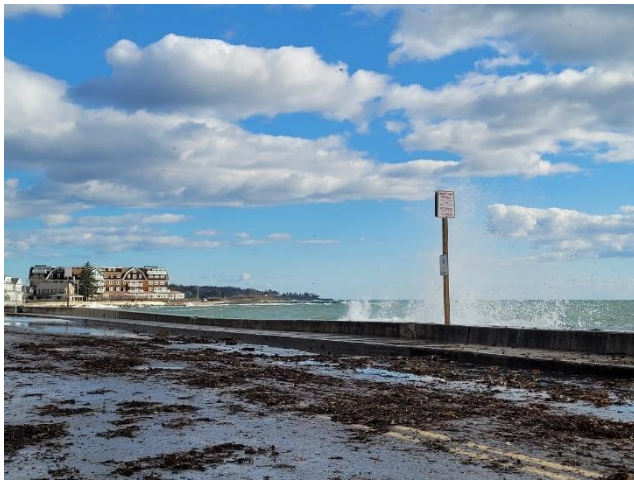




MUNICIPAL GUIDANCE for COASTAL RESILIENCE

Model Ordinance Language for Maine Municipalities

April 2022

PREPARED BY THE SOUTHERN MAINE PLANNING AND DEVELOPMENT COMMISSION
AND FB ENVIRONMENTAL ASSOCIATES

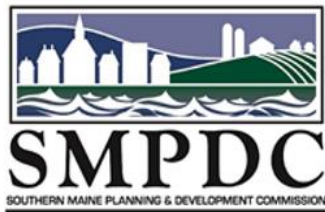


MUNICIPAL GUIDANCE for COASTAL RESILIENCE

A MAINE COASTAL COMMUNITY GRANT PROJECT IN PARTNERSHIP WITH VINALHAVEN, SOUTH
PORTLAND, TREMONT, WELLS, and KITTERY, MAINE

APRIL 2022

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Front cover photos: top left, Wells; top right, Vinalhaven; bottom right, Kittery; bottom left, Kennebunk. Credit: Abbie Sherwin and Antonia Sohns

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Table of Contents

GLOSSARY	iv
BACKGROUND	6
How to Use This Document	8
Integrating Resilience into Existing Ordinances: Optional Provisions to Increase Community Resilience to Coastal Hazards	11
1. General Ordinance Language: Purpose and Authority	11
2. Floodplain Management Ordinance	13
2.1 FLOOD MAP CONTENT	13
2.2 FREEBOARD	15
2.3 PROHIBIT CERTAIN DEVELOPMENT ACTIVITIES IN AT-RISK AREAS TO FLOODING	17
2.4 ADDRESS BUILDING HEIGHT RESTRICTIONS TO ACCOMMODATE FREEBOARD	20
2.5 REQUIRE CONSIDERATION OF FUTURE FLOODING FOR DEVELOPMENT	21
2.6 COMPLIANCE OF NONCONFORMING USE/STRUCTURE & LOWER THRESHOLD FOR 'SUBSTANTIAL IMPROVEMENT' & 'SUBSTANTIAL DAMAGE' DESIGNATION	21
2.7 REQUIRE MORE PROTECTIVE DEVELOPMENT STANDARDS IN COASTAL AREAS	23
2.8 APPLY COASTAL SAND DUNE RULES TO ALL DEVELOPMENT WITHIN THE REGULATORY COASTAL FLOODPLAIN AND SEA LEVEL RISE HAZARD AREAS	23
3. Shoreland Zoning	24
3.1 REFERENCE THE HIGHEST ASTRONOMICAL TIDE (HAT) TO DEFINE THE UPLAND EDGE OF A COASTAL WETLAND	24
3.2 ESTABLISH A NEW SHORELAND OVERLAY DISTRICT AND APPLY SHORELAND ZONING STANDARDS TO COASTAL AREAS SUBJECT TO DIRECT CLIMATE CHANGE IMPACTS	24
3.3 ZONE AREAS OF SEA LEVEL RISE AND MARSH MIGRATION AS PROTECTED RESOURCES	25
3.4 INCLUDE SEA LEVEL RISE IN SETBACK CONSIDERATION FOR EXPANSION OF NONCONFORMING STRUCTURES	26
3.5 LIMIT VEGETATION CLEARING AROUND RESOURCES	26
3.6 INCREASE RESOURCE BUFFERS AND SETBACKS	27
3.7 REGULATE WETLANDS SMALLER THAN STATE THRESHOLD	27
3.8 REDUCE MAXIMUM LOT COVERAGE	28
3.9 NONCONFORMING STRUCTURES	28
4. Subdivision and Site Plan Review	28
4.1 REQUIRE FUTURE COASTAL HAZARDS TO BE INCORPORATED IN THE DESIGN AND CONSTRUCTION OF NEW DEVELOPMENT AND REDEVELOPMENT	28
4.2 PROMOTE GREEN BUILDINGS AND LOW IMPACT DEVELOPMENT; INCLUDE CLIMATE CHANGE IMPACTS IN STORMWATER MANAGEMENT	29

4.3 REQUIRE STREAM SMART AND COASTWISE PRINCIPLES FOR CROSSINGS AND CULVERTS	30
4.4 CONSIDER SEA LEVEL RISE DURING DEVELOPMENT REVIEW PROCESS.....	30
4.5 CONSIDER CLIMATE CHANGE IN DEVELOPMENT REVIEW PROCESS	30
4.6 REMOVE RESOURCE PROTECTION AREA FROM YIELD CALCULATIONS	31
4.7 PRIORITIZATION OF NATURAL RESOURCES AND AT RISK AREAS FOR CONSERVATION IN SUBDIVISION DESIGN	31
4.8 INCLUDE SEA LEVEL RISE CONSIDERATIONS IN MUNICIPAL ROAD ACCEPTANCE STANDARDS.....	32
4.9 REQUIRE ON-SITE RETENTION AND INFILTRATION OF STORMWATER.....	32
4.10 IMPACT FEE FOR FUNDING COASTAL RESILIENCE	33
5. Zoning	33
5.1 AMEND EXISTING DEFINITIONS AND ADOPT NEW DEFINITIONS TO SUPPORT RESILIENCE OBJECTIVES.....	33
5.2 ESTABLISH NEW COASTAL HAZARD ZONE OF SEA LEVEL RISE AREAS AND APPLY FLOODPLAIN DEVELOPMENT REQUIREMENTS.....	34
5.3 TRANSFER OF DEVELOPMENT RIGHTS	34
5.4 PROHIBIT NEW DEVELOPMENT IN AREAS VULNERABLE TO FUTURE FLOODING.....	35
5.5 APPLY EROSION-BASED SETBACK FOR DEVELOPMENT	36
5.6 ESTABLISH A COASTAL RESILIENCE OVERLAY ZONING DISTRICT AND STANDALONE ORDINANCE	37
6. MAPPING RESOURCES AND MORE INFORMATION	40
7. GENERAL RESOURCES	42

GLOSSARY

Aquifer: One or more strata of rock or sediment that is saturated and sufficiently permeable to yield economically significant quantities of water to wells or springs. An aquifer includes any geologic material that is currently used or could be used as a source of water (for drinking or other purposes). (Source: U.S. Environmental Protection Agency)

Base Flood Elevation (BFE): The elevation of surface water resulting from a flood that has a 1 percent chance of equaling or exceeding that level in any given year (Source: U.S. Federal Emergency Management Agency National Flood Insurance Program).

Climate Change: Changes in average weather conditions that persist over multiple decades or longer. Climate change encompasses both increases and decreases in temperature, shifts in precipitation, changing risk of certain types of severe weather events, and changes to other features of the climate system.

Comprehensive Plan: A document or interrelated documents developed by a community that outlines the vision and goals for the community regarding topics such as land use, housing, natural resources, transportation, and economic development. In Maine, a comprehensive plan may be developed in accordance with the procedural provisions of 30-A M.R.S.A. §4324, the substantive requirements of 30-A M.R.S.A. §4326, and containing the required elements identified in Section 2 of Chapter 208 entitled, “Comprehensive Plan Review Criteria Rule.”

Erosion: The process by which wave action, wind, and storm surge removes sediment from beaches, dunes, bluffs, marshes, and headlands. Once removed from the shore, the sediment can be carried away into the coastal lagoons, deposited on the back of coastal barriers, or swept offshore. Often, the sediment will not return to the shoreline.

Flood Insurance Rate Map (FIRM): Official map of a community on which U.S. Federal Emergency Management Agency has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs), and the risk premium zones applicable to the community.

Overlay District: A zoning district that is applied over one or more previously established zoning districts, establishing additional or stricter standards and criteria for covered properties in addition to those of the underlying zoning district.

