal bank erosion mapping. Since the release of the Coastal Erosion Commission report (described in #2 above), CZM has worked with the U.S. Geological Survey (USGS) to update the Massachusetts Shoreline Change Project with two new mean high water shorelines using lidar data collected between 2010 and 2014. Long-term (more than 150-year) and short-term (approximately 30 to 40-year) shoreline change rates were calculated at 50-meter intervals along ocean-facing sections of the Massachusetts coast. CZM and USGS are continuing to collaborate on coastal change products including a 2018 shoreline, a model of sediment movement during coastal storm events, and a tool to forecast shoreline erosion. CZM also worked with the Massachusetts Department of Environmental Protection (MassDEP) to delineate coastal bank positions along ocean-facing shorelines and measure coastal bank loss over the last 30 years. These data support local land-use decisions and protection of coastal resources.

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

The "high" priority level is based on the severity of risk associated with coastal hazards and the potential for program changes and implementation of additional strategies to address these risks. The impacts of erosion, flooding, storm surge and sea level rise are increasing along the

Massachusetts coast. The state is currently working with FEMA to address the effects of three severe winter storms during March 2018, which caused extensive damage to homes, infrastructure, and natural resources. In August 2019, the state kicked off a Resilient Massachusetts Action Team (RMAT), an interagency implementation team for the State Hazard Mitigation and Climate Adaptation Plan. The RMAT will support partnerships across state government and work on resilience standards focused on community needs as well as a capital planning tool.

Stakeholders engaged include municipalities (any), non-profit organizations (The Nature Conservancy and Trustees), academic partners (Northeastern University and University of Massachusetts), environmental planning and engineering consultants (Kleinfelder and Woods Hole Group), and other state and federal agencies (MassDEP, MassDOT and USGS). This prioritization level was supported by input from a stakeholders advisory group that was convened to review enhancement area priorities and plans. Topics of concern raised included: living shorelines and viable alternatives, coastal resiliency, and sea level rise projections and tools for local communities.

C. Public Access

Section 309 Enhancement Objective: *Attain increased opportunities for public access, considering current and future public access needs, to coastal areas of recreational, historical, aesthetic, ecological, or cultural value. §309(a)(3)*

Phase I (High-Level) Assessment:
Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.

Resource Characterization:

1. *Use the table below to provide data on public access availability within the coastal zone.*

Public Access Status and Trends

Type of Access	Current number	Changes or Trends Since Last Assessment (↑, ↓, –, unknown)	Cite data source
Beach access sites	Data to differentiate between beach and shoreline access sites not available. Number of beach/shoreline access sites within 100 meters of shoreline: 1,967	↑ by 336 (1,631 beach/shoreline access sites within 100 meters of shoreline reported in last assessment)	Massachusetts Office of Coastal Zone Management. *Coast Guide Online*, [ArcGIS Online web map]. https://arcg.is/1CKium. Accessed September 24, 2019.
Shoreline (other than beach) access sites	See above	See above	See above

Type of Access	Current number	Changes or Trends Since Last Assessment (↑, ↓, –, unknown)	Cite data source
Recreational boat (power or nonmotorized) access sites	159	↑ by 1 (158 sites reported in last assessment)	Massachusetts Department of Fish and Game, Division of Marine Fisheries, 2019. *Massachusetts Saltwater Recreational Fishing Guide*.
Number of designated scenic vistas or overlook points	No statewide data available	unknown	n/a
Number of fishing access points (i.e. piers, jetties)	65	↑ by 3 (62 piers and jetties recorded in 2009)	Massachusetts Department of Fish and Game, Division of Marine Fisheries, 2019. *Massachusetts Saltwater Recreational Fishing Guide*.
Coastal trails/ boardwalks *(Please indicate number of trails/boardwalks and mileage)*	Miles of Trails/boardwalks 487 miles	↑ by 178 miles (309 miles reported in last assessment)	Massachusetts Department of Conservation and Recreation. 1) Bicycle Trails, September 2004. 2) DCR Roads and Trails, June 2015. 3) Long Distance Trails, August 2015. "Coastal Trails" [Esri shapefile]. Created by Massachusetts Office of Coastal Zone Management, using ArcGIS Pro 2.3.1, as a subset of the original three datasets. September 19, 2019.
Number of acres parkland/open space	Total sites Number of parkland/open space sites in coastal zone: 5,630 Number of acres parkland/open space in coastal zone: 190,954.7	↑ by 194 sites (3,598 sites reported in last assessment) ↑ by X acres (112,097 acres reported in last assessment)	Massachusetts Office of Geographic Information. Protected and Recreational OpenSpace, August 2019. "Coastal Public Access Sites" [Esri shapefile]. Created by Massachusetts Office of Coastal Zone Management, using ArcGIS Pro2.3.1, as a subset of the original dataset. September 19, 2019.
	Sites per miles of shoreline 5,630 sites divided by 1,519 miles of shoreline = 3.7 sites/mile of shoreline	↑ by 1.3 sites/mile (3,598 sites divided by 1,519 miles of shoreline = 2.4 sites/mile of shoreline reported in last assessment)	

Type of Access	Current number	Changes or Trends Since Last Assessment (↑, ↓, –, unknown)	Cite data source
Access sites that are Americans with Disabilities Act (ADA) compliant	No statewide data available	unknown	n/a
Other (please specify)	n/a	n/a	n/a

2. *Briefly characterize the demand for coastal public access and the process for periodically assessing demand. Include a statement on the projected population increase for your coastal counties.*

   The population within the state's coastal shoreline counties is projected to increase by 5 percent between 2010 and 2020 (source: NOAA's National Coastal Population Report: Population Trends from 1970 to 2020).

3. *If available, briefly list and summarize the results of any additional data or reports on the status or trends for coastal public access since the last assessment.*
   N/A

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if there have been any significant state- or territory-level management changes (positive or negative) that could impact the future provision of public access to coastal areas of recreational, historical, aesthetic, ecological, or cultural value.*

Significant Changes in Public Access Management

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y	Y	N
Operation/maintenance of existing facilities	Y	Y	N
Acquisition/enhancement programs	Y	Y	N

2. *For any management categories with significant changes, briefly provide the information below. this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*

N/A

3. *Indicate if your state or territory has a publicly available public access guide. How current is the publication and how frequently it is updated?*

Publicly Available Access Guide

Public Access Guide	Printed	Online	Mobile App
State or territory has? (Y or N)	N	Y	Y
Web address (if applicable)	n/a	http://www.mass.gov/eea/agencies/czm/program-areas/public-access-and-coast-guide/coast-guide/coast-guide-online.html	http://www.mass.gov/eea/agencies/czm/program-areas/public-access-and-coast-guide/coast-guide/coast-guide-online.html
Date of last update	n/a	September 18, 2019	September 18, 2019
Frequency of update	n/a	As needed	As needed

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

Medium

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

CZM supports state regulatory efforts to protect and enhance public access. The Massachusetts Department of Environmental Protection (MassDEP) regulates development in tidal waters and on former tidal areas that are now filled. In these "tidelands," property rights are held by the state in trust for the benefit of the public. CZM also supports regulatory protection of public access rights through its responsibility for overseeing the preparation of Municipal Harbor Plans (MHPs)—official plans approved by the state that establish a community's objectives, standards, and policies for guiding public and private use of land and water within Chapter 91 jurisdiction. Through this planning process, CZM can help communities protect, enhance, and develop a comprehensive blueprint for public access to their waterfront.

D. Marine Debris

Section 309 Enhancement Objective: *Reducing marine debris entering the nation's coastal and ocean environment by managing uses and activities that contribute to the entry of such debris. §309(a)(4)*

Phase I (High-Level) Assessment:
Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.

Resource Characterization:
1. *In the table below, characterize the existing status and trends of marine debris in the state's coastal zone based on the best available data.*

Existing Status and Trends of Marine Debris in Coastal Zone

Source of Marine Debris	Significance of Source (H, M, L, unknown)	Type of Impact[5] (aesthetic, resource damage, user conflicts, other)	Change Since Last Assessment (↑, ↓, –, unknown)
Beach/shore litter	M	Aesthetic, resource damage	–
Land-based dumping	L	Aesthetic, resource damage	unknown
Storm drains and runoff	M	Aesthetic, resource damage	unknown
Land-based fishing (e.g., fishing line, gear)	L	Aesthetic, resource damage	unknown
Ocean/Great Lakes-based fishing (e.g., derelict fishing gear)	M	Resource damage	↑
Derelict vessels	L	Aesthetic, resource damage	unknown
Vessel-based (e.g., cruise ship, cargo ship, general vessel)	L	Aesthetic, resource damage	unknown
Hurricane/Storm	L	Aesthetic, resource damage	unknown
Tsunami	L	Aesthetic, resource damage	N/A
Other (please specify)	L	N/A	unknown

[5] You can select more than one, if applicable.

2. *If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends or potential impacts from marine debris in the coastal zone since the last assessment.*

The primary data that Massachusetts gathers is through COASTSWEEP, Massachusetts' annual volunteer beach cleanup program, which is part of an international campaign organized by Ocean Conservancy in Washington, DC. Participants all over the world collect marine debris and record the types of material they find. This information is then used by the Ocean Conservancy to help reduce future marine debris problems. Each fall, cleanups are held all along the Massachusetts coastline. Each year the Ocean Conservancy publishes a report of the data from the previous year's cleanups. This report places the debris collected into activity categories that do not match up with the requested categories above. For the 2018 cleanups in coastal Massachusetts (the latest data available), 133,288 items were collected. The Top 10 Items collected, which includes: cigarette butts; food wrappers; plastic, glass, and foam pieces; plastic bottles and caps; straws and stirrers; foam packaging; and rope; accounted for 62% of the items collected. Items from Fishing Activities, which includes fishing gear, buoys, rope, etc., made up about 5% of items collected. Packaging materials were 5% and Personal Hygiene (materials, such as diapers, condoms, syringes, and tampon and tampon applicators, which are dumped into storm drains, sewer systems, and toilets) was less than 1%. Tiny trash less than 2.5 cm was 12%.

Regarding derelict fishing gear, the "Fishing for Derelict Gear in Cape Cod and Massachusetts Bays" project (9/1/16 - 3/31/18) and "Mobilizing Diverse Stakeholders to Remove Derelict Fishing Gear from Beaches & Bay" project (8/1/18 – 1/31/20) was conducted/is being conducted by the Center for Coastal Studies through NOAA's Marine Debris Program grants. These initiatives targeted the removal of lost, abandoned, or discarded fishing gear, which were located by CCS side-scan sonar in areas of Cape Cod Bay including off Provincetown, Truro, Wellfleet, Dennis, Sandwich, and Marshfield. More than 20 tons of debris were recovered from the ocean floor over the two winters with the help of contracted lobstermen. Over 400 lobster traps, rope, net, cable, buoys, aquaculture gear, and other assorted debris was recovered and disposed of responsibly: metal was recycled, waste was incinerated, and nearly 75% of the traps were considered to be in usable condition and returned to their owners. Additionally, the Center for Coastal Studies organized and participated in dozens of shoreline cleanups in Provincetown, Truro, and along the Cape Cod National Seashore. Fishing gear items (rope, netting, traps or parts of traps, buoys, bait bags, escape vents, claw bands, ID tags, aquaculture mesh, etc.) comprised over 20% of all debris (nearly 75% by weight).

No specific data is available for marine debris originating from stormwater, other fishing gear, derelict vessels, waste from vessels, or hurricanes. CZM works to prevent recreational vessel debris through publication of the Massachusetts Clean Marina Guide (2001) in partnership with the recreational boating industry. The Guide provides "best environmental practice" information for marina facilities, including a fact sheet that encourages proper handling of trash by boaters.

Management Characterization:

1. Indicate if the approach is employed by the state or territory and if there have been any significant state- or territory-level management changes (positive or negative) for how marine debris is managed in the coastal zone.

Significant Changes in Marine Debris Management

Management Category	Employed by State/Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Marine debris statutes, regulations, policies, or case law interpreting these	N	N	N
Marine debris removal programs	Y	Y	N

2. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:

a. Describe the significance of the changes;
b. Specify if they were 309 or other CZM-driven changes; and
c. Characterize the outcomes and likely future outcomes of the changes.

N/A

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

Low

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

State efforts have been focused primarily on educating the public on marine debris problems. A significant investment of resources would be required to observe any measurable changes. Given the limited availability of resources, when compared to the priorities of other 309 categories, any expenditure would quickly surpass the realized benefits. The priority level therefore remains low.

E. Cumulative and Secondary Impacts

Section 309 Enhancement Objective: *Development and adoption of procedures to assess, consider, and control cumulative and secondary impacts of coastal growth and development, including the collective effect on various individual uses or activities on coastal resources, such as coastal wetlands and fishery resources. §309(a)(5)*

Phase I (High-Level) Assessment: *Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.*

Resource Characterization:

1. *Using National Ocean Economics Program Data on population and housing,[6] please indicate the change in population and housing units in the state's coastal counties between 2012 and 2017. You may wish to add additional trend comparisons to look at longer time horizons as well (data available back to 1970), but at a minimum, please show change over the most recent five-year period data is available (2012-2017) to approximate current assessment period.*

Trends in Coastal Population and Housing Units			
	2012	**2017**	**Percent Change (2012-2017)**
Number of people	5,026,896	5,210,539	3.00%
Number of housing units	2,139,418	2,201,606	2.91%

2. *Using provided reports from NOAA's Land Cover Atlas,[7] please indicate the status and trends for various land uses in the state's coastal counties between 1996 and 2016. You may use other information and include graphs and figures, as appropriate, to help illustrate the information.*

Between 1996 and 2010, most counties in Massachusetts lost forested and agricultural lands and gained low and high intensity development. Plymouth County had the largest loss of forested lands at 20.78 acres. There were minor gains in barren land in Barnstable, Essex, and Plymouth counties.

[6] www.oceaneconomics.org/Demographics/PHresults.aspx. Enter "Population and Housing" section and select "Data Search" (near the top of the left sidebar). From the drop-down boxes, select your state, and "all counties." Select the year (2012) and the year to compare it to (2017). Then select "coastal zone counties."

[7] www.coast.noaa.gov/digitalcoast/tools/lca.html. Note that the 2016 data will not be available for all states until later Summer 2019. NOAA OCM will be providing summary reports compiling each state's coastal county data. The reports will be available after all of the 2016 data is available.

Barnstable County Distribution of Land Cover Types		
Land Cover Type	**Land Area Coverage in 2010 (Acres)**	**Gain/Loss Since 1996 (Acres)**
Developed, High Intensity	45.11	2.44
Developed, Low Intensity	63.55	3.67
Developed, Open Space	34.98	2.28
Grassland	11.49	-0.25
Scrub/Shrub	10.84	0.32
Barren Land	63.29	1.86
Open Water	868.83	-2.18
Agriculture	5.77	-0.28
Forested	151.44	-7.71
Woody Wetland	16.91	0.07
Emergent Wetland	33.37	-0.23

Bristol County Distribution of Land Cover Types		
Land Cover Type	**Land Area Coverage in 2010 (Acres)**	**Gain/Loss Since 1996 (Acres)**
Developed, High Intensity	70.53	5.61
Developed, Low Intensity	62.57	7.17
Developed, Open Space	36.09	5.36
Grassland	11.10	-0.65
Scrub/Shrub	4.87	0.47
Barren Land	7.14	0.46
Open Water	131.76	-0.22
Agriculture	39.29	-3.89
Forested	200.59	-12.50
Woody Wetland	114.01	-1.77
Emergent Wetland	13.24	-0.04

Dukes County Distribution of Land Cover Types		
Land Cover Type	**Land Area Coverage in 2010 (Acres)**	**Gain/Loss Since 1996 (Acres)**
Developed, High Intensity	1.89	0.14
Developed, Low Intensity	5.06	0.20
Developed, Open Space	5.55	0.26
Grassland	10.09	0.07
Scrub/Shrub	8.85	0.29
Barren Land	8.86	0.12
Open Water	371.73	-0.24
Agriculture	2.16	-0.12
Forested	54.88	-0.75
Woody Wetland	3.74	0.02
Emergent Wetland	5.88	0.00

Essex County Distribution of Land Cover Types		
Land Cover Type	**Land Area Coverage in 2010 (Acres)**	**Gain/Loss Since 1996 (Acres)**
Developed, High Intensity	88.08	4.23
Developed, Low Intensity	66.92	4.99
Developed, Open Space	30.21	3.77
Grassland	6.82	-1.32
Scrub/Shrub	3.56	0.51
Barren Land	9.00	2.50
Open Water	315.30	-2.38
Agriculture	28.62	-1.85
Forested	162.62	-9.02
Woody Wetland	64.07	-1.44
Emergent Wetland	40.51	0.02

Nantucket County Distribution of Land Cover Types		
Land Cover Type	Land Area Coverage in 2010 (Acres)	Gain/Loss Since 1996 (Acres)
Developed, High Intensity	2.82	0.14
Developed, Low Intensity	4.00	0.29
Developed, Open Space	2.65	0.71
Grassland	4.34	-0.14
Scrub/Shrub	11.23	-0.20
Barren Land	14.95	0.61
Open Water	245.30	-0.25
Agriculture	1.21	-0.16
Forested	9.57	-1.04
Woody Wetland	3.86	0.00
Emergent Wetland	3.75	0.04

Norfolk County Distribution of Land Cover Types		
Land Cover Type	Land Area Coverage in 2010 (Acres)	Gain/Loss Since 1996 (Acres)
Developed, High Intensity	76.57	5.43
Developed, Low Intensity	70.94	6.53
Developed, Open Space	39.47	4.87
Grassland	2.53	-0.27
Scrub/Shrub	3.60	-0.57
Barren Land	2.31	0.39
Open Water	40.79	-0.11
Agriculture	11.78	-3.90
Forested	130.86	-11.02
Woody Wetland	53.28	-1.11
Emergent Wetland	8.89	-0.24

Plymouth County Distribution of Land Cover Types		
Land Cover Type	Land Area Coverage in 2010 (Acres)	Gain/Loss Since 1996 (Acres)
Developed, High Intensity	54.06	7.28
Developed, Low Intensity	75.95	9.89
Developed, Open Space	46.30	8.03
Grassland	12.29	-1.13
Scrub/Shrub	8.01	0.02
Barren Land	13.77	1.39
Open Water	424.52	-0.11
Agriculture	59.11	-3.40
Forested	267.81	-20.78
Woody Wetland	102.62	-1.07
Emergent Wetland	23.54	-0.11

Suffolk County Distribution of Land Cover Types		
Land Cover Type	Land Area Coverage in 2010 (Acres)	Gain/Loss Since 1996 (Acres)
Developed, High Intensity	41.97	0.17
Developed, Low Intensity	7.26	0.13
Developed, Open Space	3.22	-0.13
Grassland	0.69	-0.11
Scrub/Shrub	0.07	0.03
Barren Land	1.06	0.08
Open Water	52.30	-0.02
Agriculture	0.29	0.01
Forested	2.65	-0.14
Woody Wetland	0.50	0.01
Emergent Wetland	2.66	-0.04

3. *Using provided reports from NOAA's Land Cover Atlas,[8] please indicate the status and trends for developed areas in the state's coastal counties between 1996 and 2016 in the two tables below. You may use other information and include graphs and figures, as appropriate, to help illustrate the information.*

Across the eight coastal counties of Massachusetts, there was an 11% increase in developed land and a 4% increase in impervious surface. The largest changes were seen in Plymouth, Nantucket, and Bristol counties, respectively. As seen in the tables below, the largest change in land use was the loss of forested lands (64.52 square miles) and the loss of agricultural lands (15.33 square miles) to development.

[8] www.*coast.noaa.gov/digitalcoast/tools/lca.html*. Note that the 2016 data will not be available for all states until later Summer 2019. NOAA OCM will be providing summary reports compiling each state's coastal county data. The reports will be available after all of the 2016 data is available.

Development Status and Trends for Barnstable County			
	1996	**2010**	**Percent Net Change**
Percent land area developed	10.36	11.00	6.20
Percent impervious surface area	3.59	3.81	6.15

Development Status and Trends for Bristol County			
	1996	**2010**	**Percent Net Change**
Percent land area developed	21.85	24.48	12.01
Percent impervious surface area	8.94	9.85	10.24

Development Status and Trends for Dukes County			
	1996	**2010**	**Percent Net Change**
Percent land area developed	2.48	2.61	5.16
Percent impervious surface area	0.63	0.67	6.17

Development Status and Trends for Essex County			
	1996	**2010**	**Percent Net Change**
Percent land area developed	21.11	22.71	7.54
Percent impervious surface area	9.18	9.74	6.11

Development Status and Trends for Nantucket County			
	1996	**2010**	**Percent Net Change**
Percent land area developed	2.74	3.12	13.69
Percent impervious surface area	0.96	1.04	8.34

Development Status and Trends for Norfolk County			
	1996	**2010**	**Percent Net Change**
Percent land area developed	38.58	42.40	9.89
Percent impervious surface area	15.37	16.74	8.90

Development Status and Trends for Plymouth County			
	1996	**2010**	**Percent Net Change**
Percent land area developed	13.89	16.20	16.67
Percent impervious surface area	4.84	5.61	15.89

Development Status and Trends for Suffolk County			
	1996	**2010**	**Percent Net Change**
Percent land area developed	46.39	46.55	0.34

Percent impervious surface area	29.00	29.17	0.60

How Land Use Is Changing in Barnstable County	
Land Cover Type	**Areas Lost to Development Between 1996-2016 (Sq. Miles)**
Barren Land	2.34
Emergent Wetland	0.51
Woody Wetland	0.15
Open Water	3.61
Agriculture	0.37
Scrub/Shrub	0.86
Grassland	1.45
Forested	7.99

How Land Use Is Changing in Bristol County	
Land Cover Type	**Areas Lost to Development Between 1996-2016 (Sq. Miles)**
Barren Land	0.28
Emergent Wetland	0.25
Woody Wetland	1.93
Open Water	0.27
Agriculture	4.24
Scrub/Shrub	0.76
Grassland	1.21
Forested	12.70

How Land Use Is Changing in Dukes County	
Land Cover Type	**Areas Lost to Development Between 1996-2016 (Sq. Miles)**
Barren Land	0.34
Emergent Wetland	0.05
Woody Wetland	0.05
Open Water	0.51
Agriculture	0.15
Scrub/Shrub	0.37
Grassland	0.57
Forested	1.01

How Land Use Is Changing in Essex County	
Land Cover Type	**Areas Lost to Development Between 1996-2016 (Sq. Miles)**
Barren Land	0.20
Emergent Wetland	0.55
Woody Wetland	1.61
Open Water	2.50
Agriculture	2.55

Scrub/Shrub	0.44
Grassland	1.74
Forested	9.16

How Land Use Is Changing in Nantucket County	
Land Cover Type	**Areas Lost to Development Between 1996-2016 (Sq. Miles)**
Barren Land	0.30
Emergent Wetland	0.04
Woody Wetland	0.03
Open Water	0.55
Agriculture	0.16
Scrub/Shrub	0.73
Grassland	0.66
Forested	1.14

How Land Use Is Changing in Norfolk County	
Land Cover Type	**Areas Lost to Development Between 1996-2016 (Sq. Miles)**
Barren Land	0.33
Emergent Wetland	0.36
Woody Wetland	1.16
Open Water	0.14
Agriculture	4.01
Scrub/Shrub	0.99
Grassland	0.57
Forested	11.15

How Land Use Is Changing in Plymouth County	
Land Cover Type	**Areas Lost to Development Between 1996-2016 (Sq. Miles)**
Barren Land	1.12
Emergent Wetland	0.42
Woody Wetland	1.36
Open Water	0.42
Agriculture	4.22
Scrub/Shrub	1.44
Grassland	2.31
Forested	21.23

How Land Use Is Changing in Suffolk County	
Land Cover Type	**Areas Lost to Development Between 1996-2016 (Sq. Miles)**
Barren Land	0.01
Emergent Wetland	0.04
Woody Wetland	0.01
Open Water	0.04

Agriculture	0.00
Scrub/Shrub	0.00
Grassland	0.12
Forested	0.14

4. *Briefly characterize how the coastal shoreline has changed in the past five years due to development, including potential changes to shoreline structures such as groins, bulkheads and other shoreline stabilization structures, and docks and piers. If available, include quantitative data that may be available from permitting databases or other resources about changes in shoreline structures.*

As reported in the 2015 Assessment, a NOAA State of the Coast viewer identified that 11% of the Massachusetts coastline was armored (see table below). This viewer is no longer available, and the methods are unknown, so it is unclear how coastal structures coverage has changed over the time period of interest.

Shoreline Types	
Surveyed Shoreline Type	**Percent of Shoreline**
Armored	11%
Beaches	21%
Flats	33%
Rocky	5%
Vegetated	30%

MassGIS does have information on shoreline structures via the Massachusetts Coastal Structures Inventories (publicly and privately owned): Bulkhead/Seawall and Revetment classes. That analysis identified 281 miles of shoreline covered in bulkhead/seawalls and revetments. Failing seawalls in Massachusetts are requiring bigger footings and revetments and thus impacting coastal dunes and beach. Also, when the failing seawalls are rebuilt they are frequently rebuilt to a higher elevation (i.e. taller) so there is more vertical face that can reflect/redirect a greater amount of wave energy, which increases scour and erosion of the fronting beaches. The seaward encroaching revetments that proponents are installing to address toe scour and lowering beach profiles increase the frequency, duration, and intensity of wave interaction with the hard structure resulting in a negatively reinforcing cycle to the detriment of the shoreline. At the same time, beach nourishment is not implemented to the frequency and scale necessary to replace eroded sediments.

5. *Briefly summarize the results of any additional state- or territory-specific data or reports on the cumulative and secondary impacts of coastal growth and development, such as water quality, shoreline hardening, and habitat fragmentation, since the last assessment.*

The Massachusetts Bays National Estuary Program (a hosted CZM program) is currently working on a Biological Condition Gradient analysis that will assess biological condition based upon the cumulative impacts to an estuary, including: dredging, wastewater disposal, impervious surface,

tidal flushing impediments, high intensity land use, stormwater, population, stream crossings, marinas, seawalls, and water quality.

Management Characterization:

1. Indicate if the approach is employed by the state or territory and if there have been any significant state-level changes (positive or negative) in the development and adoption of procedures to assess, consider, and control cumulative and secondary impacts of coastal growth and development, including the collective effect on various individual uses or activities on coastal resources, such as coastal wetlands and fishery resources, since the last assessment.

Significant Changes in Management of Cumulative and Secondary Impacts of Development

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y	Y	Y
Guidance documents	Y	Y	Y
Management plans (including SAMPs)	Y	Y	Y

1. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

Statues, Regulations, Policies, and Case Law

- In 2017, CZM revised the Ocean Sanctuaries Act regulations (301 CMR 27.00), clarifying the Prohibited and Allowed Uses and identifying the detailed information and studies needed to support permitting new or re-located sewage outfalls in the designated ocean sanctuaries. The expected outcome is that impacts to coastal resources such as shellfish and fisheries from sewage outfall location or relocation will be minimized.
- MassDEP developed 10 Total Maximum Daily Loads for nutrients for coastal waterbodies in the Buzzards Bay, Cape Cod, and the Islands watersheds. The expected outcome is that nutrient loading to these estuaries will be reduced over time and that habitat functions that have been lost will return.

Guidance Documents

- In 2015, CZM, in coordination with other executive branch agencies, began drafting implementation guidance for municipalities seeking to move or introduce new sewage outfalls to ocean sanctuaries. The expected outcome is that municipalities will have a clear path to monitoring required for permitting. With this guidance impacts to coastal resources such as shellfish and fisheries from sewage outfall location or relocation will be minimized.

Management Plans

- In 2015, CZM updated its ocean management plan with revised maps of Special, Sensitive, or Unique (SSUs) areas and Water Dependent Uses (WDUs). The update also began a process for establishing the siting and performance standards for aquaculture facilities through a Massachusetts Environmental Policy Act Special Review Procedure. The expected outcome is that impacts to coastal resource areas due to the siting and operation of aquaculture facilities will be minimized.
- In 2019, CZM began its next 5-year review of the ocean management plan with a focus on revised SSUs and WDUs. The expected outcome is a plan with up-to-date maps of resource and use areas that will allow coastal development while minimizing the cumulative impacts to important resources and uses.

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

Medium

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

While cumulative and secondary impacts continue to be an important issue for the Commonwealth as it seeks to protect coastal and marine habitat and water quality and sustainable water-dependent uses, it is a medium priority for 309 because progress is made through the implementation of several other CZM program areas working to address issues related to cumulative and secondary impacts, including Ocean Management and Planning, Coastal Water Quality, Coastal Habitat, and Port and Harbor Planning. Specifically, as with previous 309 reviews strategies proposed under the Wetlands and Ocean Resources enhancement areas will also serve to advance the development of tools which will help to address issues of cumulative and secondary impact.

F. Special Area Management Planning

Section 309 Enhancement Objective: *Preparing and implementing special area management plans for important coastal areas. §309(a)(6)*

The Coastal Zone Management Act defines a Special Area Management Plan (SAMP) as "a comprehensive plan providing for natural resource protection and reasonable coastal-dependent economic growth containing a detailed and comprehensive statement of policies; standards and criteria to guide public and private uses of lands and waters; and mechanisms for timely implementation in specific geographic areas within the coastal zone. In addition, SAMPs provide for increased specificity in protecting natural resources, reasonable coastal-dependent economic growth, improved protection of life and property in hazardous areas, including those areas likely to be affected by land subsidence, sea level rise, or fluctuating water levels of the Great Lakes, and improved predictability in governmental decision making."

Phase I (High-Level) Assessment: *Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.*

Resource Characterization:

1. *In the table below, identify geographic areas in the coastal zone subject to use conflicts that may be able to be addressed through a SAMP. This can include areas that are already covered by a SAMP but where new issues or conflicts have emerged that are not addressed through the current SAMP.*

Geographic Area	Opportunities for New or Updated Special Area Management Plans Major conflicts/issues
Ocean Planning Area	Protection of natural resources and existing human uses while achieving policy goals through allowing emerging human uses (e.g., renewable energy)
Designated Port Areas	Balancing the preservation of existing/historic infrastructure and land for water-dependent industrial uses with local land use planning goals and changing economies and industries
Areas of Critical Environmental Concern	Protection of environmental resources in state-designated areas from potential development impacts to habitat and water quality

2. *If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends of SAMPs since the last assessment.*
   No reports on the status and trends of SAMPs are available.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if there have been any significant state- or territory-level management changes (positive or negative) that could help prepare and implement SAMPs in the coastal zone.*

Significant Changes in Special Area Management Planning

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
SAMP policies, or case law interpreting these	Y	Y	Y
SAMP plans	Y	Y	Y

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

Ocean Management Plan

Since the previous assessment, CZM has initiated its review of the *2015 Massachusetts Ocean Management Plan*, which updated the original 2009 plan to incorporate new data and trends on ocean habitats and ecosystems, human uses, economics, cultural and archaeological aspects, and climate change; preliminary offshore wind transmission corridors for further study; initial planning and analysis for appropriate potential locations for offshore sand areas for beach nourishment; and a fee structure and guidance for required mitigation fees for ocean development projects. The implementation of the 2015 plan and its recently initiated review are described more fully in the Ocean Resources section of this assessment.

Designated Port Areas

In the previous assessment, SAMPs were determined to be a high priority enhancement area and Designated Port Areas (DPAs) were one of the most significant SAMPs for which a strategy was developed. CZM identified a need to review the geographic boundaries of existing DPAs in order to modernize their extents. Since the last assessment, CZM completed boundary reviews of the Beverly Harbor, Chelsea Creek, and South Boston DPAs in accordance with 301 CMR 25.00 *Designation of Port Areas*. CZM anticipates initiating a boundary review of the East Boston DPA within the next six months and continuing a systematic process of reviews of DPAs that have not been recently reviewed. In addition, CZM has provided technical assistance to multiple communities since the last assessment in the development of Designated Port Area

(DPA) Master Plans and conducted multiple boundary reviews. In 2018, Chelsea initiated development of a municipal harbor plan, which will include a DPA Master Plan for the portion of the Chelsea Creek DPA within the municipality. CZM continues to provide technical assistance as they finalize the plan, which received funding from the Seaport Economic Council (state funds). In 2019, Lynn initiated a process to amend their municipal harbor plan; this includes a DPA Master Plan for the Lynn DPA, for which CZM has provided technical assistance. Finally, the Commonwealth promulgated regulatory revisions referenced in the previous assessment that were developed by CZM and a DPA Working Group. These revised regulations provide for greater flexibility in the location of allowable non-water-dependent uses on project sites, allow recreational boating slips under specific circumstances, and clarify the DPA boundary review criteria.

Areas of Critical Environmental Concern

The Areas of Critical Environmental Concern (ACEC) program is administered by the Department of Conservation and Recreation (DCR) on behalf of the Secretary of Energy and Environmental Affairs. The purpose and goals of ACECs are implemented through a variety of state agency programs and regulations that contain specific provisions regarding ACECs. CZM coordinates closely with DCR regarding all aspects of the ACEC program within the coastal zone through technical assistance, state environmental review, and federal consistency review. CZM continues to participate in the ongoing Straits Pond Restoration Project. Straits Pond is a 94-acre costal salt pond which is located within the Weir River ACEC. Through implementation of an adaptive management tidal gate operational plan, developed as part of the culvert replacement project, tidal exchange between the Pond and outer estuary has been incrementally increased. At this time, maximum potential tidal exchange via the reconstructed culvert and tide gates has been achieved while balancing flooding concerns with adjacent properties. CZM and the Town of Hull have been conducting ongoing monitoring of pond to determine efficacy of the increase in tidal exchange. Monitoring has demonstrated a significant improvement in water quality, benthic habitat, and nekton diversity and abundance. CZM and the Town of Hull have been providing results of the monitoring, and associated Q&A sessions, at the Straits Pond Watershed Association annual meetings.

CZM awarded the Town of Plymouth a Coastal Resilience Grant in 2016-2017 to develop alternatives, including both structural and non-structural measures, for providing a more sustainable tidal inlet system servicing the Ellisville Harbor ACEC and marsh estuary. Activities associated with the grant project included an analysis of historical inlet migration and coastal processes affecting the inlet and marsh system, an engineering analysis of potential inlet management options, and public outreach. The management alternatives were evaluated relative to the ability to maximize both the health of the salt marsh resources and to provide a more consistent supply of sediment to downdrift beaches while avoiding impacts to endangered species habitat and species of special concern. The overall recommended approach for long-term shore protection and habitat enhancement of the Ellisville Harbor Marsh system consisted of jetty modifications, as well as dune restoration along the barrier beach north of the inlet. Project partners included Town officials, CZM, DCR, Friends of Ellisville Marsh, and coastal engineering consultants.

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

This enhancement area is a high priority for CZM as we are interested in continuing to build upon past achievements of two elements of Special Area Management Planning: the DPA program and ocean planning. (Ocean planning is more extensively discussed in the Ocean Resources assessment.) Regarding the DPA program, CZM's experience and stakeholder input have highlighted the need for continued refinement of DPA boundaries based upon 301 CMR 25.00 and to also analyze and plan for the impacts of a changing climate on these vital water-dependent industrial uses. As sea levels rise, port users will need to balance their need for access to the water with flood protection interventions and strategies. This prioritization was supported by a stakeholder advisory group convened to discuss draft enhancement area priorities and plans. Topics of concerns that were raised included: resilient port and harbor infrastructure, regional coordination on coastal resources, and the emerging offshore wind industry.

G. Ocean and Great Lakes Resources

Section 309 Enhancement Objective: *Planning for the use of ocean [and Great Lakes] resources. §309(a)(7)*

Phase I (High-Level) Assessment: *(Must be completed by all states and territories.)*
Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.

Resource Characterization:

1. *Understanding the ocean and Great Lakes economy can help improve management of the resources it depends on. Using Economics: National Ocean Watch (ENOW),[9] indicate the status of the ocean and Great Lakes economy as of 2015 (the most recent data) in the tables below. Include graphs and figures, as appropriate, to help illustrate the information.*

Status of Ocean and Great Lakes Economy for Coastal Counties (2015)							
	All Ocean Sectors	**Living Resources**	**Marine Construction**	**Ship & Boat Building**	**Marine Transport-ation**	**Offshore Mineral Extraction**	**Tourism & Recreation**
Employment (# of Jobs)	92,435	4,527	2,031	480	11,768	145	73,484
Establishments (# of Establishments)	5,532	553	97	39	253	50	4,540
Wages (Millions of Dollars)	3,384,953	297,093	93,156	22,753	1,133,988	10,043	1,824,821
GDP (Millions of Dollars)	7,184,792	882,412	159,696	25,920	2,208,887	48,894	3,858,921

[9] www.coast.noaa.gov/digitalcoast/tools/enow.html. If you select any coastal county for your state, you are directed to various data displays for that county, In the upper left of the screen, click the "State" box, to the left of the county box so that the state name will be highlighted. Now the data will reflect statewide data for all of the state's coastal counties. Make sure "2015" is selected for the year (top right corner). You can then click through the sector types by selecting the icons along the top and the type of economic data (employment, wages, GDP, etc.), by clicking through the icons on the left.

Change in Ocean and Great Lakes Economy for Coastal Counties (2005-2015)[10]							
	All Ocean Sectors	**Living Resources**	**Marine Construction**	**Ship & Boat Building**	**Marine Transportation**	**Offshore Mineral Extraction**	**Tourism & Recreation**
Employment (# of Jobs)	17,489	-496	1,232	33	1,050	-97	15,767
Establishments (# of Establishments)	296	-87	-2	-8	-43	-17	453
Wages (Millions of Dollars)	1,250,694	40,857	46,883	3,863	456,914	-2840	701,918
GDP (Millions of Dollars)	2,935,112	280,427	72,829	-21,493	829,388	28,563	1,745,246

2. *Understanding existing uses within ocean and Great Lakes waters can help reduce use conflicts and minimize threats when planning for ocean and Great Lakes resources. Using Ocean Reports[11], indicate the number of uses within ocean or Great Lakes waters off of your state. For energy uses (including pipelines and cables, see the "Energy and Government Facility Siting" template following). Add additional lines, as needed, to include additional uses that are important to highlight for your state.*

Uses within Ocean or Great Lakes Waters	
Type of Use	Number of Sites
Federal sand and gravel leases *(Completed)*	0
Federal sand and gravel leases *(Active)*	0
Federal sand and gravel leases *(Expired)*	0
Federal sand and gravel leases *(Proposed)*	0
Beach Nourishment Projects	23 (2011-2015)
Ocean Disposal Sites	6 (1 in federal waters)
Principle Ports *(Number and Total Tonnage)*	2
Coastal Maintained Channels	50 (13 maintained by USACE between 2011-2015)
Designated Anchorage Areas	9 (special anchorage areas); 3 (anchorage grounds)
Danger Zones and Restricted Areas	2 (danger zones)
National Marine Sanctuaries	1
Offshore wind energy leases	4 (2015)

[10] The trend data is available at the bottom of the page for each sector and type of economic data. Mouse over the data points for 2005 and 2015 to obtain the actual values and determine the change by subtracting 2005 data from 2015.