Resilience: The capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.

Saltwater Intrusion: The process of saltwater migrating landward into freshwater aquifers. This can be caused by groundwater pumping and can pose a threat to drinking water sources. Sea-level rise, in combination with increased groundwater pumping can increase saltwater intrusion in groundwater aquifers. Saltwater intrusion into groundwater aquifers can increase treatment costs for drinking water facilities or render groundwater wells unusable (Source: U.S. Environmental Protection Agency).

Sea Level Rise: This term refers to the increase in the level of the world’s oceans and is largely attributed to two primary causes: 1) thermal expansion of warmer waters and 2) increased melting of land-based ice, including glaciers and ice sheets (Source: National Oceanic and Atmospheric Administration).

Source Water Protection Area: The area of land which contributes water, either through surface water or groundwater, to a drinking water supply. This water supply, or source water, is threatened by human activities and natural sources of pollution within this area (Source: U.S. Environmental Protection Agency).

Special Flood Hazard Area (SFHA): An area identified by the U.S. Federal Emergency Management Agency as an area with a special flood or mudflow and/or flood-related erosion hazard, as shown on a flood hazard boundary

map or Flood Insurance Rate Map (FIRM). The SFHA has a one percent or greater chance of flooding in any given year, sometimes referred to as the one-percent-annual-chance flood or base flood. The SFHA is the area where the floodplain management regulations of the National Flood Insurance Program (NFIP) and the municipality must be enforced and the area where the mandatory purchase of flood insurance applies.

Storm Surge: An abnormal rise of water generated by a storm, over and above the predicted astronomical tides. Storm surge should not be confused with storm tide, defined as the water level rise due to the combination of storm surge and the astronomical tide (Source: National Oceanic and Atmospheric Administration).

Wellhead Protection Area: The surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield (Source: U.S. Environmental Protection Agency).

Zoning: A regulatory tool that defines geographic zones in a municipality and establishes rules for property use in each zone.

BACKGROUND

Climate change is a cross-cutting issue affecting communities and natural resources across the United States. In the Gulf of Maine, waters are warming faster than the vast majority of the world's oceans, and sea level is fluctuating greatly due to changes in the strength of the Gulf Stream and seasonal wind patterns. The rate of sea level rise varies geographically along the Maine coast due to local geology and topography, with Portland experiencing an average of 0.12 inches of sea level rise per year and Bar Harbor witnessing 0.11 inches of sea level rise per year, based on historical tide gauge data. Since the early 1990s, sea level rise in Maine has accelerated from roughly 0.6 feet per century to about 1 foot per century, and that rate of rise is expected to increase in the future. Nearly half of the documented sea level rise over the past century in Maine has occurred since 1993, representing a rapid increase in the rate of change. As the seas rise, high tides cause more frequent flooding of roads, infrastructure, and properties. Rising seas not only threaten coastal infrastructure and communities, but also impact coastal ecosystems, wildlife habitat, and drinking water resources. Coastal areas are also experiencing more intense and frequent storms and precipitation events. The combination of rising seas and extreme weather events threaten coastal communities with more flooding, storm surge, and coastal erosion.

Climate change impacts threaten coastal communities' economies due to property loss and devaluation, beach erosion, marsh degradation, declining water quality, infrastructure damage, and loss of tourism activity. Many of these threats can be mitigated through planning, policy, and regulatory actions that address threats to both built infrastructure and the natural environment. Most of Maine's land use laws and tools were established in the previous century and, with a few exceptions, were not designed with climate change in mind. Some were intended to give communities the ability to manage growth and development proactively, others were designed to safeguard water quality and quantity, and other environmental priorities, while others were designed to protect the health, safety, and wellbeing of people from hazards within the context of historical risk. Floodplain management regulations, for example, were explicitly intended to reduce flood risk to structures but do not account for future sea level rise or increasing precipitation trends. As with state laws, most municipal land use policies and regulations in place today were designed for flood risk and environmental conditions of the past. As climate change exacerbates municipal exposure and risk, land use policies and regulations need to be reconsidered in the context of intensifying coastal hazards. Local land use decisions should be updated to account for increased risk and changing environmental conditions to protect development, people, public expenditures, and natural resources.

Maine is a ‘home rule’ state, where municipalities have the authority to enact and enforce their own land use regulations and policies. As such, individual municipalities can adopt unique regulations and procedures governing local land use. As emphasized in *Maine Won’t Wait: A Four-Year Plan for Climate Action*, published in 2020, home rule governance in a climate context means that municipal governments have the authority and responsibility for planning and implementing most activities for community resilience (in Maine’s unorganized territories, the State’s Land Use Planning Commission serves the planning function). Many land use tools, such as shoreland zoning and floodplain management, that communities can utilize to address future flood risk and other coastal hazards are delegated to municipalities through State statute. These tools include comprehensive planning, zoning, development standards, and land use planning. Further, State law establishes a set of State goals for municipal planning and regulatory action that includes planning for the effects of sea level rise on municipal or privately held infrastructure, property, or resources (30-A M.R.S.A. §4312 (3)(N)).

Building climate resilience is essential for municipalities’ long-term economic, fiscal, social, and environmental well-being, and local action is critical for addressing impacts of climate change and coastal hazards. Maine’s home rule status offers opportunities for municipalities to adopt creative, innovative, and flexible land use solutions that address coastal hazards and are tailored to local needs and conditions. Municipal land use planning and regulations are indispensable tools for enhancing local climate resilience. Where and how communities accommodate growth, development, and redevelopment profoundly affects the vulnerability of people and property, as well as the quality and health of water, beaches, and coastal wetlands. Development that is directed away from high-risk areas, uses land efficiently, minimizes detrimental impacts to the environment, and protects natural lands allows a community to grow while still protecting people, property, and natural resources.

The goals of land use regulations and policies that promote resilience to coastal hazards and adapt to climate change impacts, such as sea level rise, are to: protect people and property from hazards; maintain natural shorelines and processes; limit shoreline hardening structures; preserve and restore natural

Key Consideration

While municipalities should be aware of legal considerations associated with restricting development on coastal properties, concerns of ‘takings’ (*i.e.*, seizure of property) should not prevent policies and regulations that promote resilience. Municipal inaction on climate change impacts can be considered negligent (*Conservation Law Foundation*).

Regulations that direct development away from vulnerable areas and those that require redevelopment to incorporate protective measures enhance community resilience to coastal hazards. Integrating hazard risk reduction measures in land use policies and development requirements will help to ensure that new and redevelopment are better able to withstand existing and future conditions and storms and can protect development and economic activity by directing it away from at-risk areas and toward more suitable, less vulnerable locations. Additionally, state law establishes goals for municipal planning and regulatory action that include planning for the effects of sea level rise on privately held infrastructure, property, or resources.

hydrological and sedimentation processes; control invasive plant species; and promote natural vegetation.

While the challenges posed by climate change may seem overwhelming, the good news is that municipalities can tackle impacts incrementally through a variety of different land use options. This document is intended to provide a starting point for municipalities interested in increasing their resilience to coastal hazards through land use regulations. It identifies specific provisions that may be helpful to that end and categorizes those provisions based on the regulatory or policy tool, such as floodplain management, zoning, or site plan review, that is generally most applicable. The example provisions address a range of resilience strategies, including directing development away from hazard areas, advanced flood risk reduction measures for development, and enhanced protection of natural resources and habitats.

How to Use This Document

This guidance document provides a menu of land use provisions that municipalities can integrate into existing ordinances or combine for a standalone coastal resilience ordinance. It is designed to allow a municipality to select and customize language that addresses local conditions, hazards, and needs. The document outlines opportunities and approaches organized by the ordinance that may be amended to improve coastal resilience. Each section presents 1) topics to consider when amending existing municipal ordinance(s), 2) a summary of provisions related to each topic, 3) detailed technical language that could be incorporated in a given provision in order to increase coastal resilience, and 4) examples from a U.S. state or municipality. Throughout the document, there are “Key Consideration” callout boxes that identify pertinent information that municipalities should consider when thinking about implementing certain provisions. Additionally, the document contains icons indicating coastal hazard(s) to which the provisions most closely relate. Please see Table 1 below for the icons and their related hazards.

Table 1: Coastal hazards and their related icons

Topic	Icon
Coastal Flooding, Storm Surge, and Sea Level Rise	
Natural Resources and Marsh Migration	
Shoreline Change and Coastal Erosion	

The document aims to:

- Provide specific yet customizable language that municipalities can integrate into land use regulations to enhance coastal resilience.
- Foster the adoption and implementation of resilience strategies that protect people, property, and the natural environment from evolving coastal hazards.
- Facilitate land use planning and regulations that are designed for flexibility and adaptability to changing environmental conditions.
- Support community growth and development that accounts for climate change impacts and minimizes risk to those impacts.
- Encourage consistency in land use requirements between municipalities.
- Establish uniform measures to support clarity of expectations regarding resilience requirements for property owners and developers.
- Promote a network of municipalities engaged in resilience planning to share best practices and lessons learned.