[11] www.coast.noaa.gov/digitalcoast/tools/ort.html. Go to "Quick Reports" and select the "state waters" option for your state or territory. Some larger states may have the "Quick Reports" for their state waters broken into several different reports. Use the icons on the left hand side to select different categories: general information, energy and minerals, natural resources and conservation, oceanographic and biophysical, transportation and infrastructure, and economics and commerce. Then scroll through each category to find the data to complete the table.

3. *In the table below, characterize how the threats to and use conflicts over ocean and Great Lakes resources in the state's or territory's coastal zone have changed since the last assessment.*

Significant Changes to Ocean and Great Lakes Resources and Uses	
Resource/Use	**Change in the Threat to the Resource or Use Conflict Since Last Assessment (↑, ↓, –, unknown)**
Benthic habitat (including coral reefs)	↑
Living marine resources (fish, shellfish, marine mammals, birds, etc.)	↑
Sand/gravel	–
Cultural/historic	–
Transportation/navigation	↑
Offshore development[12]	–
Energy production	↑
Fishing (commercial and recreational)	↑
Recreation/tourism	–
Sand/gravel extraction	–
Dredge disposal	–
Aquaculture	–
Other (please specify)	

4. *For the ocean and Great Lakes resources and uses in the table above that had an increase in threat to the resource or increased use conflict in the state's or territory's coastal zone since the last assessment, characterize the major contributors to that increase. Place an "X" in the column if the use or phenomenon is a major contributor to the increase.*

Major Contributors to an Increase in Threat or Use Conflict to Ocean and Great Lakes Resources												
	Land-based development	**Offshore development**	**Polluted runoff**	**Invasive species**	**Fishing (Comm and Rec)**	**Aquaculture**	**Recreation**	**Marine Transportation**	**Dredging**	**Sand/Mineral Extraction**	**Ocean Acidification**	**Other (Specify)**
Benthic Habitat		x			x							x
Living Marine Resources		x			x			x			x	
Transportation/Navigation		x										
Energy Production					x							
Fishing (Commercial and Recreational)		x	x								x	

[12] Offshore development includes underwater cables and pipelines, although any infrastructure specifically associated with the energy industry should be captured under the "energy production" category.

5. *If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends of ocean and Great Lakes resources or threats to those resources since the last assessment to augment the national data sets.*

Massachusetts Ocean Management Plan: The Oceans Act of 2008 requires that the Massachusetts ocean plan is reviewed and updated at least every five years. The first plan was promulgated in 2009 and reviewed in 2014. The 2015 Massachusetts ocean plan was released in January 2015. The plan includes updates to six of the twelve special, sensitive, or unique (SSU) areas, establishment of a new SSU for sea duck core habitat, and updated areas of concentrations of water-dependent use areas including commercial and recreational fishing, commercial traffic, and recreational boating. These were updated based on data collected during various survey efforts. For example, as part of the regional ocean planning process, in 2012 CZM collaborated closely with the Northeast Regional Planning Body to collect spatial and economic information on recreational boating across the northeast, including Massachusetts waters. The data were used to update the area of concentrated recreational boating in the Massachusetts ocean plan. The ocean plan also includes delineation of potential transmission corridors to bring renewable energy from offshore wind projects in federal waters across state waters to landside locations; and identification of potential sand resource areas for further characterization and assessment based on available sediment data. The siting of transmission corridors and offshore sand resource was conducted in a way to minimize impacts on marine resources and conflicts with existing uses.

Classification of Benthic and Pelagic Habitats: When developing the 2009 Massachusetts ocean plan only depth and surficial sediment were available to characterize marine waters. Since 2011 CZM has been working to develop new seafloor terrain models (for determining geoforms), used updated bathymetry data from the U.S. Geological Survey (USGS), and has worked with Division of Marine Fisheries to augment the data in the surficial sediment database four-fold. In collaboration with USGS, CZM conducted work to identify the stability of sediments and with the University of Massachusetts Dartmouth and USGS on an assessment of water column characteristics Each year between 2010-2012, CZM was awarded an eight-day cruise aboard the EPA's Ocean Survey Vessel *Bold*. With funds from the Ocean Resources and Waterways Trust Fund and the Seafloor Mapping Trust, CZM was able to purchase the necessary equipment, staff time, and analysis to gather several hundred sediment and infauna samples and several thousand seafloor images from the New Hampshire border to the Islands. These data have allowed CZM to refine the hard/complex seafloor SSU, begin to describe the species that are protected by the hard/complex seafloor SSU, and refine the Commonwealth's marine sediment map.

Offshore wind energy area: Since the identification of the Rhode Island-Massachusetts Wind Energy Area (RI-MA WEA) and the Massachusetts Wind Energy Area (MA-WEA) on the Outer Continental Shelf by the Bureau of Environmental Management in 2010 and 2012 respectively, various efforts have been underway to characterize ocean resources in the areas. The Massachusetts Clean Energy Center (MassCEC) funded several surveys to gather data on whales, turtles, and birds in the MA-WEA. Data on archeological resources, commercial fishing

and recreational activities were also collected. Although the WEA is outside Massachusetts waters, the data collection efforts include data from nearshore into adjacent areas, thereby augmenting the scale of knowledge for Massachusetts ocean planning. In 2013 and 2015, BOEM leased the RI-MA WEA and two out of the four areas in the MA-WEA for wind energy development. Since then, the developers have funded several seafloor/geology, benthic, and human use surveys, among others, to better characterize the development areas and minimize impacts. The new datasets serve to inform the Massachusetts permitting process for wind energy development, especially relevant to transmission corridors and other pertinent processes. In addition, the new data will also inform the next revision and update of the Massachusetts ocean plan in 2020.

Integrated Sentinel Monitoring Network: The network was established jointly by the Northeast Regional Ocean Council (NROC) and the Northeast Regional Association of Ocean Observing Systems (NERACOOS) in 2012 to address the need to observe and interpret changes in the ecosystem. The network will inform researchers, managers, and the public about ecosystem vulnerabilities and develop a framework to promote human and ecosystem resiliency to climate change and related stressors. CZM was directly involved in the work groups tasked to identify existing monitoring efforts, ecosystem variables, and gaps in information on ecosystem habitats. CZM also participated in the writing of a science and implementation plan for monitoring ecosystem change in the Northeast based on the data and information gathered by the work groups. The Science and Implementation Plan (http://www.neracoos.org/sites/neracoos.org/files/documents/ISMN_Plan_Edition1_final_2.pdf) was published in 2016 and during that year efforts were focused on identifying funds for implementation of activities outlined in the plan.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if any significant state- or territory-level changes (positive or negative) in the management of ocean and Great Lakes resources have occurred since the last assessment?*

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y	Y	Y
Regional comprehensive ocean/Great Lakes management plans	Y	Y	Y
State comprehensive ocean/Great Lakes management plans	Y	Y	Y
Single-sector management plans	N	N	N

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

State Comprehensive Ocean Plan Review and Update:
The Oceans Act of 2008 requires the development of Massachusetts Ocean Management Plan by the Executive Office of Energy and Environmental Affairs (EEA). The ocean plan, released in December 2009, identified and protected special, sensitive, or unique estuarine and marine life and habitats, and identified locations and performance standards for activities and facilities permitted by the Ocean Sanctuaries Act [M.G.L. c.132A Sec 12-18]. Since the last assessment, the following significant changes took place (2011-2015):

- In September 2011, NOAA approved the incorporation of the ocean plan and its enforceable policies into the Massachusetts Coastal Management Plan (CMP).
- In August 2013, regulations [contained in 301 CMR 28.00 et seq.] to implement the ocean plan developed by an advisory group with broad stakeholder representation and approved by the Ocean Advisory Commission established by the Oceans Act, were published and came into force.

The Act also requires the plan to be reviewed at least once every five years. The first formal review of the plan was conducted in 2014 and an update was released in January 2015. The 2015 ocean plan (https://www.mass.gov/service-details/2015-massachusetts-ocean-management-plan) includes updated area of special, sensitive or unique estuarine and marine life and habitat (SSUs) and water-dependent uses, provides a blueprint for allocation of transmission corridors for wind energy projects constructed on the outer continental shelf (BOEM lease areas), identifies sand resource areas for assessment as potential sites for beach nourishment, and requires the convening of a task force to establish permitting and siting standards for offshore aquaculture projects. Since 2015, offshore wind developers have been studying the area for the laying of transmission cables with minimum impacts on ocean resources while remaining economically feasible. The transmission corridors delineated in the ocean plan and associated data are informing this process. The ocean plan fisheries work group recommended that offshore aquaculture be managed as an ocean use. As a result, an interagency group discussed and drafted a process for siting and permitting of offshore aquaculture development under the Massachusetts Environmental Protection Agency's Special Review Process. This process is currently under development and more details will be provided in the next assessment.

Regional Comprehensive Ocean Management Plan:
Following the establishment of the National Policy for Stewardship of the Ocean, our Coasts, and the Great Lakes to enhance ocean and coastal management efforts (E.O. 13547) in 2010, the Northeast Regional Planning Body was convened in November 2012 to develop a regional ocean plan. Certified by the Obama Administration's National Ocean Council in December 2016,

the Northeast Ocean Plan (https://neoceanplanning.org/plan/) describes the ocean planning process for the northeast region and serves as a guide for agency decisions and practices that advance progress toward regional goals for the management of our public ocean resources. Insight and knowledge provided by the Massachusetts ocean planning process enabled the Commonwealth to play an important role in the development of the regional ocean plan. One of the products of the regional process was the development of a Northeast Ocean Data Portal (https://www.northeastoceandata.org/) that hosts and displays data and information on marine resources and uses that benefit the Massachusetts ocean plan by expanding the scope and scale of the information available for management purposes. In June 2018, the Trump Administration signed a new Executive Order entitled "Advance the Economic, Security, and Environmental Interest of the U.S." (E.O. 13840) which recognized regional ocean partnerships as the convening body to develop "improved public access to marine data and information, efficient interagency coordination on ocean-related matters, and engagement with marine industries, the science and technology community, and other ocean stakeholders." E.O. 13840 highlighted the need for regional ocean partnerships to support the development of publicly accessible ocean data portals as tools to advance a common understanding among stakeholders and agencies about ocean resource availability. This new structure has enabled continued collaboration on regional ocean planning and priorities identified in the Northeast Ocean Plan.

3. *Indicate if your state or territory has a comprehensive ocean or Great Lakes management plan.*

Comprehensive Ocean/Great Lakes Management Plan	**State Plan**	**Regional Plan**
Completed plan (Y/N) (If yes, specify year completed)	Y - First updated plan published in January 2015.	Y – Northeast Regional Ocean Plan certified by the National Ocean Council in December 2016.
Under development (Y/N)	Y – Draft review process initiated and expected in 2020.	N
Web address (if available)	https://www.mass.gov/service-details/2015-massachusetts-ocean-management-plan	https://neoceanplanning.org/plan/
Area covered by plan	Massachusetts state waters from approximately 1500 ft below mean high water.	Northeast region extends from the Maine-Canada border south to Long Island Sound.

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

With the continued interest in the development of offshore wind energy and the emerging trend for offshore aquaculture, ocean planning continues to provide an opportunity to develop and implement innovative management strategies that balance protection of ocean resources with human use. Although this started out as a state plan, the data and information that it generated serves to inform science-based policies and management strategies for human uses in adjacent state and federal waters. This prioritization was supported by stakeholders convened to review draft enhancement area priorities and plans. Topics of concern that were raised included offshore sand extraction for beach nourishment, ocean acidification, regional ocean planning, aquaculture, offshore energy facilities, ocean outfalls, and climate change. For this 309 assessment and strategy, offshore energy issues are included within Ocean Resources enhancement area planning.

H. Energy and Government Facility Siting

Section 309 Enhancement Objective: *Adoption of procedures and enforceable policies to help facilitate the siting of energy facilities and Government facilities and energy-related activities and Government activities which may be of greater than local significance. §309(a)(8)*

Phase I (High-Level) Assessment: *Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.*

Resource Characterization:

1. *In the table below, characterize the status and trends of different types of energy facilities and activities in the state's or territory's coastal zone based on best-available data. If available, identify the approximate number of facilities by type.*

Status and Trends in Energy Facilities and Activities in the Coastal Zone				
Type of Energy Facility/Activity	**Exists in Coastal Zone** (# or Y/N)	**Change in Existing Facilities/Activities Since Last Assessment** (↑, ↓, –, unknown)	**Proposed in Coastal Zone** (# or Y/N)	**Change in Proposed Facilities/Activities Since Last Assessment** (↑, ↓, –, unknown)
Pipelines	10	↑	1	–
Electrical grid (submarine transmission cables only)	7	↑	3	↑
Ports	12	-	N	-
Liquid natural gas (LNG)	3	↑	N	-
Other (please specify)	N	-	N	-
Oil and gas	17	↑	N	-
Coal	0	↓	N	-
Nuclear	0	↓	N	-
Wind	25	↑	N	↓
Wave	N	-	N	-
Tidal	N	-	N	-
Current (ocean, lake, river)	N	-	N	-
Hydropower	N	-	N	-
Ocean thermal energy conversion	N	-	N	-
Solar	20	↑	N	-
Biomass	N	-	N	-
Municipal Solid Waste	1	-	N	-

2. *If available, briefly list and summarize the results of any additional state- or territory-specific information, data, or reports on the status and trends for energy facilities and activities of greater than local significance in the coastal zone since the last assessment.*

Energy Generation

Since the previous assessment, peak demand has increased from 12,429 megawatts (MW) in 2012 to 13,338 MW in 2017,[13] while peak capacity has decreased from 13,100 MW to 11,943 MW.[14] This decrease is the result of significant shifts in Massachusetts' energy portfolio, including the closing of the last nuclear and coal power plants in the state. A decade ago, coal power plants generated almost one-fourth of Massachusetts' energy, but as of 2018 there is no longer any utility-scale, coal-fired electricity generation. In addition, the Pilgrim nuclear power plant ceased operations on May 31, 2019, eliminating a source of approximately 15% of Massachusetts' overall energy production in 2018.[15] These decreases in coal-fired and nuclear-powered energy generation have been partially offset by an increase in the use of natural gas, which is up to 67% of electricity generation from 48% in 2012;[16] petroleum, which increased from 0.5% in 2012 to 2% in 2018; and renewable energy, particularly solar and wind, which have exponentially increased in production.

Notable changes in coastal energy generating facilities since the previous assessment include:

- In 2014, Salem Harbor Station shutdown, eliminating approximately 745 MW of coal-fired energy generation capacity. Footprint Power, which had acquired the power plant in 2012, constructed Salem Harbor Footprint, a natural-gas-fired power plant that provides 674 MW of capacity, on the same site. It came online in May 2018.
- In June 2017, Brayton Point Power Station, Massachusetts' last coal power plant, ceased power generation. Proposed adaptive re-uses of the site include utility-scale solar power generation and/or an off-shore wind farm staging site.
- In March 2018, Exelon Generation filed to retire Mystic Generating Station in June 2022. Independent System Operator New England (ISO-NE) retained two of the station's eight units through June 1, 2024 for fuel-security reasons. The facility's natural-gas- and petroleum-fueled units have the highest nameplate capacity of any station in the state: 1,998 MW.
- In May 2019, Pilgrim nuclear power plant in Plymouth began the decommissioning process, which reduced the Commonwealth's energy generating capacity by 680 MW.
- In June 2019, Canal 3, a natural gas fired unit at the Canal Generating Plant, began power generation, increasing the plant's overall capacity by 333 MW. A solar array on the site provides an additional 1.5 MW to the 893 MW of petroleum-fired energy generation at the plant.

[13] Independent System Operator New England. November 2, 2017. "2017 Regional System Plan." Accessed September 19, 2019. https://www.iso-ne.com/system-planning/system-plans-studies/rsp
[14] Independent System Operator New England. n.d. "New England Power Grid State Profiles 2018-2019." Accessed September 19, 2019. https://www.iso-ne.com/static-assets/documents/2019/01/new_england_power_grid_state_profiles_2018-2019.pdf
[15] U.S. Energy Information Administration. n.d. "Massachusetts – Analysis." Last modified July 18, 2019. Accessed September 19, 2019. https://www.eia.gov/beta/states/states/ma/analysis
[16] Ibid.

Renewable Energy

Significant increases in renewable energy capacity, especially solar and wind, have been realized since the previous assessment. In 2014, solar capacity was 714.7 MW and has more than tripled to 2,480 MW in July 2019. In 2013, Massachusetts announced a goal of 1,600 MW of solar energy capacity by 2020, which was met in 2017. Wind capacity has increased from 107.6 MW in July 2014 to 113.06 MW in July 2019. Despite this small increase in capacity, wind energy generation has increased from 2,586,416 megawatt-hours (MWh) to 3,353,712 MWh over the same time period. Massachusetts has a goal of 2,000 MW of wind energy capacity by 2020.[17] While hydroelectric power only accounts for approximately 4% of the state's net generation, the Department of Public Utilities in June 2019 approved a contract to purchase hydroelectric power from Quebec, Canada; the proposed 1,000 MW of capacity is expected to be available by the end of 2022.

Offshore Wind Development

Since the last assessment, significant progress has been made in the planning, analysis, leasing, and permitting of offshore wind development in federal waters adjacent to Massachusetts. This work is led by the Bureau of Ocean Energy Management (BOEM) in close coordination and consultation with EEA, CZM, and other agencies through intergovernmental task forces and working groups. Major milestones and outcomes include:

- In April 2015, BOEM executed two commercial wind energy leases for the MA Wind Energy Area, one with Vineyard Wind and one that was later assigned to Bay State Wind.
- In August 2016, legislation requiring Massachusetts to procure 1,600 MW of offshore wind power was enacted.
- In 2017, BOEM deemed the Site Assessment Plans (SAP) for both commercial wind energy lease areas complete and sufficient; BOEM also deemed the SAP for a commercial wind energy lease area in the Rhode Island-Massachusetts Wind Energy Area (South Fork).
- In June 2017, Massachusetts utilities issued a request for proposals (RFP) for 400 MW of capacity from offshore wind turbines.
- In December 2017, Vineyard Wind submitted its Construction and Operations Plan (COP) to BOEM for an 800 MW wind farm.
- In March 2018, BOEM issued a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the Vineyard Wind COP. Upon review of the EIS, BOEM determined that additional review is necessary. The Supplemental EIS is currently under development.
- In May 2018, the Baker Administration and Massachusetts utilities selected Vineyard Wind through the RFP to provide 800 MW of offshore wind capacity.
- In October 2018, the Baker Administration leased the New Bedford Marine Commerce Terminal for 18 months in 2020-2021 for $9 million to Vineyard Wind for the staging and construction of offshore wind turbines.

[17] Massachusetts Department of Energy Resources. n.d. "Renewable Energy Snapshot." Accessed September 19, 2019. https://www.mass.gov/info-details/renewable-energy-snapshot

- In November 2018, BOEM issued a NOI to prepare an EIS for the South Fork COP.
- In December 2018, BOEM held a competitive lease sale for three commercial wind energy lease areas; Equinor Wind US, Mayflower Wind Energy, and Vineyard Wind submitted winning bids totaling more than $405 million for areas that could combine to support approximately 4.1 gigawatts (GW) of capacity.
- In May 2019, the Baker Administration completed a study will require Massachusetts utilities to proceed with the procurement of another 1,600 MW of offshore wind capacity.
- In August 2019, Bay State Wind, Mayflower Wind, and Vineyard Wind submitted bids to a second RFP for 400 to 800 MW of capacity from offshore wind turbines; the bids are currently under review.

Energy Transport

Power Cables

In order to connect the offshore wind farms to the grid, submarine cables are begin planned for, analyzed, and permitted. Three submarine electric cables are currently proposed, one by Vineyard Wind which will connect their lease area and the grid in Barnstable and two by Bay State Wind, which will connect their initial lease area to both Falmouth and Somerset. In addition to these cables, one important change in coastal energy transportation since the previous assessment includes the completion in August 2019 of the new Harbor Electric Energy Company cable, which provides power to the Deer Island Wastewater Treatment Plant in Winthrop. Sections of the previous cable will be removed to accommodate the Boston Harbor Deep Draft Navigation Improvement Project; in order to limit impacts to marine resources, some of the cable will be retired-in-place.

Natural Gas Pipelines

Since the last assessment, there have been several significant natural gas pipeline developments:

- In February 2016, Algonquin Gas Transmission LLC filed to construct a natural gas compressor station in Weymouth as a part of the proposed Atlantic Bridge Project. The compressor station would support additional firm pipeline capacity to meet market demand. Review of the proposed project by the Commonwealth is on-going.
- In March 2017, Neptune LNG filed to decommission Neptune Deepwater LNG, a deep-water liquid natural gas port off the coast of Marblehead. In September 2018, the Maritime Administration (MARAD) amended Neptune LNG's license to continue its suspension period through June 2022.
- The Northeast Gateway Deepwater Port remains open; in February 2019, it reached a peak send-out flow rate of over 800,000 million British Thermal Units (MMBTU) per day to Massachusetts.

3. *Briefly characterize the existing status and trends for federal government facilities and activities of greater than local significance[18] in the state's coastal zone since the last assessment.*

   There was no significant change or trend identified in the last five years.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) that could facilitate or impede energy and government facility siting and activities have occurred since the last assessment.*

Significant Changes in Energy and Government Facility Management

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y	Y	N
State comprehensive siting plans or procedures	Y	Y	N

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
   a. *Describe the significance of the changes;*
   b. *Specify if they were 309 or other CZM-driven changes; and*
   c. *Characterize the outcomes or likely future outcomes of the changes.*

Though there have been no significant changes, CZM has initiated a formal review of its 2015 Ocean Management Plan, which may result in changes to comprehensive siting plans or procedures within the Ocean Management Planning area.

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

[18] The CMP should make its own assessment of what Government facilities may be considered "greater than local significance" in its coastal zone, but these facilities could include military installations or a significant federal government complex. An individual federal building may not rise to a level worthy of discussion here beyond a very cursory (if any at all) mention).

Medium

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

Energy facility siting is a medium priority enhancement area for CZM. Given the status of federal offshore wind energy program as well as other planned and potential offshore energy projects, approaches that support the planning, assessment, siting, resource and use effects, and other issues are needed. However, for this 309 assessment and strategy, these issues are adequately covered within the Ocean Resources enhancement area.

I. Aquaculture

Section 309 Enhancement Objective: *Adoption of procedures and policies to evaluate and facilitate the siting of public and private aquaculture facilities in the coastal zone, which will enable states to formulate, administer, and implement strategic plans for marine aquaculture. §309(a)(9)*

Phase I (High-Level) Assessment: *Purpose: To quickly determine whether the enhancement area is a high priority enhancement objective for the CMP that warrants a more in-depth assessment.*

Resource Characterization:

1. *In the table below, characterize the existing status and trends of aquaculture facilities in the state's coastal zone based on the best-available data. Your state Sea Grant Program may have information to help with this assessment.*[19]

Type of Facility/Activity	Status and Trends of Aquaculture Facilities and Activities (2015 data)		
	# of Facilities[20]	Approximate Economic Value	Change Since Last Assessment (↑, ↓, –, unknown)
Growers	331	$41,339,042*	↑ (2011)

*Total landings value (2015) = $23,094,437 including American oyster, Quahog, Soft shell clam, Blue mussel and Bay scallop. Industry multiplier = 1.79. (Source: Division of Marine Fisheries 2015 Annual Report).

2. *If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends or potential impacts from aquaculture activities in the coastal zone since the last assessment.*

Not available for the reporting period (2011-2015). See sections below.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if there have been any state- or territory-level changes (positive or negative) that could facilitate or impede the siting of public or private aquaculture facilities in the coastal zone.*

[19] While focused on statewide aquaculture data rather than just within the coastal zone, the *Census of Aquaculture* (*www.agcensus.usda.gov/Publications/Census_of_Aquaculture/)* may help in developing your aquaculture assessment. The census is conducted every 10 years and the last report was released in 2013. The report provides a variety of state-specific aquaculture data to understand current status and recent trends.

[20] Be as specific as possible. For example, if you have specific information of the number of each type of facility or activity, note that. If you only have approximate figures, note "more than" or "approximately" before the number. If information is unknown, note that and use the narrative section below to provide a brief qualitative description based on the best information available.

Significant Changes in Aquaculture Management

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Aquaculture comprehensive siting plans or procedures	N*	N	Y
Other aquaculture statutes, regulations, policies, or case law interpreting these	N*	N	Y

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

Ocean-based aquaculture in the ocean planning area: Based on the recommendations of the Fisheries Work Group that new, larger, offshore aquaculture projects should be addressed as an ocean-based development project, the 2015 Massachusetts ocean plan directs EEA to establish an advisory group to examine the issue of ocean-based aquaculture siting and formal review under the ocean plan. The advisory group was established in 2017 and details of the activities, findings, and outcomes will be reported in the next assessment.

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

Medium

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

Since 2011, and especially since 2015, aquaculture is becoming more of a priority in Massachusetts. This is largely due to an increase in demand for the resource as well as increase in economic value of shellfish. Although primarily aquaculture has taken place in nearshore areas, rapidly depleting availability of acreage is causing prospective growers to start looking at ocean-based alternatives. In addition, stakeholders have voiced the need for a more streamlined management and permitting system. In order to address these concerns, state regulators are putting more resources and capacity to help support this industry. Although

these efforts are aimed at the various aspects of the shellfish growing industry (including wild harvesting and restoration), aquaculture is becoming a significant activity to help support increasing demand. Although an emerging trend, aquaculture is a medium level priority for CZM. CZM will address the siting and potential resource area impacts of offshore aquaculture through the Ocean Resources enhancement area (categorized as a high priority). Additionally, CZM along with other state agencies will support the MA Division of Marine Fisheries (DMF) in their efforts to address the management and permitting requirements.

IV. Assessment (Phase II)

A. Wetlands

In-Depth (Level II) Resource Characterization:
Purpose: To determine key problems and opportunities to improve the CMP's ability to protect, restore, and enhance wetlands.

a) *What are the three most significant existing or emerging physical stressors or threats to wetlands within your coastal zone? Indicate the geographic scope of the stressor, i.e., is it prevalent throughout your coastal zone, or are there specific areas that are most threatened? Stressors can be development/fill; hydrological alteration/channelization; erosion; pollution; invasive species; freshwater input; sea level rise/Great Lakes level change; or other (please specify). When selecting significant stressors, also consider how climate change may exacerbate each stressor.*

	Stressor/Threat	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Stressor 1	sea level rise	throughout coastal zone
Stressor 2	hydrological alteration/channelization	throughout coastal zone
Stressor 3	pollution	throughout coastal zone

b) *Briefly explain why these are currently the most significant stressors or threats to wetlands within the coastal zone. Cite stakeholder input and/or existing reports or studies to support this assessment.*

The Massachusetts Natural Heritage and Endangered Species Program currently classifies salt marsh as a vulnerable habitat within the Commonwealth.[21] While much work has been done to protect and minimize the damage to coastal habitats from anthropogenic impacts at the federal, state, and local level, there is a well-documented loss of salt marsh extent in Massachusetts.[22,23,24] Eutrophication from nutrient pollution is an increasing problem for Massachusetts coastal waters, leading to low dissolved oxygen, algal blooms, and other impacts to fish and wildlife.[25] Evidence suggest that while marshes can retain nutrients and other pollutants, there is a tipping point where shifts in the salt marsh vegetation

[21] [NHESP] Natural Heritage and Endangered Species Program. 2016. Priority types of natural communities. Massachusetts Division of Fisheries and Wildlife. Westborough, MA.
[22] Bromberg KD and Bertness MD. 2005. Reconstructing New England salt marsh losses using historical maps. Estuaries 28(6): 823-832.
[23] Carlisle BK, Tiner RW, Carullo M, Huber IK, Nuerminger T, Polzen C, and Shaffer M. 2005. 100 years of estuarine marsh trends in Massachusetts (1893 to 1995): Boston Harbor, Cape Cod, Nantucket, Martha's Vineyard, and the Elizabeth Islands. Massachusetts Office of Coastal Zone Management, Boston, MA; US Fish and Wildlife Service, Hadley, MA; and the University of Massachusetts, Amherst, MA. Cooperative Report.
[24] Smith S. 2009. Multi-Decadal changes in salt marshes of Cape Cod, MA: Photographic analyses of vegetation loss, species shifts, and geomorphic change. Northeastern Naturalist 16(2): 183-208.
[25] [MassDEP] Massachusetts Department of Environmental Protection. 2017. Massachusetts year 2016 integrated list of waters, proposed listing of the condition of Massachusetts' waters pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. 357 p.

community will occur— leading to cascading impacts of bank destabilization and erosion.[26] Legacy impacts from farming and mosquito control (e.g., ditching, diking, and open marsh water management), and restrictions of tidal flow (culverts, tide gates), create conditions for excessive impoundment of water on the marsh surface and contribute to degradation of the marsh.[27] Decreased elevation of the marsh platform (subsidence), species shifts, and vegetation losses have been documented in Massachusetts and elsewhere.[24,28]

c) *Are there emerging issues of concern but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.*

Emerging Issue	Information Needed
Sediment supply	Multiple lines of evidence indicate that sediment supply, along with biological processes, is important for marshes to build area both vertically and horizontally.[29] The interaction between dredging activities and sediment supply for marshes, particularly of fine materials, is not well understood in Massachusetts. Information on sediment processes is critical to understanding salt marsh resiliency.
Changing levels of groundwater flows	With anticipated increases in precipitation, groundwater flows may also increase – leading to additional freshwater flows into the marsh and changes in salinity while also facilitating the spread of the invasive reed *Phragmites australis*. More research is needed to model and characterize potential impacts to salt marshes and other wetlands as a result of increases in or changes to groundwater flows.

In-Depth Management Characterization:

Purpose: To determine the effectiveness of management efforts to address identified problems related to the wetlands enhancement objective.

1. *For each additional wetland management category below that was not already discussed as part of the Phase I assessment, indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred since the last assessment.*

[26] Deegan LA, Johnson DS, Warren RS, Peterson BJ, Fleeger JW, Fagherazzi S, and Wollheim WM. 2012. Coastal eutrophication as a driver of salt marsh loss. Nature 490: 388-392.
[27] Rodríguez JF, Saco PM, Sandi S, Saintilan N, and Riccardi G. 2017. Potential increase in coastal wetland vulnerability to sea-level rise suggested by considering hydrodynamic attenuation effects. Nature Communications 8: 1-12.
[28] Watson E B, Raposa KB, Carey JC, Wigand C, Warren RS. 2017. Anthropocene survival of Southern New England's salt marshes. Estuaries and Coasts 40(3): 617-625.
[29] Ganju, NK. 2019. Marshes are the new beaches: Integrating sediment transport into restoration planning. Estuaries and Coasts 42(4): 917-926.

Management Category	Employed By State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Wetland assessment methodologies	Y	N	Y
Wetland mapping and GIS	Y	Y	Y
Watershed or special area management plans addressing wetlands	Y	N	N
Wetland technical assistance, education, and outreach	Y	Y	N
Other (please specify)			

2. *For management categories with significant changes since the last assessment, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information.*

Wetland assessment methodologies

a. Describe significant changes since the last assessment.

CZM, in collaboration with MassDEP's Wetlands Monitoring and Assessment Program (M&A Program) team and the University of Massachusetts, collected data from 2009-2012 to build the Conservation and Assessment Prioritization System (CAPS) model in salt marshes, in addition to developing several years of test data sets (2013-2016). While the CAPS model has shown promise in a number of biological communities (such as wadeable streams), the performance in salt marshes has been less than ideal. CZM has shifted our approach to wetland assessment to focus more on physical indicators in light of recent studies utilizing satellite imagery and remote sensing, which show promise in documenting marsh condition and change.[30,31] We have recently partnered with USGS to apply the unvegetated-vegetated marsh ratio (UVVR) to all salt marshes in Massachusetts for products based on both 1-meter source imagery and 30-meter Landsat imagery–the latter of which will be applied at multiple temporal scales for trends analysis. We will extend the utility of these data products by developing an innovative data viewing and communication tool via Esri's ArcGIS Online (AGOL).

Long term data is necessary to understand trends in marsh microhabitats through time. Under previous EPA Wetland Program Development Grants, CZM implemented a sentinel site monitoring program within three priority salt marsh areas. The Sentinel Site model builds on

[30] Ganju NK, Defne Z, Kirwan ML, Fagherazzi S, D'Alpaos A, and Carniello L. 2017. Spatially integrative metrics reveal hidden vulnerability of microtidal salt marshes. Nature Communications 8:14156.

[31] Leonardi N, Defne Z, Ganju NK, and Fagherazzi S. 2016. Salt marsh erosion rates and boundary features in a shallow Bay. Journal of Geophysical Research: Earth Surface 121: 1-15.

efforts of the National Estuarine Research Reserves (NERRs) to collect data to support multimetric approaches to assess both resilience[32] and vulnerability of tidal marshes.[33] These data consist of a variety of parameters collected both in the field and through remote sensing to measure baseline conditions and track changes through time. In 2017, CZM collected hydrologic, elevation, and vegetation community data at permanent transects from the marsh edge into the upland at our three sentinel sites. In 2018, we partnered with the University of Massachusetts Amherst Unmanned Aerial System Research and Education Collaborative (UMassAir) to link remote sensing imagery and ground-based vegetation, hydrologic, and elevation data to further refine ecological community mapping and classification at sentinel sites. Building on this effort, we will collect elevation, hydrologic, and vegetation community data at each current sentinel site in 2020 to generate a comparison dataset to analyze trends in salt marsh ecological communities and to inform program refinement. To further expand the utility and representativeness of CZM's Sentinel Site Program we will add an additional sentinel site on state-owned lands on the North Shore of Massachusetts, as well as add two additional permanent transects for a total of five transects per site. We will work to implement lessons learned from a recently completed project by the NERRs that reviewed and compared data across their sentinel sites to develop a standardized data analysis template for the field data we collect. This dataset will build a robust picture of representative salt marsh conditions across Massachusetts, further extending our ability to detect trends and inform management actions.

b. Specify if they were 309 or other CZM-driven changes.

Changes were not 309 driven but were supported by EPA Wetland Program Development Grant funding along with state capital funds. Program needs were documented in the EPA-approved 5-year Massachusetts Wetland Program Plan (WPP) from 2013-2017 and 2019-2024.

c. Characterize the outcomes or likely future outcomes of the changes.

These datasets will increase capacity to assess salt marsh vulnerability across Massachusetts and extend the ability to detect trends. The data and technical assistance resources developed will inform management actions to protect and restore critical wetland areas of Massachusetts.

Wetland Mapping and GIS

a. Describe significant changes since the last assessment.

Several wetland mapping datasets with coverage in Massachusetts have been published since the previous assessment. Known datasets on the extent and distribution of wetlands include the following:

- Salt Marsh Habitat Avian Research Program (SHARP) Salt Marsh Habitat/Community Types (released in 2017)

[32] Raposa KB, Wasson K, Smith E, Crooks JA, Delgado P, Fernald SH, Ferner MC, Helms A, Hice LA, Mora JW, Puckett B, Sanger D, Shull S, Spurrier L, Stevens R, and Lerberg S. 2016. Assessing tidal marsh resilience to sea-level rise at broad geographic scales with multi-metric indices. Biological Conservation 204: 263–275.

[33] Cole Ekberg ML, Raposa KB, Ferguson WS, Ruddock K, and Watson EB. 2017. Development and application of a method to identify salt marsh vulnerability to sea level rise. Estuaries and Coasts 40:694-710.

- National Wetland Inventory (NWI) Wetlands, Region 5, Rapid Update, 2008 (released in 2014)
- Massachusetts Department of Environmental Protection (MassDEP) Wetlands, 2005 (released in 2017)
- MassGIS 2016 Land Cover/Land Use (released in 2019 and developed by NOAA OCM as High-Resolution Land Cover, C-CAP)

CZM is working on developing a tidal marsh change analysis program for our long-term monitoring sites, with the intent to expand the program statewide if feasible.

In addition, CZM has finalized the Sea Level Rise Affecting Marshes Model (SLAMM) data to model the effects of sea level rise on coastal wetlands. Using long-term marsh monitoring data (where available) and complex geometric and numeric models, we are predicting wetland distribution by type over time, and identifying areas of potential loss, gain from landward migration, and barriers to landward migration.

b. Specify if they were 309 or other CZM-driven changes.
A 2013 project of special merit award helped to initiate the SLAMM model project.

c. Characterize the outcomes or likely future outcomes of the changes.
SLAMM provides data, maps, and narrative that lay the foundation to improve our collective ability to enhance planning, management, and regulation of coastal wetlands in the face of sea level rise.

3. *Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's or territory's management efforts in protecting, restoring, and enhancing coastal wetlands since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's or territory's management efforts?*

In 2018 the Massachusetts Ecosystem Adaptation Network (ECAN) initiated a working group of salt marsh researcher and managers in Massachusetts, the ECAN Salt Marsh Working Group. Co-led by CZM and the University of Massachusetts, Amherst Gloucester Marine Station Staff, the group initiated a survey of participants to identify research priorities, needs, and barriers. Results of the survey indicate that while gains have been made in our understanding of salt marsh processes, large data gaps exist, particularly for interactions between salt marshes and climate changes, legacy impacts, lack of long-term data, and information to support innovative and/or adaptive management for resiliency. Researchers identified that marshes are at risk, from climate changes such as sea level rise and cascading impacts of anthropogenic stressors. Understanding the underlying ecological processes that build and sustain marshes through time and how these intersect with outside factors is critical to an informed management approach.

Identification of Priorities:

1. *Considering changes in wetlands and wetland management since the last assessment and stakeholder input, identify and briefly describe the top one to three management priorities*

where there is the greatest opportunity for the CMP to improve its ability to more effectively respond to significant wetlands stressors. (Approximately 1-3 sentences per management priority.)