While each community faces unique land use issues and coastal hazards due to its geography, characteristics, and circumstances, there are some provisions outlined in the following sections that may be a good starting place for implementation. Figure 1 outlines some of the overarching themes that may guide municipalities.

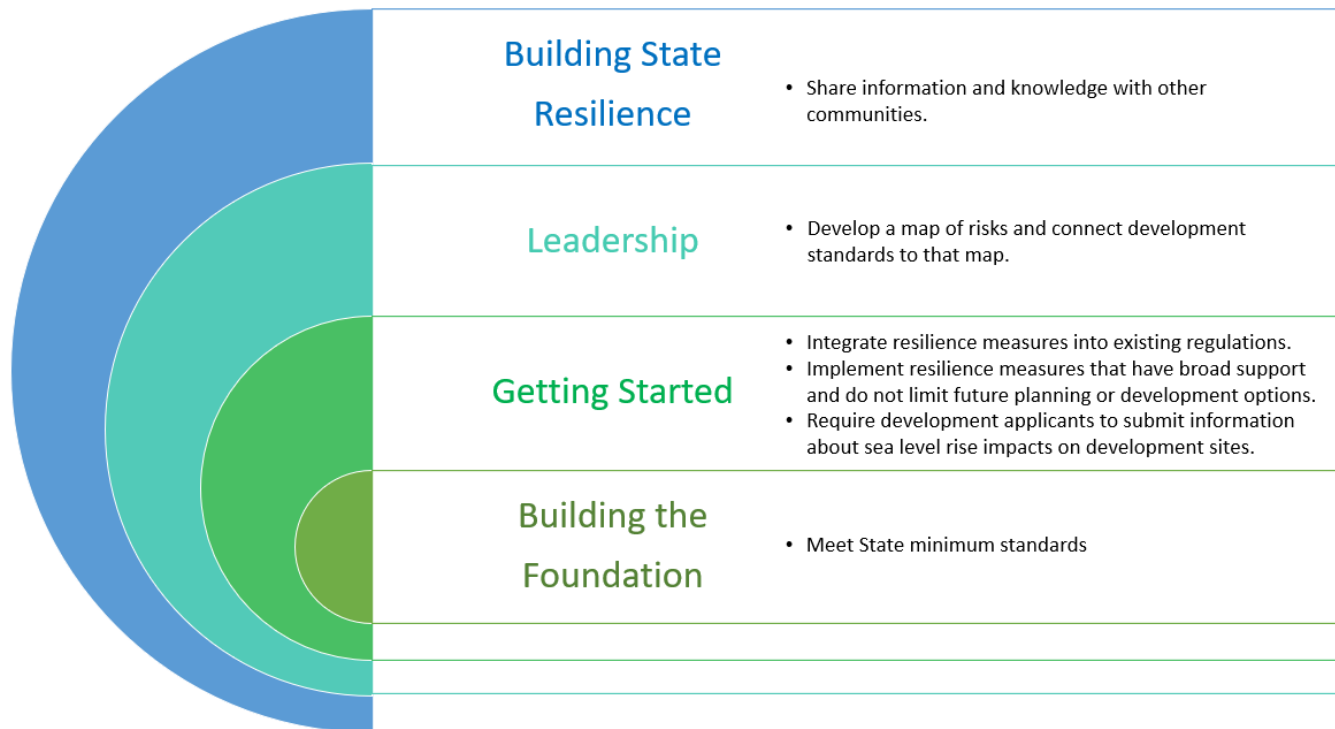


Figure 1: Suggested steps on the path to resilience

It is important to note that most provisions outlined in this guidance document are interconnected, so consideration should be given to actions that may be implemented together, and how certain adopted provisions may impact others as well as existing regulations. Additionally, measures and standards that aim to address future hazards should be periodically evaluated and adjusted over time as environmental conditions change and areas at risk of hazards shift. While that approach may be time- and resource-intensive for communities and requires an acknowledgement of uncertainty and acceptance that development standards will not be static, a phased approach in which zoning requirements and development standards evolve and are adapted over time to match risk and conditions is likely most effective for enhancing resilience.

Integrating Resilience into Existing Ordinances: Optional Provisions to Increase Community Resilience to Coastal Hazards

1. General Ordinance Language: Purpose and Authority

When enacting new resilient standards, particularly if a municipality is requiring more stringent standards than state or federal regulations (*e.g.*, expanding flood zone boundaries beyond the Federal Emergency Management Agency (FEMA) delineated flood zones, establishing greater setbacks from unstable bluffs), municipalities should include clear language to establish the purpose and rationale of the standards. Providing justification that relates to public safety, health, and welfare purposes is important. Municipalities must also ensure that new standards and provisions are compliant with federal and state regulations and substantive due process protections for property owners.

Including language that outlines a municipality's authority to and intent for having regulatory language for coastal resilience provides clear justification for resilience requirements and enhanced standards. It can also provide legal protection for the municipality against possible legal challenges, including those related to regulatory takings. The language may also encourage growth and development in areas that avoid hazards associated with sea level rise, coastal storms, flooding, landslides, and other climate hazards with consideration for the development's use and design lifespan. The authority and intent should be noted in appropriate sections of municipal ordinance(s) in which resilience language is being included. Example language is listed below.

Key Consideration

Legal cases involving land use regulations that limit or restrict development based on coastal hazards and resilience measures have demonstrated that courts are most deferential to regulations that are based on health, safety, and welfare issues.

Example Ordinance Language

- PURPOSE
 - The [TOWN/CITY] of [MUNICIPALITY] is exposed to coastal hazards, including [LIST LOCAL HAZARDS, *e.g.*, flooding, sea level rise, erosion].
 - To protect the health, safety, and welfare of citizens and emergency response personnel.
 - To protect the fiscal health of the [TOWN/CITY] of [MUNICIPALITY] by mitigating the need for costly flood control and unwise investment in infrastructure that is at risk of damage from flooding or erosion.
 - To help maintain a stable tax base by providing for the sound use and development of coastal hazard areas and minimize prolonged business interruptions or economic losses caused by structural damage, flooding, and/or erosion.

- To prevent loss or diminution of coastal resources and their beneficial natural functions that contribute to storm and flood damage prevention or pollution prevention, including by allowing them to migrate landward in response to relative sea level rise.
- To restrict or prohibit development in known hazard areas where the provision of public safety may be jeopardized or where public safety personnel may be endangered, thereby minimizing the need for rescue efforts associated with flooding, which are generally undertaken at the expense of the general public, and enabling safe access to and from coastal homes and buildings for homeowners and emergency response personnel in order to effectively provide public safety services.
- This ordinance expressly disclaims liability for flood damage that occurs in reliance on these local regulations.

Key Consideration

Any proposed changes to a municipal floodplain ordinance or regulatory flood map should be reviewed by state floodplain management officials prior to any public hearing to ensure compliance with state and federal requirements and the National Flood Insurance Program (NFIP).

Adoption of a local floodplain management ordinance allows a community to participate in the NFIP, which in turn, allows the purchase of federally-backed flood insurance anywhere within the community. A community amending its ordinance with resilience measures needs to structure its adoption process to ensure that if the amended language does not get adopted, the required regulations will remain in effect.

For municipalities that adopt a map of sea level rise hazard areas that are referenced in ordinance language:

- As a coastal community with significant waterfront property along [NAME OF COASTAL AREAS], the [TOWN/CITY] of [MUNICIPALITY] recognizes the future threats that climate change and projected sea level rise pose to the health, safety, and general welfare of its citizens. The [TOWN/CITY] of [MUNICIPALITY] has identified areas likely to be at risk of [FLOODING, EROSION, OTHER COASTAL HAZARD] in the future under projections for rising sea levels associated with global climate change. These areas may be subject to a higher likelihood of flood damage, and as base flood elevations change over time, they may be added to FEMA special flood hazard areas in the future. The map titled [“NAME OF MUNICIPALITY’S ADOPTED SEA LEVEL RISE MAP” or online mapping reference] dated [DATE OF MAP] is declared to be part of this ordinance and is hereby incorporated by reference. The [TOWN/CITY] of [MUNICIPALITY] [REQUIRES/RECOMMENDS] that landowners, homeowners, developers, and any parties seeking to build in lands designated as [NAME OF FLOOD RISK AREA(S)] comply with the requirements, and follow best practices, as presented herein.