Management Priority 1: **Facilitate widespread data collection and research on marsh ecosystem process across the Commonwealth**
Description: Given the complex interrelationships between salt marshes, landscape position, elevation, surrounding landforms and use, and hydrological regime, significant data gaps exists to determine sources and solutions to marsh degradation. CZM will leverage partnerships including the Waquoit Bay National Estuarine Research Reserve, USGS, NOAA OCM, The Massachusetts Ecosystem Climate Adaptation Network Salt Marsh Working Group, MassDEP, New England Coastal Programs and others to identify research priorities, support data collection in Massachusetts salt marshes, connect with regional indices and data metrics as applicable, and provide linkages to management.

Management Priority 2: **Development of multi-metric geospatial tools to support effective decision making**
Description: The development of geospatial tools and underlying data to support broadscale analysis and decision making has become a central focus of CZM's wetlands work as we seek to better understand ecological processes and the intersection with anthropogenic impacts, including climate change, given the size, scale, and complexity of salt marshes across the coastal zone. CZM will continue to build on this work to develop a suite of geospatial tools to support multimeric approaches for marsh protection and restoration prioritization.

Management Priority 3: **Provide technical assistance and outreach based on the best available science and data tools to facilitate ecologically sound decision making and wetlands management over the short and long term**
Description: Stakeholders across the Commonwealth need technical assistance to address current and emerging impacts to wetlands resources to ensure that management decisions are sound and viable over the short and long term. CZM will continue to provide innovative communication tools to ensure data and products are distributed widely and accessible to a variety of audiences.

2. *Identify and briefly explain priority needs and information gaps the CMP has to help it address the management priorities identified above. The needs and gaps identified here do not need to be limited to those items that will be addressed through a Section 309 strategy but should include any items that will be part of a strategy.*

Priority Needs	Need? (Y or N)	Brief Explanation of Need/Gap
Research	Y	More research is needed on impacts of stressors on wetland habitats and how this relates to resiliency.
Mapping/GIS	Y	Standardized, higher resolution mapping of wetland microhabitats is needed to better track changes and detect impacts from climate related effects and other stressors, in addition to utilizing and building multimeric indices for assessment.
Data and information management	N	
Training/capacity building	N	

Enhancement Area Strategy Development:

1. *Will the CMP develop one or more strategies for this enhancement area?*

Yes

2. *Briefly explain why a strategy will or will not be developed for this enhancement area.*

Salt marshes are a critical habitat in Massachusetts; however, significant losses have been documented with concern growing of a downward trend in condition and extent. A strategy will be developed for this enhancement area because there is a need to continue work to address coastal wetland habitat issues related to climate change and support opportunities for restoration and protection of sensitive wetland resources.

B. Coastal Hazards

In-Depth (Level II) Resource Characterization:
Purpose: To determine key problems and opportunities to improve the CMP's ability to prevent or significantly reduce coastal hazard risks by eliminating development and redevelopment in high-hazard areas and managing the effects of potential sea level rise and Great Lakes level change.

1. *Based on the characterization of coastal hazard risk, what are the three most significant coastal hazards[26] within your coastal zone? Also indicate the geographic scope of the hazard, i.e., is it prevalent throughout the coastal zone, or are there specific areas most at risk?*

	Type of Hazard	Geographic Scope (throughout coastal zone or specific areas most threatened)
Hazard 1	Coastal storms	Throughout the coastal zone
Hazard 2	Shoreline erosion	Throughout the coastal zone
Hazard 3	Sea level rise	Throughout the coastal zone

2. *Briefly explain why these are currently the most significant coastal hazards within the coastal zone. Cite stakeholder input and/or existing reports or studies to support this assessment.*

Shoreline erosion and flooding from coastal storms and sea level rise impacts natural resources, property, infrastructure, and local businesses along the coast of Massachusetts. Coastal communities are losing beaches, dunes, coastal banks, and salt marshes. Structural losses from coastal flooding and erosion are also significant. Between 1953 and 2019, the Commonwealth experienced eight major disaster declarations related to coastal flood events. Four of these events have occurred since Hurricane Sandy in 2012. Other emergency declarations have occurred as well. As sea levels rise at an accelerated rate, increased tidal and coastal storm inundation is becoming an even greater concern. Please see the 2015 Report of the Massachusetts Coastal Erosion Commission and 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan for more information on these issues. These documents reflect input from stakeholders. The stakeholders who participated in the 309 assessment also confirmed the significance of these coastal hazards.

3. *Are there emerging issues of concern, but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.*

Emerging Issue	Information Needed
None	

In-Depth Management Characterization:

Purpose: To determine the effectiveness of management efforts to address identified problems related to the coastal hazards enhancement objective.

1. *For each coastal hazard management category below, indicate if the approach is employed by the state or territory and if there has been a significant change since the last assessment.*

Significant Changes in Coastal Hazards Statutes, Regulations, and Policies

Management Category	Employed by State/Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Change Since the Last Assessment (Y or N)
Shorefront setbacks/no build areas	Y	Y	N
Rolling easements	Y	N	N
Repair/rebuilding restrictions	Y	Y	N
Hard shoreline protection structure restrictions	Y	Y	N
Promotion of alternative shoreline stabilization methodologies (i.e., living shorelines/green infrastructure)	Y	Y	Y
Repair/replacement of shore protection structure restrictions	Y	Y	N
Inlet management	N	N	N
Protection of important natural resources for hazard mitigation benefits (e.g., dunes, wetlands, barrier islands, coral reefs) (other than setbacks/no build areas)	Y	Y	N
Repetitive flood loss policies (e.g., relocation, buyouts)	N	N	N
Freeboard requirements	Y	Y	N
Real estate sales disclosure requirements	N	N	N
Restrictions on publicly funded infrastructure	Y	Y	N
Infrastructure protection (e.g., considering hazards in siting and design)	Y	Y	N
Other (please specify)			

Significant Changes to Coastal Hazard Management Planning Programs or Initiatives

Management Category	Employed by State/Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Change Since the Last Assessment (Y or N)
Hazard mitigation plans	Y	Y	Y
Sea level rise/Great Lake level change or climate change adaptation plans	Y	Y	Y
Statewide requirement for local post-disaster recovery planning	N	Y	N
Sediment management plans	Y	Y	Y
Beach nourishment plans	Y	Y	N
Special Area Management Plans (that address hazards issues)	N	Y	N
Managed retreat plans	Y	Y	N
Other (please specify)			

Significant Changes to Coastal Hazard Research, Mapping, and Education Programs or Initiatives

Management Category	Employed by State/Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Change Since the Last Assessment (Y or N)
General hazards mapping or modeling	Y	Y	Y
Sea level rise mapping or modeling	Y	Y	Y
Hazards monitoring (e.g., erosion rate, shoreline change, high-water marks)	Y	Y	Y
Hazards education and outreach	Y	Y	Y
Other (please specify)			

2. *Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's management efforts in addressing coastal hazards since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's management efforts?*

The Massachusetts State Hazard Mitigation and Climate Adaptation Plan (2018) highlights many efforts of CZM to effectively address coastal hazards including CZM's Coastal Resilience Grant program that provides funding and technical assistance to advance local efforts to address coastal flooding, erosion, and sea level rise. The Massachusetts Shoreline Change Project and other CZM data are presented as critical elements of site-specific vulnerability and risk assessments. The state plan also features these CZM policy, planning, and technical assistance initiatives: StormSmart Coasts program, sea level rise and coastal flooding viewer, Coastal A Zone mapping, and increasing resilience through application of nature-based infrastructure.

In addition, the Surfrider 2019 State of the Beach Report has found CZM to be doing a "good" job with a "B" grade while the majority (74%) of coastal and Great Lakes states earn a "C" or below. Sediment management and climate change are two issues that Surfrider highlights as successes. Their recommendations call for strengthening development setbacks and retreat strategies.

Identification of Priorities:

1. *Considering changes in coastal hazard risk and coastal hazard management since the last assessment and stakeholder input, identify and briefly describe the top one to three management priorities where there is the greatest opportunity for the CMP to improve its ability to more effectively address the most significant hazard risks. (Approximately 1-3 sentences per management priority.)*

Management Priority 1: **Enhance access to forward-looking coastal hazards data and tools**
Description: CZM and partners (e.g., U.S. Geological Survey, Massachusetts Department of Transportation, and University of Massachusetts) have been working on shoreline erosion forecasts, models of future flood risk, and sea level rise projections. CZM primarily provides technical support to communities through workshops and coastal resilience projects. State and local managers need direct access to these resources for adaptation planning and implementation of strategies and projects. These data can be provided through new online data viewers and portals.

Management Priority 2: **Expand the application of nature-based shoreline management approaches**
Description: Through CZM's Coastal Resilience Grant Program, progress has been made to restore and naturally stabilize coastal landforms to manage erosion and coastal storm damages. Additional information needs to be communicated to communities to further support fringing salt marsh, berm, dune, coastal bank, and other nature-based projects. Local case studies that address site suitability, costs, and all relevant permitting requirements would be especially helpful. CZM-funded coastal resilience projects as well as projects on private property could serve as case studies.

Management Priority 3: **Increase support for proactive long-term planning**
Description: As the shoreline moves landward, the need for additional state and local management options to reduce vulnerability and long-term costs of erosion, flooding, and coastal storm damages becomes more critical. Managed retreat needs to be further explored and evaluated for some types of development and infrastructure in high-hazard areas. Areas of interest for CZM and partners include planning and zoning mechanisms to direct coastal redevelopment inland, and benefit cost analyses of buyouts.

2. *Identify and briefly explain priority needs and information gaps the CMP has for addressing the management priorities identified above. The needs and gaps identified here should not be limited to those items that will be addressed through a Section 309 strategy but should include any items that will be part of a strategy.*

Priority Needs	Need? (Y or N)	Brief Explanation of Need/Gap
Research	Y	innovative options and mechanisms for retreat including buyouts; design standards for mixed-sediment beach and dune nourishment; effectiveness of nature-based shoreline management approaches; cumulative impacts of revetment encroachment on beaches
Mapping/GIS/modeling	Y	differentiation of coastal and inland A Zone boundaries; future flood risk modeling with more refined coastal change analysis; sediment transport modeling under current and future conditions
Data and information management	Y	enhanced flood zone maps that reflect current and future risk; post-storm lidar and change analysis; high water marks
Training/Capacity building	Y	site selection for nature-based shoreline management approaches; successful case studies
Decision-support tools	Y	costs of nature-based shoreline management approaches including permitting, construction, and maintenance; coastal flooding viewer and guidance for statewide dynamic coastal flood risk modeling results
Communication and outreach	Y	best available data and tools for risk assessment and planning; additional local resilience case studies; fact sheets on nature-based shoreline management approaches; coastal floodplain function
Other (specify)		

Enhancement Area Strategy Development:

1. *Will the CMP develop one or more strategies for this enhancement area?*

Yes

2. *Briefly explain why a strategy will or will not be developed for this enhancement area.*

Coastal hazards risk reduction continues to be a high priority for CZM and has been identified by NOAA as well. The Commonwealth and coastal communities need more effective options for managing increasing erosion and flooding.

C. Special Area Management Planning

In-Depth (Level II) Resource Characterization:
Purpose: To determine key problems and opportunities regarding the preparation and implementation of special area management plans for important coastal areas.

1. *What are the one to three most significant geographic areas facing existing or emerging challenges that would benefit from a new or revised special area management plan (SAMP) or better implementation of an existing SAMP? For example, are there areas where existing management approaches are not working and could be improved by better coordination across multiple levels of government? What challenges are these areas facing? Challenges can be a need for enhanced natural resource protection; use conflicts; coordinating regulatory processes or review; additional data or information needs; education and outreach regarding SAMP policies; or other (please specify). When selecting significant challenges, also consider how climate change may exacerbate each challenge.*

	Geographic Scope (within an existing SAMP area (specify SAMP) or within new geographic area (describe new area))	**Challenges**
Geographic Area 1	Ocean Planning Area	Protection of natural resources and existing human uses while achieving policy goals through allowing emerging human uses (e.g., renewable energy)
Geographic Area 2	Designated Port Areas	Balancing the preservation and efficient utilization of existing/historic infrastructure and land for water-dependent industrial use with local land use planning, changing and emerging economies and industries, and climate-related risks

2. *Briefly explain why these are currently the most significant challenges that may require developing a new SAMP, or revising or improving implementation of an existing SAMP. Cite stakeholder input and/or existing reports or studies to support this assessment.*

The 2015 Ocean Management Plan ("Plan") includes a comprehensive assessment of the progress in completing the requirements and commitments established by the Oceans Act of 2008 and the initial ocean plan. The development, content, and five-year review (currently underway as of this assessment) of the Plan is described more fully in the Ocean Resources section of this assessment.

The Designation of Port Areas regulations (301 CMR 25.00) stipulate that CZM shall, from time to time, carry out reviews that apply specific standards to determine whether particular areas of land or water shall be included or remain in an existing Designated Port Area (DPA). It has been apparent since the regulations were first established that several DPAs would benefit

from boundary adjustments; for this purpose, an initial series of four reviews was completed between 1994 and 2003 (two in Boston, one in Gloucester, and one in Plymouth). Between 2015 and 2019, CZM completed two additional boundary reviews – another in Boston and one in Chelsea – and revised the boundary of one based upon legislative action. CZM needs to resume its boundary review activities in one or more of the remaining DPAs, potentially including the East Boston and Gloucester Inner Harbor DPAs.

In addition to the boundary reviews, CZM, with stakeholder input, has identified the need for more detailed understanding of climate-related impacts within DPAs, which often include some of the lowest lying areas of densely populated municipalities, major employment centers, and key transportation nodes. Analysis of vulnerability to climate-related impacts, economic studies, development of design guidelines for resilient water-dependent industrial development, and the identification of best practices for water-dependent industrial uses to manage climate risks are necessary to preserve and enhance the maritime industry in DPAs.

To further support water-dependent industrial uses in the coastal zone, CZM in coordination with state and municipal partners has also identified an opportunity to promote not only climate resilience within the DPAs, but also economic resilience. Collectively, DPAs are a major driver of economic activity in the Commonwealth and the "blue economy" continues to rapidly change, as historic water-dependent industrial uses, such as fishing, are joined by emerging industries and technologies, such as offshore renewable energy and related supply chains. Coordinating and leveraging this rapid change will maximize the economic benefit of DPAs, minimize use conflicts, and protect natural resources outside of DPAs. To do so, a comprehensive economic assessment is necessary to evaluate current water-dependent industrial uses within DPAs; opportunities for and challenges to the growth of existing and new water-dependent industrial uses; emerging water-dependent industrial uses and their needs; and the potential for water-dependent industrial clusters to be promoted in specific DPAs in cooperation with the municipality/ies and other stakeholders.

3. *Are there emerging issues of concern, but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.*

Emerging Issue	Information Needed
Climate-related risks	Detailed vulnerability analyses, benefit-cost analyses, water-dependent industrial use-specific resilient design guidelines and best practices for climate-related risks
Changing/emerging economies and industries	Comprehensive understanding of current uses within DPAs, opportunities/challenges for/to water-dependent industrial uses

In-Depth Management Characterization:

Purpose: To determine the effectiveness of management efforts to address identified problems related to the special area management planning enhancement objective.

1. *For each additional SAMP management category below that was not already discussed as part of the Phase I assessment, indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred since the last assessment.*

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
SAMP research, assessment, monitoring	Y	Y	Y
SAMP GIS mapping/database	Y	Y	N
SAMP technical assistance, education, and outreach	Y	Y	N

2. *For management categories with significant changes since the last assessment briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information.*

Designated Port Area Planning and Boundary Reviews

a. Describe significant changes since the last assessment;

Since the last assessment, CZM completed two boundary reviews, one for the Chelsea Creek DPA and another for the South Boston DPA.

b. Specify if they were 309 or other CZM-driven changes; and

The boundary review of the Chelsea Creek DPA was requested by the City of Chelsea to precede and inform the development of a Municipal Harbor Plan (MHP) and DPA Master Plan. The boundary review of the South Boston DPA was requested by a property owner within the DPA and with the support of the City of Boston.

c. Characterize the outcomes or likely future outcomes of the changes.

In Chelsea, two planning units (out of five) of the DPA were removed from the DPA because CZM found that these planning units were not in substantial conformance with DPA designation standards, specifically having a substantially developed shoreline and access to deep water. The development of the MHP and DPA Master Plan continues by the City and is likely to be completed in 2020.

In South Boston, one planning unit (out of three) of the DPA was removed because CZM found that the planning unit was functionally separated from the watersheet within the DPA. However, one planning unit was added to the DPA because it met the criteria for designation; this addition resulted in no net loss of DPA area within the South Boston DPA.

3. *Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's or territory's special area management planning efforts since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's or territory's management efforts?*

CZM has taken a comprehensive approach to strengthen the program including new regulatory flexibility to allow for a greater mix of uses; conducting DPA boundary reviews to modernize the DPA boundaries; and ongoing technical and regulatory assistance to communities through the Municipal Harbor Planning and DPA Master Planning processes.

Identification of Priorities:

1. *Considering changes with coastal resource protection or coastal use conflicts within defined geographic areas, special area management planning activities since the last assessment, and stakeholder input, identify and briefly describe the top one to three management priorities where there is the greatest opportunity for the CMP to improve their ability to prepare and implement special area management plans to effectively manage important coastal areas. (Approximately 1-3 sentences per management priority.)*

Management Priority 1: **Conduct review of existing DPA boundaries**
Description: Since the boundaries of these DPAs were originally established in 1978, and the subsequent underlying regulatory framework was sequentially developed, there has not been a comprehensive boundary review, using the designation standards found at 301 CMR 25.04, to determine if the current boundaries of the East Boston DPA should remain as currently established or whether they should be modified. In addition, further refinement of the Gloucester Inner Harbor DPA may be necessary to continue to balance conflicting uses within the SAMP.

Management Priority 2: **Climate-related resilience study of DPAs**
Description: Analyses of DPA vulnerability to climate-related impacts, development of design guidelines for resilient water-dependent industrial development, identification of best practices for water-dependent industrial uses to manage climate risks are necessary to protect existing and promote new water-dependent industrial uses within the DPAs, which will also be supported with a comprehensive economic study to coordinate and leverage rapid changes in the "blue economy" and identify opportunities and challenges in the growth of existing and emerging water-dependent industrial uses.

2. Identify and briefly explain priority needs and information gaps the CMP has to help it address the management priorities identified above. The needs and gaps identified here do

not need to be limited to those items that will be addressed through a Section 309 strategy but should include any items that will be part of a strategy.

Priority Needs	Need? (Y or N)	Brief Explanation of Need/Gap
Research	Y	Economic research and information
Mapping/GIS	Y	Climate-related vulnerability assessments, mapping of new boundaries (if appropriate)
Data and information management	Y	Utilize existing and/or create new DPA inventories which catalog port users and site characteristics, vulnerability to climate risks, economic value
Training/Capacity building	N	
Decision-support tools	Y	Design guidelines and best practices
Communication and outreach	Y	Public information sessions, meetings, and hearings to receive feedback on current port activities and proposed boundary changes; opportunities/challenges to water-dependent industrial growth; promotion of design guidelines and best practices

Enhancement Area Strategy Development:

1. *Will the CMP develop one or more strategies for this enhancement area?*

Yes

2. *Briefly explain why a strategy will or will not be developed for this enhancement area.*

Multiple strategies will be developed for this enhancement area because there is a need to review the current DPA boundaries to ensure that they accurately reflect the criteria outlined in CZM regulations (301 CMR 25.00) and reflect the existing land use patterns in DPA communities; to understand climate-related risks to the DPAs and promote resilience; and coordinate and leverage the rapidly changing "blue economy" to maximize economic benefit and the protection of natural resources.