- AUTHORITY
 - The [TOWN/CITY] of [MUNICIPALITY] has the legal authority to adopt land use and control measures to reduce future flood losses and plan for the effects of sea level rise on municipal or privately held infrastructure, property, or resources pursuant to Title 30-A M.R.S.A. §§3001 - 3007, 4312, 4352, and 4401 - 4407.

2. Floodplain Management Ordinance

The municipal floodplain management ordinance offers an existing regulatory mechanism to increase coastal resilience and minimize flood risk to development in areas vulnerable to flood hazards, including future sea level rise. The floodplain management ordinance and associated Flood Insurance Rate Map (FIRM), which is issued by FEMA and depicts the regulatory floodplain of the 1% annual chance storm event, outline what and where flood risk reduction measures must be enforced in order to make properties eligible for flood insurance through the National Flood Insurance Program (NFIP). The ordinance can be amended by municipalities to incorporate considerations of sea level rise, future flood hazards, and enhanced flood resilience measures, as long as the resulting ordinance language and regulatory flood map are no less stringent than federal and state floodplain management requirements.

The provisions described below offer approaches to reduce the risk of flooding in a community and minimize flood risk for structures, while also providing for improved stormwater management, allowing for water storage and conveyance, and protecting water quality and wildlife habitat. The outlined provisions describe various approaches to protecting development from flooding, rising sea levels, and storm surge, as well as improving coastal planning through incorporating future flood risk in mapped floodplains, directing development away from areas of high flood risk, and including resilient design practices and development standards. Additionally, the provisions seek to encourage municipalities to consider present and future flood risks to their community to better prepare for intensifying coastal flood impacts due to climate change.

2.1 FLOOD MAP CONTENT

2.1.1 Depict Limit of Moderate Wave Action (LiMWA) line on the municipality's Flood Insurance Rate Map (FIRM)



The Limit of Moderate Wave Action (LiMWA) marks the inland limit of the Coastal A Zone, the part of the coastal Special Flood Hazard Area (SFHA) referenced by building codes and standards where wave heights can be between 1.5 and 3 feet during a base flood event. Studies have shown that waves as small as 1.5 feet can cause foundation failure and structural damage to buildings. Showing the LiMWA on the municipality's FIRM can help to clarify for municipal staff, property owners, and developers what areas in the Coastal A Zone are at increased risk of flood impacts and damage. Further, municipalities may amend their floodplain ordinance to apply VE Zone development standards to Coastal A Zone areas in order to minimize flood risk to structures (see development standards language in Sections 2.2 and 2.3 below). (Note that not all communities' FIRMs include a LiMWA. For those communities, this

provision may be impractical, as determining the LiMWA would likely require a costly engineering analysis).

2.1.2 Incorporate areas vulnerable to sea level rise in the municipality's mapped regulatory floodplain



Including areas that are vulnerable to sea level rise in the regulatory floodplain allows a municipality to apply existing floodplain development standards and/or new, enhanced flood resilience standards, to new and redevelopment within the community in order to reduce flood risk to people and property. This can be accomplished through several approaches.

- **Adopt, by reference in the floodplain ordinance, a supplemental map depicting inundation from the sea level rise scenario(s) for which the community wishes to regulate development.** If this approach is taken, the floodplain ordinance would need to be updated to reference the new sea level rise map and to identify specific development standards that apply to those sea level rise areas. The ordinance would need to include language dictating which development standards would apply in instances where a site is located in both the mapped sea level rise area and the regulatory 100-year floodplain, as depicted on the FEMA-issued FIRM. As with most ordinances, it is recommended that the language specify that the more stringent or restrictive of the requirements and standards would apply.
- **Amend the municipality's regulatory flood map (FIRM), to which the floodplain management ordinance applies, by establishing a flood zone or zones of areas subject to flooding from sea level rise scenarios.** The scenarios should be those to which the municipality wants to apply standards for new and redevelopment to enhance flood resilience. Those mapped sea level rise areas could be depicted by an inundation boundary(ies) or by boundary(ies)

Key Consideration:

The decision to include additional flood hazard areas in the floodplain ordinance and regulatory flood maps should consider technical mapping information, how flood information will be depicted, and how to apply development standards. FIRMs show the horizontal extent, or horizontal boundaries, of different flood zones of the 100-year floodplain, as well as vertical flood boundaries, identified as the base flood elevation (BFE), or expected floodwater depth, for some locations.

Additional flood hazard impacts can be depicted on the regulatory map as a horizontal inundation boundary(ies) showing the landward extent of flooding or they can be presented as both a horizontal inundation boundary(ies) and a vertical boundary of associated flood depths. The latter approach requires more technical, and likely expensive, modeling and mapping, as determining flood elevation that accounts for sea level rise at a given location is not as simple as adding the sea level rise scenario 'depth' (e.g., 3.0 feet) to the underlying, FEMA-determined BFE.

The mapping approach a municipality selects will dictate how regulations and development standards are applied to areas impacted by sea level rise. Showing just the horizontal boundary means that regulations will be based on whether a development site is located within the horizontal boundary of the inundation zone, following a regulatory structure similar to shoreland zoning. Showing both horizontal and vertical (e.g., flood depths) boundaries means that standards can be applied based on projected vertical flood depths of a site. *For more information on mapping and examples see Section 6.*

and projected flood depths (see *Key Consideration note*). Amend the floodplain ordinance to include the newly established sea level rise zone(s) and indicate the existing or new floodplain development requirements that apply to those areas.

EXAMPLE

Durham, N.H.: The Town of Durham, N.H. has adopted a map, called the Advisory Climate Change Risk Areas (ACCRA) map, depicting areas in town that are vulnerable to sea level rise. The land use ordinance recommends (but does not require) that landowners, homeowners, developers, and other parties apply the provisions of the floodplain management chapter proactively to construction and development projects as applicable when seeking to build on properties located in ACCRA as designated on Durham's ACCRA map, but not in a Special Flood Hazard Area (e.g., 100-year floodplain). All applicants seeking to build in the ACCRA shall inform the Durham Building Official which standard they intend to follow. In ACCRA, where base flood elevation is not available, applicants are advised to determine the flood elevation by adding at least two feet above the highest point around the perimeter of the building footprint.

2.2 FREEBOARD



In floodplain management, freeboard means elevating a building's lowest floor above predicted flood elevation by an additional amount of height. Elevating a building by a small amount of freeboard above the BFE provides a factor of safety for higher flood levels resulting from sea level rise and extreme precipitation events expected with climate change. It tends to compensate for the many unknown factors, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed, which could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions.

Requiring coastal and inland structures to be elevated above projected flood levels enhances a community's resilience by reducing the flood risk now and in the future with sea level rise. Maine requires one foot of freeboard for development in the regulatory floodplain. Municipalities can require additional freeboard, or require freeboard in areas that are outside of the mapped 100-year floodplain in order to reduce flood risk to properties and people, and to address sea level rise. Most Maine municipal floodplain ordinances specify freeboard requirements in the 'development standards' section of the ordinance.

Example Ordinance Language

Development Standards

For residential and manufactured homes: New construction or substantial improvement any residential structure located within:

- **Zones A1-30 and AE:** shall have the lowest floor (including basement) elevated at least [X FEET] above the base flood elevation or at least [2 + X FEET] above the highest grade adjacent

to the structure if no depth is specified on the Flood Insurance Rate Map.

- **Zone AO:** shall have the lowest floor (including basement) elevated at least [X FEET] higher than the depth specified on the community's Flood Insurance Rate Map; or at least [2 + X FEET] above the highest grade adjacent to the structure if no depth is specified.
- **Zone A:** shall have the lowest floor (including basement) elevated at least [X FEET] above the base flood elevation utilizing information obtained pursuant to [REFERENCE APPLICABLE SECTION OF ORDINANCE] or at least [2 + X FEET] above the highest grade adjacent to the structure if no depth is specified.
- **Zone V and Coastal A Zone:** shall be elevated on posts or columns such that: the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to at least [X FEET] above the base flood elevation.
- **Zone X:** shall have the lowest floor (including basement) elevated at least [X FEET] above the base flood elevation or at least [X FEET] above the highest adjacent grade if no depth is specified on the Flood Insurance Rate Map.
- **All FIRM Zones:** Any mechanical, utility equipment and fuel storage tanks must be anchored and either elevated or floodproofed to [X FEET] above the base flood elevation.

Nonresidential. New construction or substantial improvement of any nonresidential structure located within:

- Require the same freeboard amount as for residential structures above, but retain the existing option noted in the State's model ordinance for nonresidential properties to be floodproofed to the freeboard amount.

For municipalities that include additional flood hazards (e.g., sea level rise) on the regulatory flood map as part of the floodplain management ordinance:

Key Consideration

The amount of freeboard to require should be determined by the municipality based on local flood hazards, sea level rise projections, and desired planning horizons. State regulations require a minimum of 1 foot of freeboard above the BFE and a minimum of 2 feet above the highest grade adjacent to the structure when the BFE has not been determined. To account for future sea level rise and storms, consider requiring a minimum of 3 feet of freeboard above the BFE or highest grade adjacent to the structure. Higher freeboard amounts can be adopted for enhanced protection from future sea level rise. Note that the Maine Climate Council recommends planning for at least 4 feet of sea level rise by 2100.

Key Consideration

A community can apply freeboard requirements to the 500-year floodplain, or Zone X on the FIRM, to provide a factor of safety for new and redevelopment to account for future increases in the frequency and severity of precipitation events driven by climate change.

- All development within the [NAME(S) OF NEW FLOOD HAZARD ZONE(S)] on the [NAME OF MAP] adopted by [MUNICIPALITY NAME] on [DATE OF ADOPTION] shall comply with the development standards for coastal floodplains [REFERENCE APPLICABLE SECTION OF ORDINANCE].

OR

- Areas subject to inundation from future sea level rise as identified on the [NAME OF MAP] adopted by [MUNICIPALITY NAME] on [DATE OF ADOPTION] shall have the lowest flood (including basement) elevated to at least [X FEET] above the base flood elevation or at least [X FEET] above the highest adjacent grade if no depth is specified on the map.
- For areas that are located, either entirely or partially, within both a FIRM flood zone and sea level rise zone as shown on the [NAME OF MAP], the more restrictive standard shall apply.

EXAMPLES

Saco, ME: The City's floodplain management ordinance requires 3 feet of freeboard for structures within the regulatory 100-year floodplain. In other words, structures within the regulatory floodplain are required to be built 3 feet above the base flood elevation.

Norfolk, VA: The City's zoning ordinance includes the following innovative practices for fostering more flood resilient urban development: Freeboard - The ordinance requires that construction in the 100-year floodplain be elevated at least 3 feet above the 100-year base flood elevation, and construction in the 500-year (0.2% chance) floodplain, to be elevated or floodproofed to 1.5 feet above the 500-year flood elevation. It also requires development outside of floodplain to be elevated 16 inches above adjacent grade.

2.3 PROHIBIT CERTAIN DEVELOPMENT ACTIVITIES IN AT-RISK AREAS TO FLOODING



In VE Zone, Coastal A Zones, and areas subject to other flood hazards as included on the municipality's regulatory flood map (see Section 2.1):

- Prohibit the addition, alteration or reconstruction of an existing structure that results in an increase in building footprint; the repair of a substantially damaged existing structure which results in an increase in building footprint; and any increase in impervious surface on a residential and/or commercial lot.
- Prohibit new structures, expansion of existing structures, and increase in impervious surface in VE, Coastal A Zones and areas subject to other flood hazards as identified on the municipality's regulatory flood map (see Section 2.1) for any type of development. The municipality may wish to include an exception for repair or replacement of existing shoreline stabilization projects, such as seawalls or bulkheads.

- Prohibit foundations other than open pilings or columns; new or expansion of driveways or parking lots, or impermeable paving for existing unpaved roads, driveways, or parking lots; and new or proposed expansions of coastal engineering structures.
- Limit the replacement of a substantially damaged structure to a one-time activity per parcel/lot.
- Require replacement structures to be elevated, as outlined in Section 2.2 above, even if the replacement structure does not exceed the footprint of the pre-existing structure.

Example Ordinance Language

- The following uses are prohibited within the entire Special Flood Hazard Area (SFHA) and the [NAME OF NEW FLOOD HAZARD ZONE(S)]: The installation of a basement.
- The following uses and activities are prohibited within the V, VE, AO, and Coastal A Zones of the SFHA and the [NAME OF NEW FLOOD HAZARD ZONE(S)]: New construction of residential structures; the addition, alteration or reconstruction of an existing structure that results in an increase in building footprint or floor area; repair of a substantially damaged structure or reconstruction of an existing structure that results in an increase in building footprint or floor area; new construction of non-residential structures, with the exception of functionally dependent structures; any increase in impervious surface on a residential lot, which may include, but is not limited to, swimming pools, tennis/basketball courts, pavers, concrete slabs at grade, curbing, and retaining walls. For functionally dependent uses allowed in the V, VE, AO, Coastal A, and [NAME OF NEW FLOOD HAZARD ZONE(S)] Zones, impervious surfaces accessory to the use are allowed provided a registered professional engineer certifies in writing that the impervious surface will not cause an increase in wave runup, a deflection or channelization of flood waters, or an increase in the velocity of flow.
- Within the V, VE, AO, and Coastal A Zones of the SFHA and the [NAME OF NEW FLOOD HAZARD ZONE(S)], with the exception of beach nourishment and raised septic systems, which must receive a Special Permit, the following uses are specifically prohibited and may not be allowed by Special Permit: the storage or disposal of any soil, loam, peat, sand, gravel, rock, or other mineral substance, refuse, trash, rubbish, debris, or dredged spoil, with the exception of minor landscaping fill that is permitted,

Key Consideration

It is important to consider how prohibitory ordinance language might impact the ability of a municipality or a property owner to seek and receive approval for legally permissible shoreline stabilization projects, including living shorelines and/or green infrastructure projects. Any proposed modification to a seawall would require an engineering analysis to determine if it changes the flood zone and/or the flood elevation at the site. If it does, the applicant would need to file for a Letter of Map Revision with FEMA. Additionally, any alterations would require permitting from Maine DEP under the Coastal Sand Dune Rules and would need to prove that structure alteration is less damaging to the coastal sand dune system.

Note that the definition of ‘functionally dependent’ for floodplain management differs from the shoreland zoning definition of ‘functionally water dependent.’

provided a registered professional engineer certifies in writing that the fill will not cause an increase in wave runup, a deflection or channelization of flood waters, or an increase in the velocity of flow; draining, excavation, or dredging, or removal or relocation of loam, peat, sand, gravel, soil, rock, or other mineral substance.

- Replacement or reconstruction of a structure that is substantially damaged by storm impacts is limited to one time for any single lot of record. Any reconstructed building located within the Coastal Sand Dune System, as defined in Chapter 355, shall meet the requirements of 38 MRS §§ 480-A (Natural Resources Protection Act) and the standards contained in Chapter 355, Coastal Sand Dune Rules of the Department of Environmental Protection.
- Within VE, Coastal A, and [NAME OF NEW FLOOD HAZARD ZONE(S)] Zones, the following are prohibited: foundations other than open pilings or columns that allow for the free movement of water and sand; new or expansion of roads, driveways, or parking lots, or impermeable paving for existing unpaved roads, driveways, or parking lots; and new or proposed expansions of coastal engineering structures.

Key Consideration

Certain development activities may be appropriate within the SFHA or areas at risk of future flooding, depending on the use, risk tolerance, and criticality of the development. If development is proposed in higher risk areas, it is critical to determine the type of development (e.g., commercial vs. residential) and consider whether flooding of the development would interrupt social services, negatively impact public safety, health, and welfare, or cause environmental damage from hazardous substances.

EXAMPLES

Wellfleet, MA: Model bylaw that prohibits certain activities in V-Zones, including foundations other than open pilings or columns; new or expansion of roads, driveways, or parking lots, or impermeable paving for existing unpaved roads, driveways, or parking lots; and new or proposed expansions of coastal engineering structures. The bylaw also requires the development application reviewing body to consider a project's adaptation to potential climate change impacts.

Chatham, MA: The zoning bylaw prohibits expansion of existing structures or increase in impervious surface in VE Zone, including: a) addition, alteration or reconstruction of an existing structure that results in an increase in building footprint, b) repair of a substantially damaged existing structure which results in an increase in building footprint, or c) any increase in impervious surface on a residential lot, including swimming pools, tennis/basketball courts and retaining walls.

Oak Bluffs, MA: The zoning bylaw prohibits new residential development and expansion of existing development in the most hazardous flood zones—those designated as V, VE, or AO Zones on FIRM.

2.4 ADDRESS BUILDING HEIGHT RESTRICTIONS TO ACCOMMODATE FREEBOARD



Ensure that dimensional standards, especially building height restrictions, allow for the elevation of new and redeveloped structures above projected flood levels (*i.e.*, freeboard). If amending building height standards is not feasible, consider allowing for a special exception for new construction, substantial improvements, and/or other development for the conduct of a functionally dependent use, provided that requirements of relevant ordinances are met and the structure is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety or environmental health.