D. Ocean Resources

In-Depth (Level II) Resource Characterization:
Purpose: To determine key problems and opportunities to enhance the state CMP to better address cumulative and secondary impacts of coastal growth and development.

1. What are the three most significant existing or emerging stressors or threats to ocean and Great Lakes resources within your coastal zone? Indicate the geographic scope of the stressor, i.e., is it prevalent throughout the coastal zone, or are specific areas most threatened? Stressors can be land-based development; offshore development (including pipelines, cables); offshore energy production; polluted runoff; invasive species; fishing (commercial and/or recreational); aquaculture; recreation; marine transportation; dredging; sand or mineral extraction; ocean acidification; or other (please specify). When selecting significant stressors, also consider how climate change may exacerbate each stressor.

	Stressor/Threat	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Stressor 1	Offshore development, including cables and offshore energy structures	Throughout coastal zone and in adjacent federal waters
Stressor 2	Sand extraction for beach nourishment	Throughout coastal zone
Stressor 3	Coastal and ocean acidification/stormwater	Throughout coastal zone

2. Briefly explain why these are currently the most significant stressors or threats to ocean resources within the coastal zone. Cite stakeholder input and/or existing reports or studies to support this assessment.

On behalf of the Executive Office of Energy and Environmental Affairs (EEA), the Massachusetts Office of Coastal Zone Management (CZM) serves as the lead state agency for ocean planning—working with other state agencies and regional and federal partners to balance current and new uses of ocean waters while protecting ocean habitats and promoting sustainable economic development. In early 2019, CZM initiated the five-year review of the 2015 Ocean Management Plan (required by the 2008 Oceans Act). Through its experience in ocean planning and management—including its role on the Bureau of Ocean Energy Management's (BOEM) Intergovernmental Renewable Energy Task Force, BOEM's Gulf of Maine Renewable Energy Task Force, and the Northeast Regional Ocean Council—and in its functions in project review, CZM has been involved in the review of several offshore development projects, including pipelines, cables, and the first offshore wind projects. These offshore development projects represent key stressors and threats to coastal resources and have been affirmed by stakeholders during the ocean plan review process and by a group convened by CZM to provide input and feedback specific to the §309 assessment and strategy process.

Offshore Development: Massachusetts southern waters are adjacent to seven Bureau of Ocean Energy Management (BOEM) offshore wind lease areas where three developers[34] have proposed new structures (turbines, energy service platforms) with supporting transmission cables. Further, in December 2018, BOEM the first meeting of the Gulf of Maine Intergovernmental Renewable Energy Task Force with state and local officials from Massachusetts, Maine, New Hampshire as well as federal, state, and regional agency representatives. The Task Force will support the identification of Wind Energy Areas in the Gulf of Maine for the potential leasing and development of offshore energy on the Outer Continental Shelf. The construction and operation of these offshore energy development areas present potential conflicts with protected species, important fishing areas, and navigation.
Sand Extraction: Projected sea level rise, an increase in intensity and frequency of storms and rainfall, and continued development of the Massachusetts coast combine to produce erosion, flooding, and repetitive loss hotspots across the coast. The Massachusetts Coastal Erosion Commission report[35] identified the need for offshore sand resources for beach nourishment and to protect coastal properties. The need for extracting sand from offshore areas must be balanced with protecting existing uses and resources that are contiguous with offshore sand areas.
Coastal and Ocean Acidification and Stormwater: Water quality monitoring conducted by state agencies, local communities, and watershed-based associations affirms that polluted runoff continues to be a threat to coastal and ocean water quality. While stormwater pollution has been a known stressor for many years, coastal and ocean acidification is a more recent concern that has received attention lately because of the burgeoning nearshore oyster aquaculture sector and how acidification threatens the viability of larval and juvenile bivalves. Massachusetts waters, in particular those that make up the southern extent of the Gulf of Maine, are more at risk of acidification than other coastal waters.[36] These potential stressors and threats have been affirmed by stakeholders during the Massachusetts ocean plan update process (via a directed survey) and by a group convened by CZM to provide input and feedback specific to the §309 assessment and strategy process, and by the Massachusetts Ocean Acidification Commission, of which the CZM Director is a member.

3. *Are there emerging issues of concern, but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.*

Emerging Issue	Information Needed
Long-term ocean temperature change and ocean acidification	New models to describe how temperature changes species distributions—and their prey distributions—and how these changes affect existing uses of the ocean. More data on pH and pCO_2 levels. Models to predict aragonite saturation state in various locations of the Massachusetts coastal waters and estuaries.

[34] https://www.boem.gov/renewable-energy/state-activities/massachusetts-activities

[35] https://www.mass.gov/service-details/massachusetts-coastal-erosion-commission

[36] Wang, Z. A., Wanninkhof, R., Cai, W.-J., Byrne, R.H., Hu, X., Peng, T.-H., Huang, W.J. 2013a. The marine inorganic carbon system along the Gulf of Mexico and Atlantic coasts of the United States: Insights from a transregional coastal carbon study. Limnology and Oceanography 58 (1): 325-342. DOI:10.4319/lo.2013.58.1.0325

Emerging Issue	Information Needed
Offshore aquaculture	There is currently no offshore commercial aquaculture in Massachusetts state waters; all aquaculture facilities in the marine environment are located nearshore and are focused on shellfish species including oyster, soft shell clam, blue mussel, quahog, and bay scallop. With growing interest in offshore aquaculture (finfish, kelp, mussels) there is a need for more data to inform the siting and permitting of facilities, including understanding the potential effects on marine resources and uses. The Massachusetts ocean plan survey identified offshore aquaculture as an area of emerging concern for stakeholders.

In-Depth Management Characterization:

Purpose: To determine the effectiveness of management efforts to address identified problems related to the ocean and Great Lakes resources enhancement objective.

1. *For each of the additional ocean and Great Lakes resources management categories below that were not already discussed as part of the Phase I assessment, indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred since the last assessment.*

Significant Changes in Management of Ocean and Great Lakes Resources

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Ocean and Great Lakes research, assessment, monitoring	Y	Y	Y
Ocean and Great Lakes GIS mapping/database	Y	N	Y
Ocean and Great Lakes technical assistance, education, and outreach	Y	N	N
Other (please specify)			

2. *For management categories with significant changes since the last assessment briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information.*
    a. *Describe significant changes since the last assessment;*

b. Specify if they were 309 or other CZM-driven changes; and
c. Characterize the outcomes or likely future outcomes of the changes.

Ocean Research, Assessment, and Monitoring and GIS/Mapping Database

a. Describe significant changes since the last assessment;

Extensive work has been completed to identify, categorize, and map benthic habitats, a priority science action in the 2015 ocean plan. CZM identified nine potential offshore sand resource areas; gathered new information on the sediment grain size, patch extent, and depth; and developed estimates of sand resource volume. Five sand resource areas were also surveyed by towed video to characterize the biological communities. In addition, CZM's continued its long-term collaboration with U.S. Geological Survey to perform extensive geological and geophysical seafloor characterization, using acoustic, photographic, and core/grab sample data of two areas adjacent to Nantucket and Martha's Vineyard Islands. CZM began working with NOAA OCM and the coastal programs of New Hampshire and Maine, to create derived geoform products for the Gulf of Maine. Finally, CZM produced significant updates to the Massachusetts Ocean Resource Information System (MORIS) online mapping tool. New spatial information on Special, Sensitive, or Unique habitats (whale, sea duck habitat, hard/complex seafloor, eelgrass, intertidal flats) and water dependent uses (recreational and commercial fishing, recreational boating, and commercial marine traffic) was developed for the 2015 ocean plan and added to MORIS where it is accessible to the public.

b. Specify if they were 309 or other CZM-driven changes;

Much of this work was driven by the Massachusetts Ocean Management Plan management planning process and implementation which was advanced in part under 309 Ocean Planning projects.

c. Characterize the outcomes or likely future outcomes of the changes.

Sediment and habitat maps are incorporated into CZM's ocean planning and project review (e.g., federal consistency) processes and some become part of the Massachusetts coastal program through the ocean plan.

3. *Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's or territory's management efforts in planning for the use of ocean and Great Lakes resources since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's or territory's management efforts?*

A 2019 stakeholder survey demonstrated a continued interest in the approach being implemented to protect core habitat areas and balance multiple uses in the ocean planning area. Specific areas of interest included sectors that are currently addressed to some extent in the ocean plan (wind and tidal energy, recreational boating, erosion, and climate change) and

identified interest in a revised management structure that addresses aquaculture (as both a resource and use), offshore oil and gas exploration, white shark core habitat, and artificial reefs. The results of this survey will also be incorporated into the Massachusetts ocean plan "Review" document (Q2 2020). The review reports on the ocean plan development process, including the policies and management framework, plan administration and implementation, and efforts toward achieving science and data priorities identified in the ocean plan's Science Framework. The Review document also synthesizes the views and opinions of the state's Ocean Advisory Commission and Ocean Science Advisory Council on the ocean planning and implementation process and summarizes stakeholder and public input received during a public review process (Q3 2020). The review will inform the update of the ocean plan.

Identification of Priorities:

1. *Considering changes in threats to ocean and Great Lakes resources and management since the last assessment and stakeholder input, identify and briefly describe the top one to three management priorities where there is the greatest opportunity for the CMP to improve its ability to effectively plan for the use of ocean and Great Lakes resources. (Approximately 1-3 sentences per management priority.)*

Management Priority 1: **Planning for Offshore Development.**
Description: The management framework that was established for the Massachusetts ocean plan in 2009 identified activities that conflicted with the protection of marine resources, habitats, and water-dependent uses. Over the last decade, new information on ocean resources has been developed and at the same time, there has been an increased understanding of the impacts of traditional and emerging ocean development. In keeping with ecosystem-based management principles, this project would allow the ocean plan to adapt to this new information. The existing management framework (allowed uses, siting and performance standards, resources and uses in conflict with a specific development) would be assessed and potentially updated.

Management Priority 2: **Further characterize potential offshore sand resource areas.**
Description: Engage with the fishing community and fisheries agencies to implement resource and use surveys to identify areas and times appropriate for sand extraction. Use existing sediment grain size data to match potential sand resources with donor beaches. Engage U.S. Geological Survey and/or other marine geologists to design a study to determine the time required for an extraction site to recover. The six existing mapped potential offshore sand resource areas in the 2020 ocean management plan will be refined to those areas that have the least amount of conflict with fishing activity, fisheries resources, and habitats of known high value. New data will be developed to help coastal managers determine the best times and locations accessing potential sand donor sites.

2. *Identify and briefly explain priority needs and information gaps the CMP has to help it address the management priorities identified above. The needs and gaps identified here do not need to be limited to those items that will be addressed through a Section 309 strategy but should include any items that will be part of a strategy.*

Priority Needs	Need? (Y or N)	Brief Explanation of Need/Gap
Research	Y	Develop a greater understanding of the potential impacts to biological resources and human uses in offshore sand areas and predict the recovery time and potential of sand borrow areas.
Mapping/GIS	Y	Continue to improve the quality and spatial resolution of current maps on marine habitats, species, resources, and ocean uses by using the best and most up-to-date data.
Data and information management	N	
Training/Capacity building	N	
Decision-support tools	Y	Development and implementation of compatibility assessments; better understanding of potential interactions between ocean development activities and ocean resources and uses; siting and performance standards to optimize co-located uses.
Communication and outreach	Y	Continuing to work with key stakeholders to build on and improve communication, outreach, and participation so that multiple voices are heard in the ocean planning and implementation process. This will help provide stakeholder and public support/buy-in.

Enhancement Area Strategy Development:

1. *Will the CMP develop one or more strategies for this enhancement area?*

Yes

2. *Briefly explain why a strategy will or will not be developed for this enhancement area.*

Protecting ocean resources and sustainable water dependent uses are critical to the Commonwealth and region and continue to support productive maritime industries, coastal communities, and marine life. New approaches to manage ocean resources have been developed and are being implemented through the ocean plan but continuing and emerging threats and conflicts remain. Reliable data are needed to support science-based policies and adaptive, ecosystem-based management strategies that balance human use and protection of the ocean environment.

V. Strategies

A. Wetlands – Developing Climate Change Adaptation Techniques for Salt Marshes

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas:

Wetlands
Coastal Hazards

II. Strategy Description

A. *The proposed strategy will lead to, or implement, the following types of program changes:*

☐ *A change to coastal zone boundaries;*
☐*New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;*
☐ *New or revised local coastal programs and implementing ordinances;*
☒ *New or revised coastal land acquisition, management, and restoration programs;*
☐ *New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,*
☒ *New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.*

B. ***Strategy Goal:***

This strategy will result in targeted research on salt marsh ecological processes to identify drivers of change in areas identified as vulnerable and support the refinement of geospatial tools for tidal marsh management. The data collected will inform and strengthen policies to protect and preserve the ecological services of salt marshes, building climate change resilience for communities in the Massachusetts coastal zone.

C. *Describe the proposed strategy and how the strategy will lead to and/or implement the program changes selected above. If the strategy will only involve implementation activities, briefly describe the program change that has already been adopted, and how the proposed activities will further that program change. (Note that implementation strategies are not to exceed two years.)*

The development of geospatial tools and underlying data to support broadscale analysis and decision making has become a central focus of CZM's wetlands work. We seek to better understand the ecological processes and their intersection with anthropogenic impacts, including climate change, given the size, scale, and complexity of salt marshes across the coastal zone. Recent studies have demonstrated great promise in documenting physical indicators of marsh condition using satellite or aerial imagery and other remote sensing data.[37,38] Additional efforts incorporating field and remote sensing data collection at the National Estuarine Research Reserves (NERRs) and elsewhere have resulted in the development of multimetric approaches to assess both resilience[39] and vulnerability of tidal marshes.[40,41] CZM applied the Sea Level Rise Affecting Marshes Model (SLAMM) coastwide, along with the Marsh Equilibrium Model (MEM) in the Great Marsh, to develop statewide predictions of the future extent and distribution of coastal wetlands, and where they may migrate, in response to sea level rise. CZM is also in the initial stages of building a remote sensing mapping program at our long-term sentinel salt marsh monitoring sites in coordination with the NOAA Office for Coastal Management.

Building on this work, CZM (with partners) will apply a geospatial indicator of marsh vulnerability, the unvegetated-vegetated marsh ratio (UVVR) to all salt marshes in Massachusetts for products based on both 1-meter source imagery and 30-meter Landsat imagery. The metric uses remote sensing imagery to calculate the ratio of unvegetated areas (e.g., pools, pannes, mudflats) on the marsh platform with vegetated areas.[37] The UVVR metric has been tested and applied successfully in multiple locations along the Atlantic East Coast, including a recent pilot for the Plum Island Estuary and the Cape Cod National Seashore in Massachusetts, and is strongly correlated to net sediment budget, elevation, and tidal inundation making the metric a powerful screening tool for the identification of both vulnerable salt marshes and marshes less at risk.[37,42,43]

Salt marshes build elevation and maintain areal extent from organic material produced by the plants that inhabit them and the incorporation of mineral soils into peat.[44] As sea levels rise beyond the capacity for tidal marshes to accumulate sediment and gain elevation, they will begin to drown—leading to cascading impacts to the system and a loss of ecosystem services

[37] Ganju NK, Defne Z, Kirwan ML, Fagherazzi S, D'Alpaos A, and Carniello L. 2017. Spatially integrative metrics reveal hidden vulnerability of microtidal salt marshes. Nature Communications 8:14156.
[38] Leonardi N, Defne Z, Ganju NK, and Fagherazzi S. 2016. Salt marsh erosion rates and boundary features in a shallow Bay. Journal of Geophysical Research: Earth Surface 121: 1-15.
[39] Raposa KB, Wasson K, Smith E, Crooks JA, Delgado P, Fernald SH, Ferner MC, Helms A, Hice LA, Mora JW, Puckett B, Sanger D, Shull S, Spurrier L, Stevens R, and Lerberg S. 2016. Assessing tidal marsh resilience to sea-level rise at broad geographic scales with multi-metric indices. Biological Conservation 204: 263–275.
[40] Cole Ekberg ML, Raposa KB, Ferguson WS, Ruddock K, and Watson EB. 2017. Development and application of a method to identify salt marsh vulnerability to sea level rise. Estuaries and Coasts 40:694-710.
[41] Wasson K, Ganju NK, Defne Z, Endris, C, Elsey-Quirk T, Thorne KM, Freeman CM, Guntenspergen G, Nowacki DJ and Raposa KB. 2019 Understanding tidal marsh trajectories: evaluation of multiple indicators of marsh persistence. Environmental Research Letters 14: 124073.
[42] Defne Z, and Ganju NK. 2018. Unvegetated to vegetated marsh ratio in Plum Island Estuary and Parker River salt marsh complex, Massachusetts: U.S. Geological Survey data release. https://doi.org/10.5066/P9OW6LFU
[43] Defne Z, and Ganju NK. 2019. Unvegetated to vegetated marsh ratio in Cape Cod National Seashore salt marsh complex, Massachusetts: U.S. Geological Survey data release. https://doi.org/10.5066/P99KU0C5
[44] Redfield, AC. 1972 Development of a New England Salt Marsh. Ecological Monographs 42(2):201-237

important for coastal protection and habitat. While the UVVR score may flag a salt marsh area as vulnerable, more data is required to identify how and why the vulnerability exists. Measurements of suspended sediment concentration or turbidity on both the ebb and flood tide have been suggested as an important indicator of sediment supply in the context of marsh persistence along with wind and wave conditions.[45,46] CZM will design a data collection protocol that will outline collection methods, instruments, and data sources required for a clearer picture of the correlated factors in a marsh with a poor UVVR score to maximize the linkages of the UVVR to on-the-ground management.

CZM proposes to advance this work through a 309 strategy to pilot the protocol in vulnerable marsh areas initially identified by the UVVR metric and other data sources, while at the same time using these data to ground truth and finalize the UVVR metric product. The strategy will commence in 2021 once final data products are received from USGS and the protocol is finalized. The first year will focus on setting up the project and building capital and partnership capacity, followed by two years of data collection and analysis. Finally, the last year is focused on refinement and expanding this proof of concept to other locations and linking to enhanced wetland policies and recommendations for resiliency.

This strategy will continue the work of CZM to manage wetland resources in the face of climate change by identifying vulnerabilities and informing policies to protect and restore wetland functions. The information generated by this project will improve implementation of CZM Habitat Policy 1 to: *"Protect coastal, estuarine, and marine habitats—including salt marshes… to preserve critical wildlife habitat and other important functions and services including nutrient and sediment attenuation, wave and storm damage protection, and landform movement and processes"* and Coastal Hazards Policy 1 to: "*Preserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as … salt marshes*…" and their underlying legal authorities including the Wetlands Protection Act and its regulations. The information produced from this project will be formally adopted as procedural guidance by CZM and used by CZM and other state agencies and local Conservation Commissions to assist their regulatory decision making.