Example Ordinance Language

Special Exception of Existing Structures: Any building in existence prior to [SPECIFIED DATE] which is located in a flood hazard area as identified on [NAME OF APPLICABLE MAP(S)] and which is thereafter substantially improved, as defined in [REFERENCE DEFINITION SECTION OF FLOODPLAIN MANAGEMENT ORDINANCE], may be elevated pursuant to the standards of [REFERENCE FLOODPLAIN MANAGEMENT ORDINANCE], and may be allowed to exceed the height limits of the dimensional standards of [REFERENCE APPROPRIATE ORDINANCE SECTION] without need for a variance from the Board of Appeals, so long as all of the following standards are met: the overall height of the reconstructed building may exceed the maximum height in the zone in which it is located without the need for a variance, but by no more than the distance that the lowest floor (including basement) is raised above its original elevation during reconstruction; and the height of a structure may be raised to, but not above, the minimum elevation necessary to be consistent with the local floodplain management elevation requirement or to 3 feet above base flood elevation, whichever is greater, as long as the structure is relocated, reconstructed, replaced or elevated within the boundaries of the parcel so that the water body or wetland setback requirement is met to the greatest practical extent. Any reconstructed building located within the Coastal Sand Dune System, as defined in Chapter 355, shall meet the requirements of 38 MRS §§ 480-A et seq (Natural Resources Protection Act) and the standards contained in Chapter 355, Coastal Sand Dune Rules of the Department of Environmental Protection.

Key Consideration

The Maine Department of Environmental Protection (DEP) must review any variance application for a project within the shoreland zone.

The State Shoreland Zoning law was amended in March 2022 to change the definition of structure height for existing principal and accessory structures, including legally existing nonconforming structures, within an area of special flood hazard in order to allow elevation of such structures above the municipally established BFE. The amended law specifically allows for an exception to Shoreland Zoning structure height limitation for legally existing nonconforming structures in areas of special flood hazard for elevation above the BFE established by the municipality.

2.5 REQUIRE CONSIDERATION OF FUTURE FLOODING FOR DEVELOPMENT



Require development applicants to submit proposed building elevation(s) that account(s) for local projected coastal flood hazards, such as sea level rise and storm surge, based on scenarios selected by the municipality, the recommendations outlined in *Maine Won't Wait: A Four-Year Plan for Climate Action*, or other widely accepted sea level rise projections.

Example Ordinance Language

- For activities proposed in V, VE, AO, and Coastal A Zones of the SFHA and/or the [NAME OF NEW FLOOD HAZARD ZONE(S)], applicants shall incorporate future local sea level rise projections of, at a minimum, [X FEET BY X YEAR], into the project design and construction. The Planning Board may also take other credible evidence of projected sea level rise into consideration. The Planning Board may require the applicant to submit information about how the development project mitigates other climate change impacts, such as coastal erosion.

Key Consideration

If the municipality is going to require applicants to consider and address site-specific future sea level rise or other hazards in development applications, the municipality should adopt a map showing the location of those hazards. The municipality may also need to amend submittal requirements, submission forms, checklists, and ordinance language for floodplain development applications.

EXAMPLES

Hingham, MA: For activities proposed in VE Zones and A Zones, the Town requires, at a minimum, the historic rate of relative sea level rise in Massachusetts of 1 foot per 100 years to be incorporated into project design and construction. The permitting authority may also take other credible evidence of projected sea level rise, such as predictions from the Intergovernmental Panel on Climate Change (IPCC) into consideration.

Wellfleet, MA: The Town has adopted a model bylaw that addresses climate change resilience measures, including sea level rise and marsh migration. It includes provisions for a 'Transitional Area' of future flooding areas and the requirement that relative sea level rise and the landward migration of resource areas in response to relative sea level rise must be incorporated into the design and construction of structures and other activities proposed in the 'Land Subject to Flooding or Inundation' area.

2.6 COMPLIANCE OF NONCONFORMING USE/STRUCTURE & LOWER THRESHOLD FOR 'SUBSTANTIAL IMPROVEMENT' & 'SUBSTANTIAL DAMAGE' DESIGNATION



Amend the definition of 'substantial improvement' and 'substantial damage' in the floodplain management ordinance to account for cumulative, incremental improvements and/or repairs over a certain time period such as 5-year cumulative, 10-year cumulative, or over the lifetime of the

structure. Alternatively, require that improvements/ or repairs be considered substantial if, within a five-year period, they cumulatively meet the definition of ‘substantial improvement.’

Example Ordinance Language

- A destroyed structure must be returned to use within one year of the date of damage, or any future use of structure on the site must conform to the requirements of this ordinance and other ordinances adopted by the [CITY/TOWN] of [MUNICIPALITY’S NAME].
- If a nonconforming use is discontinued for [X YEAR(S)] or more, any further use of the property must conform to the requirements of this ordinance and other ordinances adopted by the [CITY/TOWN] of [MUNICIPALITY’S NAME].

Definitions of ‘substantial improvements’ and ‘substantial damage’:

- **Substantial Damage** means damage of any origin sustained by a structure whereby the cost of restoring the structure to its pre-damage condition would equal or exceed 50 percent of the [MARKET OR ASSESSED] value of the structure before the damage occurred. Substantial damage also means flood-related damages sustained by a structure on more than one separate occasion during a [X-YEAR] period for which the cost of repairs at the time of such flood event, on the average, equals or exceeds 25 percent of the [MARKET OR ASSESSED] value of the structure before the damage occurred.
- **Substantial Improvement** means any singular or successive repairs, reconstructions, rehabilitations, additions, or other improvements of a structure, the cumulative cost (value) of which equals or exceeds 50 percent of the [MARKET OR ASSESSED] value of the structure before the start of construction of the first improvement project following the effective date of [EFFECTIVE DATE OF AMENDMENT]. In determining whether a

Key Consideration

If a municipality chooses to enforce a definition of substantial improvement or substantial damage that can change over time, data and record-keeping is critical. The municipality needs to maintain accurate and current permitting records to determine whether an improvement or set of incremental improvements triggers compliance with current standards.

When deciding to use ‘market’ or ‘assessed’ value for the definition of ‘substantial,’ market value can be especially difficult to determine during times of intense growth and real estate market activity. Assessed value can be easier to determine because the municipal assessor determines the value based on established criteria.

Key Consideration

When amending the definition of “substantial improvement”, a municipality can identify exclusions from improvements of a structure to correct existing violations of state or local health, sanitary, or safety code. The local code enforcement official may also specify minimums necessary to assure safe living conditions.

A municipality can also allow any alteration of an historic structure, provided that the alteration will not preclude the structure's continued designation as a historic structure, and a variance is obtained from the relevant municipal Board (e.g., Zoning Board of Appeal).

development project constitutes a substantial improvement, the total cost (value) of all repairs, reconstructions, additions, or other improvements shall accrue over a period of [X YEARS] from the time of the first permit application following the effective date of [EFFECTIVE DATE OF AMENDMENT]. The term "substantial improvement" includes structures which have incurred substantial damage, regardless of the actual repair work performed.

- Any improvements or repairs shall be considered substantial if, within a [X-YEAR] period, they cumulatively meet the definition of 'substantial improvement.'

2.7 REQUIRE MORE PROTECTIVE DEVELOPMENT STANDARDS IN COASTAL AREAS



Require V-Zone development standards in Coastal A Zone and areas vulnerable to additional flood hazards including sea level rise and storm surge. This requires the municipality to include the Limit of Moderate Wave Action (LiMWA) on the regulatory floodplain maps (FIRMs) to delineate the Coastal A Zone and to incorporate additional flood hazards, such as sea level rise, in its regulatory flood map (see Section 2.1).

Example Ordinance Language

- V-Zone development standards shall apply in Coastal A Zones, as delineated by the LiMWA on the Flood Insurance Rate Map, and in [NAME OF NEW FLOOD HAZARD ZONE(S)] Zones, as depicted on the [NAME OF MAP] adopted [DATE OF ADOPTION].

2.8 APPLY COASTAL SAND DUNE RULES TO ALL DEVELOPMENT WITHIN THE REGULATORY COASTAL FLOODPLAIN AND SEA LEVEL RISE HAZARD AREAS



Restrict development projects in areas that are reasonably expected to erode or be inundated because of future shoreline changes from sea level rise and coastal erosion that will likely cause severe structural damage. Coastal restoration and resilience projects should be excluded from this requirement.

Example Ordinance Language

- Development projects that are reasonably expected to be inundated or eroded as a result of sea level rise or changes in the shoreline such that the structure(s) are likely to be severely damaged after allowing for a [X FOOT] rise in sea level over [X YEARS] are prohibited. Coastal restoration and resilience projects that are certified by a professional engineer are excluded from this requirement.

Key Consideration

All building construction in Maine, with some exceptions, is governed by the Maine Uniform Building Code and Uniform Energy Code ("MUBEC" "MUBC" "MUEC"), which is adopted by the Technical Building Codes and Standards Board by rule, pursuant to 10 M.R.S §9721, et seq.