III. Needs and Gaps Addressed

Identify what priority needs and gaps the strategy addresses and explain why the proposed program change or implementation activities are the most appropriate means to address the priority needs and gaps. This discussion should reference the key findings of the assessment and explain how the strategy addresses those findings.

[45] Ganju NK, Nidzieko NJ, and Kirwan ML. 2013. Inferring tidal wetland stability from channel sediment fluxes: Observations and a conceptual model. Journal of Geophysical Research: Earth Surface 118: 2045–2058.

[46] Ganju, NK. 2019. Marshes are the new beaches: Integrating sediment transport into restoration planning. Estuaries and Coasts 42(4): 917-926.

This project will directly address the need to provide improved and informed decision-making tools to allow coastal managers to identify marshes at risk and to implement and/or regulate appropriate techniques to preserve or restore wetland functions in the face of climate change.

IV. Benefits to Coastal Management

Discuss the anticipated effect of the strategy, including the scope and value of the strategy, in advancing improvements in the CMP and coastal management, in general.

The increasing recognition of the threats of sea level rise and other stressors to salt marshes has led to widespread concern among government agencies, local officials, and citizens regarding a relatively urgent need to explore, identify, and begin implementation of options for adaptation. This project will directly benefit coastal zone management by providing the data required to further characterize the drivers of salt marsh vulnerability, further refining the utility of geospatial tools for decision making, directly informing adaptive management, and providing the basis for enhanced program policies. The information generated through this project will also support other important management efforts such as identification of priority restoration areas or sites for land acquisition or easement actions.

V. Likelihood of Success

Discuss the likelihood of attaining the strategy goal and program change (if not part of the strategy goal) during the five-year assessment cycle or at a later date. Address the nature and degree of support for pursuing the strategy and the proposed program change, as well as the specific actions the state or territory will undertake to maintain or build future support for achieving and implementing the program change, including education and outreach activities.

The likelihood of success is high. CZM and its partners have high caliber wetlands personnel with extensive estuarine ecosystem and regulatory experience and a strong history of creating tools to enhance and inform coastal management decision making. CZM will work with technical partners to ensure the products developed are scientifically sound and accessible to a broad range of decision makers.

VI. Strategy Work Plan

Using the template below, provide a general work plan that includes the major steps that will lead toward or achieve a program change or implement a previously achieved program change. If the state intends to fund implementation activities for the proposed program change, describe those in the plan as well. The plan should identify a schedule for completing the strategy and include major projected milestones (key products, deliverables, activities, and decisions) and budget estimates. If an activity will span two or more years, it can be combined into one entry (i.e., Years 2-3 rather than Year 2 and then Year 3). While the annual milestones are a useful guide to ensure the strategy remains on track, OCRM recognizes that they may change somewhat over the course of the five-year strategy unforeseen circumstances. The same holds true for the annual budget estimates. Further detailing and adjustment of annual activities, milestones, and budgets will be determined through the annual cooperative agreement negotiation process.

Strategy Goal: To build capacity towards a more comprehensive understanding of the intersection of salt marsh processes and climate resiliency

Total Years: 5
Total Budget: $297,730

Year: 1
Description of activities: Continue to support UVVR development and application, identify preliminary partners for on the ground verification, quality assurance/quality control review on initial data products.
Major Milestone(s): UVVR deliverables, QA/QC review on data products.
Budget: $26,000

Year: 2
Description of activities: Review final geospatial products and identify initial salt marsh locations for field-based investigation. Refine site selection using available SLAMM model data, technical review, and other information as applicable. Finalize field protocol and begin to build stakeholder partnerships and secure resources, as needed, to implement the initial investigations. Development of standard operating procedures (SOP)/ Quality Assurance Project Plan (QAPP) as applicable.
Major Milestone(s): A minimum of three salt marsh locations identified as vulnerable using the UVVR product, SLAMM model data, and other data as available/applicable are selected for further on the ground characterization using the field protocol. Approved QAPP as applicable.
Budget: $74,922

Years: 3-4
Description of activities: Initialize field investigation of vulnerable salt marsh locations identified in Year 1 as outlined in the field protocol, leveraging partnerships and/or contractual support. Review collected data to refine protocol as applicable. Develop database to support data collection.
Major Milestone(s): Initial data collection implemented at priority locations, database developed, and initial data entry/quality control.
Budget: $122,000 (Year 3: $60,602, Year 4: $61,200)

Year: 5
Description of activities: Data analysis to further characterize the drivers of vulnerability at the selected salt marsh locations. Once drivers are identified, review and research management actions to restore and/or increase resiliency of the marsh. Provide recommendations on review and identification of vulnerable marshes using CZM's available geospatial data tools (SLAMM, UVVR, others as applicable). Enhance or refine program policies to include guidance on utilization of the data to identify management priorities. Work with stakeholders to advance priority actions and to expand data collection to additional areas.

Major Milestone(s): Sediment processes and drivers of marsh vulnerability are identified at salt marsh focus locations. Broadened stakeholder engagement to advance adaptive management actions as appropriate and build support of expansion of field assessment to additional locations.
Budget: $74,998

VII. Fiscal and Technical Needs

A. Fiscal Needs: *If 309 funding is not sufficient to carry out the proposed strategy, identify additional funding needs. Provide a brief description of what efforts the CMP has made, if any, to secure additional state funds from the legislature and/or from other sources to support this strategy.*

We anticipate seeking funding in addition to 309 sources for some aspects of the project, particularly contractual support if warranted for field data collection and analysis. CZM would likely seek outside funding or partnerships to support this aspect.

B. Technical Needs: *If the state does not possess the technical knowledge, skills, or equipment to carry out all or part of the proposed strategy, identify these needs. Provide a brief description of what efforts the CMP has made, if any, to obtain the trained personnel or equipment needed (for example, through agreements with other state agencies).*

CZM staff currently have the technical knowledge and skills to manage the proposed project in-house. Field investigations likely will be supported through outside contractual or partnership support with assistance from CZM technical staff as applicable. Advancement of adaptive management may be supported by other stakeholders and agencies.

VIII. Projects of Special Merit (Optional)

If desired, briefly state what projects of special merit the CMP may wish to pursue to augment this strategy. Any activities that are necessary to achieve the program change or that the state intends to support with baseline funding should be included in the strategy above. The information in this section will not be used to evaluate or rank projects of special merit and is simply meant to give CMPs the option to provide additional information if they choose. Project descriptions should be kept very brief (e.g., undertake benthic mapping to provide additional data for ocean management planning). Do not provide detailed project descriptions that would be needed for the funding competition.

Specific activities described above may be identified and advanced as a project of special merit to augment this strategy.

B. Coastal Hazards - Enhancing Natural Buffers and Retreat Strategies

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas (check all that apply):

Coastal Hazards

II. Strategy Description

A. *The proposed strategy will lead to, or implement, the following types of program changes (check all that apply):*

☐ *A change to coastal zone boundaries;*

☐*New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;*

☐ *New or revised local coastal programs and implementing ordinances;*

☐*New or revised coastal land acquisition, management, and restoration programs;*

☐ *New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,*

☒ *New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.*

B. Strategy Goal:

Develop and apply guidelines for identifying suitable sites for nature-based shoreline management approaches and criteria for determining where these projects may be most suitable and cost effective.

C. *Describe the proposed strategy and how the strategy will lead to and/or implement the program changes selected above. If the strategy will only involve implementation activities, briefly describe the program change that has already been adopted, and how the proposed activities will further that program change. (Note that implementation strategies are not to exceed two years.)*

As described in the Coastal Hazards Assessment, CZM is committed to expanding the use of nature-based shoreline management approaches and recognizes the need to evaluate cost-effective adaptation strategies in high-hazard areas over the long term. This enhancement strategy builds on CZM's 2016-2020 Coastal Hazards Strategy, which was supported through CZM's Coastal Resilience Grant Program as well as regional coastal resilience projects funded by NOAA. It also leverages a state capital planning project tied to the implementation of the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan. The 2021-2025 Coastal

Hazards Strategy focuses on effectively siting nature-based projects to manage erosion and flooding while investing state and local resources where these projects are the best alternative. The development of nature-based project guidelines will strengthen CZM's StormSmart Coasts Program and ability to enforce Coastal Hazards Policy #1 ("*to enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms) as well as prioritize relocation of structures out of high-hazard areas"* (Coastal Hazards Policy #4).

III. Needs and Gaps Addressed

Identify what priority needs and gaps the strategy addresses and explain why the proposed program change or implementation activities are the most appropriate means to address the priority needs and gaps. This discussion should reference the key findings of the assessment and explain how the strategy addresses those findings.

The Coastal Hazards Assessment highlights necessary research, tools, and outreach materials to increase state and local capacity to site and implement effective nature-based projects and identify where retreat from the coast may be most appropriate. Knowledge of and interest in nature-based approaches has grown in Massachusetts over the last five years. Now, CZM needs to focus these projects in the most appropriate locations and begin to broaden the coastal resilience discussion to include more proactive planning tools. The proposed guidance will strengthen technical assistance offered by the StormSmart Coasts Program and help prioritize Coastal Resilience Grant Program awards.

IV. Benefits to Coastal Management

Discuss the anticipated effect of the strategy, including the scope and value of the strategy, in advancing improvements in the CMP and coastal management, in general.

New StormSmart guidance and Coastal Resilience Grant Program criteria will strengthen coastal resilience planning and investment in nature-based projects across the coast of the Commonwealth. The strategy will also help increase awareness of the need to comprehensively evaluate and select coastal adaptation options depending on site-specific characteristics. There is need to build local understanding and support for additional planning tools including retreat and to be able to present all options as viable management strategies.

V. Likelihood of Success

Discuss the likelihood of attaining the strategy goal and program change (if not part of the strategy goal) during the five-year assessment cycle or at a later date. Address the nature and degree of support for pursuing the strategy and the proposed program change and the specific actions the state or territory will undertake to maintain or build future support for achieving and implementing the program change, including education and outreach activities.

This strategy has a high likelihood of success. In 2016, Governor Baker issued Executive Order 569 to establish an integrated climate change strategy for the Commonwealth. Among the mitigation and adaptation directives is a call for "…strategies that conserve and sustainably

employ the natural resources of the Commonwealth to enhance climate adaptation, build resilience and mitigate climate change." The 2018 State Hazard Mitigation and Climate Adaptation Plan fulfills the Governor's requirements for a climate adaptation plan and underscores the importance of nature-based solutions for hazard mitigation and climate adaptation. The plan includes a list of co-benefits that should be accounted for when considering the benefits and costs of nature-based solutions. CZM's Coastal Resilience Grant Program is highlighted for supporting nature-based projects since its launch in 2014. CZM has strong state and local support for this grant program and the proposed strategy is integral to it and the technical assistance and outreach efforts of CZM's StormSmart Coasts team.

VI. Strategy Work Plan

Using the template below, provide a general work plan that includes the major steps that will lead toward or achieve a program change or implement a previously achieved program change. If the state intends to fund implementation activities for the proposed program change, describe those in the plan as well. The plan should identify a schedule for completing the strategy and include major projected milestones (key products, deliverables, activities, and decisions) and budget estimates. If an activity will span two or more years, it can be combined into one entry (i.e., Years 2-3 rather than Year 2 and then Year 3). While the annual milestones are a useful guide to ensure the strategy remains on track, OCRM recognizes that they may change somewhat over the course of the five-year strategy unforeseen circumstances. The same holds true for the annual budget estimates. Further detailing and adjustment of annual activities, milestones, and budgets will be determined through the annual cooperative agreement negotiation process.

Strategy Goal: Develop and apply guidelines for identifying suitable sites for nature-based shoreline management approaches and criteria for determining where these projects may be most suitable and cost effective.
Total Years: 4
Total Budget: $300,000

Year(s): 1-2
Description of activities:
Task 1: Analyze (1) results of the two regional coastal resilience projects focused on advancing and monitoring nature-based projects; (2) design plans and monitoring data for other nature-based projects supported through CZM's Coastal Resilience Grant Program;
(3) CZM-funded Pleasant Bay shoreline suitability assessment for nature-based approaches; and (4) guidance on siting nature-based projects from other states and organizations. Develop StormSmart guidance for siting nature-based projects.
Task 2: Review community reports that prioritize shoreline adaptation strategies such as Scituate's 2016 shoreline management strategy report. Conduct benefits and costs analyses for 2-3 completed nature-based projects supported through CZM's Coastal Resilience Grant Program (e.g., Salem – Collins Cove fringing salt marsh, Winthrop – Coughlin Park coastal bank stabilization and cobble nourishment, and Kingston – Gray's Beach dune restoration). Use the

results to refine the Coastal Resilience Grant Program evaluation criteria to support cost-effective nature-based projects with the greatest benefits.
Major Milestone(s): StormSmart nature-based project suitability guidelines and Coastal Resilience Grant Program funding criteria
Budget: $100,000 (Year 1: $50,000, Year 2: $50,000)

Year(s): 3-4
Description of activities:
Task 3: Apply the guidelines to site and design one or more local nature-based project(s).
Task 4: Screen the local project(s) for cost effectiveness and competitiveness using the grant program selection criteria and revise the guidelines and criteria if necessary.
Major Milestone(s): model nature-based project design; revised suitability guidelines and funding criteria
Budget: $200,000 (Year 3: $150,00, Year 4: $50,000)

VII. Fiscal and Technical Needs

A. Fiscal Needs: *If 309 funding is not sufficient to carry out the proposed strategy, identify additional funding needs. Provide a brief description of what efforts the CMP has made, if any, to secure additional state funds from the legislature and/or from other sources to support this strategy.*

The proposed strategy aligns with priorities of the state's capital investment plan, which funds CZM's Coastal Resilience Grant Program. CZM anticipates awarding a Coastal Resilience Grant for a nature-based design project to test the suitability guidance and funding criteria. Additional funds could be allocated to help carry out other tasks of the 309 strategy if necessary.

B. Technical Needs: *If the state does not possess the technical knowledge, skills, or equipment to carry out all or part of the proposed strategy, identify these needs. Provide a brief description of what efforts the CMP has made, if any, to obtain the trained personnel or equipment needed (for example, through agreements with other state agencies).*

CZM has a network of coastal engineering and bioengineering consultants who could provide assistance and feedback on siting guidelines. CZM could also leverage partnerships with Woods Hole Sea Grant and academics including economists and policy specialists for the analysis of benefits and costs of nature-based approaches and projects.

VIII. Projects of Special Merit (Optional)

If desired, briefly state what projects of special merit the CMP may wish to pursue to augment this strategy. Any activities that are necessary to achieve the program change or that the state intends to support with baseline funding should be included in the strategy above. The information in this section will not be used to evaluate or rank projects of special merit and is simply meant to give CMPs the option to provide additional information if they choose. Project descriptions should be kept very brief (e.g., undertake benthic mapping to

provide additional data for ocean management planning). Do not provide detailed project descriptions that would be needed for the funding competition.

Specific activities described above may be identified and advanced as a project of special merit to augment this strategy.

C. Special Area Management Plan – Designated Port Area Boundary Reviews

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas (check all that apply):

Special Area Management Planning

II. Strategy Description

A. *The proposed strategy will lead to, or implement, the following types of program changes (check all that apply):*

☐ *A change to coastal zone boundaries;*

☐*New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;*

☐ *New or revised local coastal programs and implementing ordinances;*

☐ *New or revised coastal land acquisition, management, and restoration programs;*

☒ *New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,*

☒ *New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.*

B. Strategy Goal:

This strategy will review the current DPA boundaries to ensure that they accurately reflect the criteria outlined in CZM's Designated Port Area regulations (301 CMR 25.00) including criteria such as appropriate physical attributes, adequate land and water connections, and compatible land use development patterns.

C. *Describe the proposed strategy and how the strategy will lead to and/or implement the program changes selected above. If the strategy will only involve implementation activities, briefly describe the program change that has already been adopted, and how the proposed activities will further that program change. (Note that implementation strategies are not to exceed two years.)*

The strategy will lead to a program change by modifying the boundaries of certain DPAs. In areas that are removed from the DPA, the regulatory framework (under MassDEP's Chapter 91 regulations and CZM's Municipal Harbor Plan regulations) allows for a greater diversity in uses and development allowances. The strategy will also implement recommendations of the DPA Working Group and many DPA stakeholders that CZM conduct comprehensive reviews of all DPAs to ensure that the boundaries accurately reflect current community needs and are compatible with surrounding land use patterns.

III. Needs and Gaps Addressed

Identify what priority needs and gaps the strategy addresses and explain why the proposed program change or implementation activities are the most appropriate means to address the priority needs and gaps. This discussion should reference the key findings of the assessment and explain how the strategy addresses those findings.

Since the boundaries of the DPAs were originally established in 1978, and the subsequent underlying regulatory framework was developed, there have not been comprehensive reviews of many of the DPAs. This project will address this need by conducting comprehensive reviews, using the designation standards found at 301 CMR 25.00, to determine whether the boundaries should remain as currently established or whether they should be modified.

IV. Benefits to Coastal Management

Discuss the anticipated effect of the strategy, including the scope and value of the strategy, in advancing improvements in the CMP and coastal management, in general.

Reviewing and modernizing DPA boundaries provides municipalities a greater ability to manage and plan for uses in their DPAs. In areas that are removed from the DPA, it gives property owners greater flexibility to incorporate commercial and supporting uses that are consistent with the community's vision for the waterfront.

V. Likelihood of Success

Discuss the likelihood of attaining the strategy goal and program change (if not part of the strategy goal) during the five-year assessment cycle or at a later date. Address the nature and degree of support for pursuing the strategy and the proposed program change and the specific actions the state or territory will undertake to maintain or build future support for achieving and implementing the program change, including education and outreach activities.

The likelihood for success is high. CZM has recently conducted two comprehensive boundary reviews in the past four years in the Cities of Boston and Chelsea. CZM's methodology for conducting these boundary reviews, and our robust public process, is widely supported by DPA stakeholders. This project will continue to build on our recent successes, with CZM actively engaging a number of municipalities to modernize their DPA boundaries.

VI. Strategy Work Plan

Using the template below, provide a general work plan that includes the major steps that will lead toward or achieve a program change or implement a previously achieved program change. If the state intends to fund implementation activities for the proposed program change, describe those in the plan as well. The plan should identify a schedule for completing the strategy and include major projected milestones (key products, deliverables, activities, and decisions) and budget estimates. If an activity will span two or more years, it can be combined into one entry (i.e., Years 2-3 rather than Year 2 and then Year 3). While the annual milestones are a useful guide to ensure the strategy remains on track, OCRM recognizes that they may change somewhat over the course of the five-year strategy unforeseen circumstances. The

same holds true for the annual budget estimates. Further detailing and adjustment of annual activities, milestones, and budgets will be determined through the annual cooperative agreement negotiation process.