Note that this provision is related to the suggested development standards outlined in Sections 2.2 and 2.3.

3. Shoreland Zoning

The State Mandatory Shoreland Zoning Act requires municipalities to adopt, administer, and enforce local ordinances that regulate land use activities in shoreland areas. Municipal shoreland zoning ordinances must be no less stringent than State standards, but communities can choose to include provisions and standards that exceed the minimum State standards. Because shoreland zoning regulates land use activities near waterbodies and wetlands and is meant to protect natural resources, the ordinance offers a fitting opportunity to integrate enhanced measures to address sea level rise and marsh migration.

The provisions described below provide opportunities for municipalities to integrate sea level rise and coastal hazard considerations into the existing regulatory framework of shoreland zoning to (1) protect water quality, wildlife habitat, wetlands, archaeological sites and historic resources, and commercial fishing and maritime industries; (2) conserve shore cover, public access, natural beauty, and open space; (3) protect new and redevelopment from flood hazards; and (4) expand areas subject to shoreland zoning beyond those areas required by State law in order to address sea level rise impacts. The provisions outlined below describe various approaches to guide placement of structures, plan for areas that may act as natural buffers to protect people and infrastructure from natural hazards, and account for the importance of natural vegetation and habitat for increasing resilience to coastal hazards.

3.1 REFERENCE THE HIGHEST ASTRONOMICAL TIDE (HAT) TO DEFINE THE UPLAND EDGE OF A COASTAL WETLAND



For the purpose of defining shoreland zoning boundaries, amend the definition of the upland edge of a wetland to reference the highest astronomical tide (HAT) rather than the highest annual tide. The HAT is the elevation of the highest predicted astronomical tide expected to occur at a specific tide station over the National Tidal Datum Epoch, a specific 19-year period adopted by the National Atmospheric and Oceanic Administration over which tide observations are taken and reduced to obtain mean values (e.g., mean lower low water, etc.) for tidal datums. Using the HAT to define shoreland zoning boundaries addresses short-term variation in local sea level and ensures that a municipality is using the highest predicted tide over a 19-year period, rather than a tide level that varies annually.

3.2 ESTABLISH A NEW SHORELAND OVERLAY DISTRICT AND APPLY SHORELAND ZONING STANDARDS TO COASTAL AREAS SUBJECT TO DIRECT CLIMATE CHANGE IMPACTS



Incorporate areas subject to sea level rise, storm surge, and marsh migration in existing or newly established shoreland zoning district(s) so that shoreland zoning requirements account for future conditions. This can ensure that setbacks, buffers, and development standards apply to areas affected by climate impacts as they will likely be regulated natural resources (e.g., future coastal wetlands) in the future.

Shoreland overlay district criteria and definition of districts

- Amend or add to the shoreland zoning ordinance district definitions to incorporate areas subject to future sea level rise, storm surge, and/or marsh migration. If a new district is established, the municipality will need to further amend the shoreland zoning ordinance to specify permitted uses and development standards in the new district. The existing Resource Protection district provides a good example of what the standards of the new district could be. Standards for topics such as protective buffers, development setbacks, and development standards should be established.
 - Consider prohibiting new sewage disposal systems in this newly established district.
- Amend the shoreland zoning map to include areas subject to future sea level rise, storm surge, and/or marsh migration. (See Section 6 for additional information about mapping future coastal hazards for regulatory purposes).
- Such a shoreland overlay district would be statutorily authorized through Title 30-A after adoption of a consistent Comprehensive Plan but is not authorized if only pursuant to Title 38 §435.

Key Consideration

State Shoreland Zoning requirements currently restrict the maximum height of new structures within most shoreland zoning districts to 35 feet. If a municipality amends its Shoreland Zoning ordinance to include areas vulnerable to sea level rise in shoreland zoning district(s), the maximum building height could apply to those areas, thus potentially limiting the implementation of freeboard requirements a municipality chooses to adopt (*see Key Consideration above regarding structure height definition*).

3.3 ZONE AREAS OF SEA LEVEL RISE AND MARSH MIGRATION AS PROTECTED RESOURCES



Designate areas subject to future sea level rise, storm surge, and/or marsh migration as ‘Resource Protection’ in the municipal shoreland zoning ordinance. To do this, the municipality would need to amend the definition of districts within the shoreland zoning ordinance as well as the official shoreland zoning map to include those areas in the Resource Protection district.

Example Ordinance Language

Resource protection district definition/criteria:

- Coastal hazard areas - all areas identified as impacted by [X FEET] of sea level rise, [X FEET OF STORM SURGE], [AND/OR] all areas identified as able to support future marsh migration as shown on [REFERENCE SPECIFIC OFFICIAL MUNICIPAL MAP(S) BASED ON INUNDATION SCENARIO AND

Key Consideration

Areas that are expected to support future marsh migration in Maine have been mapped by the Maine Natural Areas Program. Municipalities can incorporate those mapped areas into Shoreland Zoning maps or other maps referenced by ordinances.

MARSH MIGRATION AREAS]. Such a resource protection district would be statutorily authorized through Title 30-A after adoption of a consistent Comprehensive Plan, but is not authorized if only pursuant to Title 38 §435.

Key Consideration

If a community chooses this approach, all Resource Protection District regulations and standards will apply to 'new' areas added to the Resource Protection District area. Dimensional standards, including the maximum building height of 35 feet noted in the 'Key Consideration' box in Section 3.2, will apply to the new Resource Protection District areas, which might conflict with other resilience ordinance provisions such as requiring new structures to be elevated a specified height (i.e., freeboard) above flood elevation to account for future sea level rise.

EXAMPLES

Rye, NH: Wetland restoration through protecting, restoring, and creating salt marsh as a buffer to storm surges and sea level rise to provide natural flood protection.

Rhode Island: To conserve wetlands, Rhode Island has considered placing, through spreading and/or spraying, sediment on marsh surface to increase the elevation of the marsh surface and prevent drowning and dying of marsh vegetation. This technique is commonly referred to as thin layer deposition and helps marsh vegetation better keep pace with sea level rise.

3.4 INCLUDE SEA LEVEL RISE IN SETBACK CONSIDERATION FOR EXPANSION OF NONCONFORMING STRUCTURES



If the municipality does not amend its shoreland zoning ordinance to incorporate areas subject to future sea level rise, it may still include sea level rise considerations in existing individual provisions. A municipality may require any expansion of nonconforming principal and accessory structures within the area subject to inundation from a certain sea level rise scenario to meet the setback requirements required in the Resource Protection district. Applying the setback standards would require the municipality to define the sea level rise area within its ordinance.

3.5 LIMIT VEGETATION CLEARING AROUND RESOURCES



Prohibit removal of native vegetation within the shoreland setback areas to preserve natural protection for storm surge and coastal erosion.

Example Ordinance Language

- No person shall remove native vegetation in setback areas of the Resource Protection District in order to preserve natural protection for storm surge and coastal erosion, except that which is necessary for uses expressly authorized in the District.

3.6 INCREASE RESOURCE BUFFERS AND SETBACKS

Increase the distance of buffers and/or setbacks from regulated resources (*e.g.*, wetlands, streams, rivers, *etc.*) beyond the minimum required by the Mandatory Shoreland Zoning Act. Amend the dimensional standards for all or some shoreland zoning districts to increase the required structure setbacks from resource(s) and/or increase the required width of vegetative buffers. Amend setback requirements from the bluffs to be consistent for all of the categories of coastal bluffs (stable, unstable, and highly unstable) and ensure that the methodology for determining the bluff setback is standardized and understandable. If setbacks vary depending on the bluff stability, prohibit armoring of bluffs for the implicit purpose of decreasing the required setback. If a bluff is stabilized, consider requiring or encouraging that material from regrading of the bluff be placed at the toe of the bluff to simulate natural bluff erosion processes in order to provide sediment nourishment to adjacent resources such as mudflats and wetlands.

Currently, the State requires setbacks of 75 feet from the highest annual tide for stable bluffs and 75 feet from the top of the bluff for unstable bluffs. Determining the top of a bluff can be difficult to do in the field. Municipalities can amend bluff setback requirements to refer to an established distance from the highest astronomical tide (HAT) plus sea level rise, such as 100 feet from the HAT plus 3 feet of sea level rise for stable bluffs and 150 from the HAT plus 3 feet of sea level rise for unstable.

3.7 REGULATE WETLANDS SMALLER THAN STATE THRESHOLD

Apply shoreland zoning requirements to wetlands smaller than the 10-acre minimum established by the State and require protection of isolated wetlands, vernal pools, and vernal pool habitat. Amend the definition of wetlands to reference the minimum acreage on which to apply the municipality's chosen regulations. Include isolated wetlands of a certain size and vernal pool habitat determined to have high habitat and/or resilience value in the definition of the Resource Protection district and update the official shoreland zoning map to correspond with changes to the ordinance text.