Strategy Goal: Comprehensive designated port area boundary reviews, using the state standards found at 301 CMR 25.00
Total Years: 5
Total Budget: $225,000

Year(s): 1-2
Description of activities: Initiate first DPA boundary review of the East Boston DPA. Conduct public information meeting to discuss boundary review process. Consult with the municipality/ies and MassDEP, review applicable licenses, permits, and municipal records and perform outreach with waterfront property owners. Prepare boundary review report and hold public hearing to receive public input. Prepare final designation decision.
Major Milestone(s): Boundary review report and final designation decision
Budget: $75,000 (Year 1: $50,000, Year 2: $25,000)

Year(s): 2-3
Description of activities: Initiate second DPA boundary review for the potential designation of the Tisbury harbor area as a DPA. Conduct public information meeting to discuss boundary review process. Consult with the municipality/ies and MassDEP, review applicable licenses, permits, and municipal records and perform outreach with waterfront property owners. Prepare boundary review report and hold public hearing to receive public input. Prepare final designation decision.
Major Milestone(s): Boundary review report and final designation decision
Budget: $75,000 (Year 2: $50,000, Year 3: $25,000)

Year(s): 4-5
Description of activities: Conduct third DPA boundary review of either the Lynn Harbor or Weymouth Fore River DPAs. Conduct public information meeting to discuss boundary review process. Consult with the municipality/ies and MassDEP, review applicable licenses, permits, and municipal records and perform outreach with waterfront property owners. Prepare boundary review report and hold public hearing to receive public input. Prepare final designation decision.
Major Milestone(s): Boundary review report and final designation decision
Budget: $75,000 (Year 4: $50,000, Year 5: $25,000)

VII. Fiscal and Technical Needs

A. Fiscal Needs: *If 309 funding is not sufficient to carry out the proposed strategy, identify additional funding needs. Provide a brief description of what efforts the CMP has made, if any, to secure additional state funds from the legislature and/or from other sources to support this strategy.*

We anticipate that 309 resources will be sufficient to carry out the proposed strategy, with supplementation by additional support from other local or state sources as necessary.

B. Technical Needs: *If the state does not possess the technical knowledge, skills, or equipment to carry out all or part of the proposed strategy, identify these needs. Provide a brief description of what efforts the CMP has made, if any, to obtain the trained personnel or equipment needed (for example, through agreements with other state agencies).*

CZM staff have sufficient technical knowledge and skills to carry out all of the proposed strategy.

VIII. Projects of Special Merit (Optional)

If desired, briefly state what projects of special merit the CMP may wish to pursue to augment this strategy. Any activities that are necessary to achieve the program change or that the state intends to support with baseline funding should be included in the strategy above. The information in this section will not be used to evaluate or rank projects of special merit and is simply meant to give CMPs the option to provide additional information if they choose. Project descriptions should be kept very brief (e.g., undertake benthic mapping to provide additional data for ocean management planning). Do not provide detailed project descriptions that would be needed for the funding competition.

Specific activities described above may be identified and advanced as a project of special merit to augment this strategy.

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D. Special Area Management Plan – Promoting Climate Resilience and Economic Development in DPAs

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas (check all that apply):

Special Area Management Planning

II. Strategy Description

A. *The proposed strategy will lead to, or implement, the following types of program changes (check all that apply):*

☐ *A change to coastal zone boundaries;*

☐ *New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;*

☐ *New or revised local coastal programs and implementing ordinances;*

☐ *New or revised coastal land acquisition, management, and restoration programs;*

☒ *New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,*

☐ *New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.*

B. Strategy Goal:

This strategy will promote the climate resilience of and economic development within DPAs to preserve, enhance, and promote their capacity to support water-dependent industrial uses into the future.

C. *Describe the proposed strategy and how the strategy will lead to and/or implement the program changes selected above. If the strategy will only involve implementation activities, briefly describe the program change that has already been adopted, and how the proposed activities will further that program change. (Note that implementation strategies are not to exceed two years.)*

The strategy will lead to a program change by providing additional tools for technical and financial assistance to encourage the expansion of water-dependent industrial uses in DPAs. These tools may include design guidelines for the development or retrofitting of climate-resilient water-dependent industrial uses and structures; a catalogue of industry best practices

to manage climate risks; and data, information, and other materials for economic development in specific DPAs.

III. Needs and Gaps Addressed

Identify what priority needs and gaps the strategy addresses and explain why the proposed program change or implementation activities are the most appropriate means to address the priority needs and gaps. This discussion should reference the key findings of the assessment and explain how the strategy addresses those findings.

In order to balance the preservation and efficient utilization of existing and/or historic infrastructure and land for water-dependent industrial use with local land use planning goals, climate related risk, and changing industry, it is vital to identify the vulnerability of DPAs to climate-related impacts, potential solutions to reduce these vulnerabilities, and opportunities and challenges for the growth of existing and emerging water-dependent industrial uses. This project will provide the necessary analyses and information to inform the development of tools for technical assistance to preserve, enhance, and promote the capacity of DPAs to accommodate water-dependent industrial uses.

IV. Benefits to Coastal Management

Discuss the anticipated effect of the strategy, including the scope and value of the strategy, in advancing improvements in the CMP and coastal management, in general.

This strategy will provide the state, municipalities, property owners, water-dependent industrial users, and other stakeholders the tools necessary to make informed decisions and plan regarding the efficient and increased utilization of DPAs for the benefit of the coastal zone and local and regional economies in a manner consistent with the local and state vision for the respective DPA.

V. Likelihood of Success

Discuss the likelihood of attaining the strategy goal and program change (if not part of the strategy goal) during the five-year assessment cycle or at a later date. Address the nature and degree of support for pursuing the strategy and the proposed program change and the specific actions the state or territory will undertake to maintain or build future support for achieving and implementing the program change, including education and outreach activities.

The likelihood for success is high. CZM has engaged various DPA stakeholders and experts in resilience and economic development to develop this strategy with an emphasis on the usability of the tools resulting from this strategy. This strategy will utilize and further develop CZM's expertise in DPAs, resilience, and the blue economy.

VI. Strategy Work Plan

Using the template below, provide a general work plan that includes the major steps that will lead toward or achieve a program change or implement a previously achieved program change. If the state intends to fund implementation activities for the proposed program

change, describe those in the plan as well. The plan should identify a schedule for completing the strategy and include major projected milestones (key products, deliverables, activities, and decisions) and budget estimates. If an activity will span two or more years, it can be combined into one entry (i.e., Years 2-3 rather than Year 2 and then Year 3). While the annual milestones are a useful guide to ensure the strategy remains on track, OCRM recognizes that they may change somewhat over the course of the five-year strategy unforeseen circumstances. The same holds true for the annual budget estimates. Further detailing and adjustment of annual activities, milestones, and budgets will be determined through the annual cooperative agreement negotiation process.

Strategy Goal: This strategy includes comprehensive vulnerability analyses of the DPAs, the development of design guidelines for resilient water-dependent industrial development, the identification of best practices for water-dependent industrial uses to manage climate risk; the identification of existing uses with DPAS, opportunities for and challenges to the growth of existing and new water-dependent industrial uses, and potential water-dependent industrial cluster.
Total Years: 5
Total Budget: $500,000

Year(s): 1-2
Description of activities: Initiate climate-related components of strategy, including vulnerability analyses, design guidelines development, and industry best practices.
Major Milestone(s): Completion of analyses, publication of design guidelines and industry best practices
Budget: $225,000 (Year 1: $112,500, Year 2: $112,500)

Year(s): 3-4
Description of activities: Initiate economic-related components of strategy, including identification of current water-dependent industrial uses in DPAs, opportunities for and challenges to growth of water-dependent industrial uses; and potential water-dependent industrial use clusters.
Major Milestone(s): Completion of economic study, report on opportunities and challenges, and materials for promotion of water-dependent industrial use clusters
Budget: $225,000 (Year 3: $112,500, Year 4: $112,500)

Year: 5
Description of activities: Creation, promotion and distribution of materials, including physical and web-based publications, presentations to stakeholders and at conferences.
Major Milestone(s): Completion of development of publication materials and stakeholder outreach program.
Budget: $50,000

VII. Fiscal and Technical Needs

A. Fiscal Needs: *If 309 funding is not sufficient to carry out the proposed strategy, identify additional funding needs. Provide a brief description of what efforts the CMP has made, if any, to secure additional state funds from the legislature and/or from other sources to support this strategy.*

We anticipate seeking funding in addition to 309 sources for some aspects of the project, particularly contractual support if warranted for field data collection and analysis. CZM would likely seek outside funding or partnerships to support this aspect.

B. Technical Needs: *If the state does not possess the technical knowledge, skills, or equipment to carry out all or part of the proposed strategy, identify these needs. Provide a brief description of what efforts the CMP has made, if any, to obtain the trained personnel or equipment needed (for example, through agreements with other state agencies).*

CZM staff have sufficient technical knowledge and skills to carry out the proposed strategy.

VIII. Projects of Special Merit (Optional)

If desired, briefly state what projects of special merit the CMP may wish to pursue to augment this strategy. Any activities that are necessary to achieve the program change or that the state intends to support with baseline funding should be included in the strategy above. The information in this section will not be used to evaluate or rank projects of special merit and is simply meant to give CMPs the option to provide additional information if they choose. Project descriptions should be kept very brief (e.g., undertake benthic mapping to provide additional data for ocean management planning). Do not provide detailed project descriptions that would be needed for the funding competition.

Specific activities described above may be identified and advanced as a project of special merit to augment this strategy.

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E. Ocean Resources - Advance Ocean Planning

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas (check all that apply):

Energy & Government Facility Siting
Ocean/Great Lakes Resources
Special Area Management Planning

II. Strategy Description

A. *The proposed strategy will lead to, or implement, the following types of program changes (check all that apply):*

☐ *A change to coastal zone boundaries;*

☒ *New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;*

☐ *New or revised local coastal programs and implementing ordinances;*

☐ *New or revised coastal land acquisition, management, and restoration programs;*

☐ *New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,*

☒ *New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.*

A. ***Strategy Goal:***

The goal/program change of this strategy is twofold: 1) the basic framework that underpins the Massachusetts Ocean Plan, its siting and performance standards and determinations of conflicts between uses, will be revisited and updated as necessary to include new scientific knowledge of species and habitats at risk to ocean development, as well as emerging ocean uses; and 2) benthic and pelagic habitat maps used in ocean planning and project review will be updated. The latter includes seafloor mapping (sediment, geology, and geoform identification) and updating the biological resource maps--Special, Sensitive, or Unique (SSU) areas that restrict how the MA coastal zone can be developed—to reflect recent changes in species' distributions and habitat use. As a result of this strategy, the siting and performance standards for specific ocean uses (renewable energy, cables and pipelines, and sand extraction) will be assessed, at least six SSU areas will be updated, an offshore sand resource area will be further characterized, and a geoform map for MA coastal waters will be generated.

B. *Describe the proposed strategy and how the strategy will lead to and/or implement the program changes selected above. If the strategy will only involve implementation activities, briefly describe the program change that has already been adopted, and how the proposed activities will further that program change. (Note that implementation strategies are not to exceed two years.)*

As described in the Assessment, the Massachusetts Oceans Act requires the Ocean Plan to be reviewed at least once every five years. In the current review of the ocean plan, there are specific elements that need to be addressed to advance the ongoing implementation and future revision of the plan. Specific to this strategy is the update of the ocean plan management framework, enhanced understanding of benthic and pelagic habitat (especially within offshore sand resources), and updates to SSU boundaries. Once these elements are addressed, CZM will amend the ocean plan and formally adopt the enforceable elements of the ocean plan into the CZM program.

III. Needs and Gaps Addressed

Identify what priority needs and gaps the strategy addresses and explain why the proposed program change or implementation activities are the most appropriate means to address the priority needs and gaps. This discussion should reference the key findings of the assessment and explain how the strategy addresses those findings.

The strategy will directly address the management priorities noted in the Phase II Assessment: 1) Update the MA Ocean Plan management framework and 2) Further characterize potential offshore sand resource areas.

IV. Benefits to Coastal Management

Discuss the anticipated effect of the strategy, including the scope and value of the strategy, in advancing improvements in the CMP and coastal management, in general.

The strategy will support work on needs identified by coastal stakeholders, enable implementation of review/revision of the 2020 ocean plan, allow for incorporation of the revised management framework into the state's Coastal Program, and support future formal revision and updating of the ocean plan. More specifically, implementation of this strategy will allow CZM to respond to the increased interest in the ocean as a space for renewable energy siting and as a source of sand for beach nourishment and shoreline protection, while at the same time protecting coastal and ocean habitats and biological resources.

V. Likelihood of Success

Discuss the likelihood of attaining the strategy goal and program change (if not part of the strategy goal) during the five-year assessment cycle or at a later date. Address the nature and degree of support for pursuing the strategy and the proposed program change and the specific actions the state or territory will undertake to maintain or build future support for achieving and implementing the program change, including education and outreach activities.

This strategy has a high likelihood of success. CZM previously led the development of the 2009 Ocean Plan and the update/amendment of the 2015 Ocean Plan. CZM has demonstrated the proficiency, leadership, and capacity to execute such endeavors as it has staff with the necessary science, technical, planning and policy expertise, and a long track-record of working with partners on cooperative projects via stakeholder engagement. CZM's long-term cooperative agreement with the U.S. Geological Survey has led to many useful seafloor mapping products. This relationship will continue to help CZM be a regional leader in seafloor and habitat mapping.

VI. Strategy Work Plan

Using the template below, provide a general work plan that includes the major steps that will lead toward or achieve a program change or implement a previously achieved program change. If the state intends to fund implementation activities for the proposed program change, describe those in the plan as well. The plan should identify a schedule for completing the strategy and include major projected milestones (key products, deliverables, activities, and decisions) and budget estimates. If an activity will span two or more years, it can be combined into one entry (i.e., Years 2-3 rather than Year 2 and then Year 3). While the annual milestones are a useful guide to ensure the strategy remains on track, OCRM recognizes that they may change somewhat over the course of the five-year strategy unforeseen circumstances. The same holds true for the annual budget estimates. Further detailing and adjustment of annual activities, milestones, and budgets will be determined through the annual cooperative agreement negotiation process.

Strategy Goal: Update the MA ocean management plan data and management framework
Total Years: 5
Total Budget: $975,000

Year(s): 1-2
Description of activities: Review the MA Ocean Plan management framework.
A first phase would update the existing siting and performance standards for existing ocean development activities. New data on core habitat areas will be used to review existing and explore new siting and performance standards for existing ocean development activities. A second phase would establish a management framework for ocean development activities that are not currently proposed in Massachusetts but are gaining interest (i.e. aquaculture) would be generated. A third phase would look at various forms of ocean construction (cable laying by hydroplow, cable laying by dredging, etc.) and would identify organisms whose habitat, feeding, reproduction, or abundance may be vulnerable to specific construction methods. Literature and studies of the potential impacts of various construction techniques would be compiled.
Major Milestone(s): Convene a work group to evaluate the existing management framework; make a list of recommendations to get the ocean management framework current; present the recommended changes to the MA Ocean Advisory Commission. Incorporate recommended changes into Ocean Plan.
Budget: $300,000 (Year 1: $150,000, Year 2: $150,000)
Year(s): 4-5

Description of activities: Address critical science and data needs to improve management of ocean resources and uses in the MA Ocean Plan.
CZM will convene its Habitat and Geological/Sediment Work Groups and consult with resource specialists to determine if there are critical data gaps or new data sources with which to update the SSU maps. Specific resources and uses to be updated may include: seafloor habitat where survey has not occurred - prioritizing areas adjacent to Martha's Vineyard and Nantucket; sea turtle strandings/sightings; flight corridors and other critical life stage data for marine birds; North Atlantic Right Whale core habitat; biogenic habitat classification as it may relate to specific species; and classes of fish species based on vulnerability to types of marine construction.
Mapping methods will be revisited as necessary. Maps will be updated and incorporated into the ocean plan.
Major Milestone(s): Convene the various biological, geological, and mapping specialists and acquire new data, as available. CZM will present the revised SSU and resource maps to the Science Advisory Council. Maps will be incorporated into the draft ocean plan and public comment taken. Final maps will be incorporated into the ocean plan and used to implement the coastal program.
Budget: $150,000 (Year 4: $75,000, Year 5 $75,000)

Year(s): 3, 4-5
Description of activities: Further characterize potential offshore sand resource areas.
As a pilot study, At least one potential offshore sand resource area selected from the areas identified in previous 309 funded work will be further refined with a goal of evaluating those areas that for potential overlap with fishing activity, fisheries resources, and habitats of known high value. New data and best management practices will be developed to assist coastal managers in determining the best times and locations for utilizing potential sand donor sites for beach nourishment.
Major Milestone(s): CZM will engage with the fishing community and fisheries agencies to implement directed resource and use surveys to identify areas and times that may not be appropriate for sand extraction. CZM will use existing sediment grain size data from at least one offshore sand resource area to match potential sand resources with donor beaches. CZM will engage the U.S. Geological Survey and/or other marine geologists to design a study to determine the time required for an extraction site to recover.
Budget: $300,000 (Year 3: $150,000, Year 4: $75,000, Year 5: $75,000)

Year(s): 1, 4-5
Description of activities:
Year 1: Incorporate enforceable components of next Ocean Management Plan into the Massachusetts Coastal Program.
Year 4-5: Initiate and implement Ocean Plan review and update/amendment process; develop plan amendment material, public review process, Ocean Advisory Commission/Science Advisory Council process.
Major Milestone(s): Program change
Budget: $225,000 (Year 1: $75,000, Year 4: $75,000, Year 5: $75,000)

VII. Fiscal and Technical Needs

A. Fiscal Needs: *If 309 funding is not sufficient to carry out the proposed strategy, identify additional funding needs. Provide a brief description of what efforts the CMP has made, if any, to secure additional state funds from the legislature and/or from other sources to support this strategy.*

We anticipate that 309 resources will be sufficient to carry out the proposed strategy, with supplementation by additional support from other local or state sources as necessary.

B. Technical Needs: *If the state does not possess the technical knowledge, skills, or equipment to carry out all or part of the proposed strategy, identify these needs. Provide a brief description of what efforts the CMP has made, if any, to obtain the trained personnel or equipment needed (for example, through agreements with other state agencies).*

CZM's technical and policy capacities would be supported by other states, federal agencies, and regional organizations.

VIII. Projects of Special Merit (Optional)

If desired, briefly state what projects of special merit the CMP may wish to pursue to augment this strategy. Any activities that are necessary to achieve the program change or that the state intends to support with baseline funding should be included in the strategy above. The information in this section will not be used to evaluate or rank projects of special merit and is simply meant to give CMPs the option to provide additional information if they choose. Project descriptions should be kept very brief (e.g., undertake benthic mapping to provide additional data for ocean management planning). Do not provide detailed project descriptions that would be needed for the funding competition.

Specific activities described above may be identified and advanced as a project of special merit to augment this strategy.

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5-Year Budget Summary by Strategy

Enhancement Area	Proposed Project	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Wetlands	Understanding the intersection of salt marsh ecological processes and resiliency to support informed decision making	$26,000	$74,922	$60,602	$61,208	$74,998	**$297,730**
Coastal Hazards	Enhancing natural buffers & retreat strategies	$50,000	$50,000	$150,000	$50,000	-	**$300,000**
Special Area Management Planning	Designated Port Area (DPAs) Boundary Reviews	$50,000	$75,000	$25,000	$50,000	$25,000	**$225,000**
Special Area Management Planning	Promoting Climate Resilience and Economic Development in DPAs	$112,500	$112,500	$112,500	$112,500	$50,000	**$500,000**
Ocean Resources	Advance Ocean Planning	$225,000	$150,000	$150,000	$225,000	$225,000	**$975,000**
Total funding		**$463,500**	**$462,422**	**$498,102**	**$498,708**	**$374,998**	**$2,297,730**

Note: For the purposes of this 309 Strategy budget summary, project years all begin in Year 1. The actual starting year will be dependent on 309 funding available (including Projects of Special Merit).