Key Consideration

Natural vegetative buffers protect water quality and habitat health. Setbacks and buffer zones protect natural resources and habitats from negative impacts of development and human activity. Buffers efficiently slow stormwater runoff, trap pollutants, stabilize soil, and control erosion. Scientific studies have demonstrated that 100-foot vegetative buffers reduce harmful impacts of polluted runoff, improve water quality, and protect important habitat.

Key Consideration

If a municipality chooses to regulate wetlands beyond those required by the Mandatory Shoreland Zoning Act, care should be taken with respect to terminology and the statutory definitions in the Shoreland Zoning Act.

Example Ordinance Language

Definition of districts and/or shoreland overlay district map criteria sections:

- Tidal waters, coastal wetlands, and inland wetlands contiguous to those resources [REGARDLESS OF THEIR SIZE or X ACRES AND GREATER] and those areas within 250 feet, horizontal distance, of the normal high-water mark of such resources; all inland wetlands with a contiguous area of [X] acres or more, and all areas within 250 feet of the upland edge of such wetlands.

3.8 REDUCE MAXIMUM LOT COVERAGE



Reduce maximum lot coverage in the dimensional standards of shoreland zoning districts, especially those that include areas subject to inundation from sea level rise and storm surge and areas identified as being able to support future marsh migration.

3.9 NONCONFORMING STRUCTURES



Restrict expansion of non-conforming structures that are located within a set distance of regulated resources, especially areas subject to inundation from sea level rise and storm surge and areas identified as being able to support future marsh migration.

4. Subdivision and Site Plan Review

The subdivision and site plan review (SPR) provisions described below provide options for municipalities to consider development and planning in the context of climate change and associated hazards. The outlined provisions describe various approaches that may help municipalities guide development that reduces exposure to natural hazards and better incorporates green building elements or low impact development practices to plan for climate change impacts and manage stormwater runoff. Several of the provisions aim to conserve key natural resources and vulnerable areas. Other provisions help a municipality consider how new conserved open space can support the entire landscape rather than providing only a site-specific contribution to community resilience. Such considerations will improve community resilience by protecting critical habitat and ecosystem services, providing buffer zones where water from flooding may be absorbed in the landscape, and ensuring development occurs in a way that works with, rather than against, site conditions.

4.1 REQUIRE FUTURE COASTAL HAZARDS TO BE INCORPORATED IN THE DESIGN AND CONSTRUCTION OF NEW DEVELOPMENT AND REDEVELOPMENT



Establish a new zone(s) of sea level rise, storm surge, and/or marsh migration areas and establish development standards for those areas, including setbacks from resources and hazard areas, maximum lot coverage, and site clearing limitations. Require that applicants incorporate future sea level rise and the landward migration of resource areas in response to relative sea level rise (*e.g.*, marsh migration) into the design and construction of structures and proposed uses/activities.

Example Ordinance Language

Amend existing ordinance language that addresses the concept of development projects having no adverse impact on the natural environment:

- In determining whether a developer has made adequate provisions for fitting development harmoniously into the existing natural environment, the Planning Board may consider the effects of at least [X] feet of relative sea level rise by [YEAR] and [X] feet by [YEAR].

Key Consideration

MRSA Title 38 (Waters and Navigation), Chapter 3 (Protection and Improvement of Waters), Section 484 was amended in 2022 to allow for consideration of the effects of at least 1.5 feet of relative sea level rise by 2050 and 4 feet by 2100 in determining whether a developer has made adequate provision for fitting the development harmoniously into the existing natural environment.

4.2 PROMOTE GREEN BUILDINGS AND LOW IMPACT DEVELOPMENT; INCLUDE CLIMATE CHANGE IMPACTS IN STORMWATER MANAGEMENT



Encourage or require green building performance elements, including incorporation of on-site retention, detention, and low impact development (LID) measures for the treatment of stormwater runoff. Encourage or require on-site and off-site stormwater drainage sized to accommodate the effects of climate change impacts, including projected sea level rise, flooding, and increased frequency and intensity of storm events.

Consider requiring developers to design stormwater management measures to more intense storm events, beyond the 2-, 10-, and 25-year events. Require that applicants use NOAA Atlas 14 and Northeast Regional Climate Center (NERCC) precipitation data for design of stormwater management measures and erosion and sediment control plans. In cases where the precipitation data from those two sources differs, require the more extreme precipitation values be used. If the community does not want to require the use of more intense storm events for design, it can take a more flexible approach and provide the municipal reviewing body with the authority to require more stringent standards when they deem appropriate. This approach requires amending applicable land use ordinances to allow the Planning Board the discretion to require applicants to design stormwater management components for more intense and severe storm events (e.g., 50-year, 24-hour, 100-year, 24-hour; 500-year, etc.).

Key Consideration

Areas of riverine and storm surge flooding are of particular importance when considering precipitation amounts for stormwater management, see references in section 6 of this document for maps and guidance in such areas.

Example Ordinance Language

- To the maximum extent practicable, the applicant shall use low impact development and/or green infrastructure to treat stormwater. Stormwater components shall be designed and sized to

accommodate, at a minimum, impacts of sea level rise and flooding from the [STORM FREQUENCY AND DURATION] rainfall event.

- The Planning Board may require the applicant or their designee to design stormwater management components to accommodate more intense and severe storm frequencies, such as the 50-year, 24-hour event or 100-year, 24-hour event.

EXAMPLES

Hull, MA: As part of the Nantasket Beach Overlay District, there are rules for the promotion of ‘green buildings’ as defined in ordinance. Identified green building performance elements include incorporation of on-site retention, detention, and LID treatment of stormwater runoff and on-site and off-site stormwater drainage sized to accommodate effects of SLR, flooding, and increased frequency and intensity of storm events.

Wellfleet, MA: Model bylaw allows the reviewing body to require applicant to design stormwater management components for 500-year flood frequency event period.

4.3 REQUIRE STREAM SMART AND COASTWISE PRINCIPLES FOR CROSSINGS AND CULVERTS



Require tidal crossings to follow Maine CoastWise principles. Require new roadway culverts and culvert replacement and upgrades in non-tidal areas to follow Maine Stream Smart principles.

4.4 CONSIDER SEA LEVEL RISE DURING DEVELOPMENT REVIEW PROCESS



Require development applicants to submit information about site-specific coastal flooding impacts, including from future sea level rise and storm surge, and information about how the development is designed to address those impacts.

Example Ordinance Language

- Submittal requirements: The applicant shall submit information about flooding hazards, including sea level rise and storm surge, for the development site and resilience design measures that mitigate flooding impacts to the property and do not exacerbate flooding on nearby properties.
- The applicant shall, to the extent practicable and applicable, integrate considerations of adaptation planning into their project to promote climate change resilience to protect natural resources, infrastructure, and people from coastal hazards and climate change impacts.

4.5 CONSIDER CLIMATE CHANGE IN DEVELOPMENT REVIEW PROCESS



Require development application reviewing body (e.g., the Planning Board) to consider a project's adaptation to projected climate change impacts.

Example Ordinance Language

- The Planning Board shall consider a development project's resilience and ability to adapt to

projected climate change impacts, including but not limited to, sea level rise and extreme precipitation events. The Board may require the applicant to submit information about how future climate change is reasonably expected to impact the development site and adaptation and resilience measures that the development will implement to address those impacts.

4.6 REMOVE RESOURCE PROTECTION AREA FROM YIELD CALCULATIONS



Require key natural resources areas and areas vulnerable to coastal hazards and climate impacts, as shown on appropriate maps, to be removed from the total land area available for development during calculations to determine density and/or lot coverage. Specific areas to remove from the calculations include those zoned as Resource Protection in the municipality's Shoreland Zoning ordinance, areas vulnerable to flooding from future sea level rise and storm surge, areas vulnerable to coastal erosion, and those areas identified as being able to support future marsh migration.

4.7 PRIORITIZATION OF NATURAL RESOURCES AND AT RISK AREAS FOR CONSERVATION IN SUBDIVISION DESIGN



For proposed subdivisions, require that open space is the first consideration in the development design, with priority given to conservation of important natural resources; habitat; connectivity of conserved lands; water quality protection; recreation opportunities; public access; protection of areas vulnerable to existing and future flooding; and areas identified as being able to support landward migration of significant coastal habitat.

Example Ordinance Language

Requirements:

- The first meeting with the [NAME OF REVIEWING BODY] shall be a conceptual design review and shall precede submission of a preliminary review application. The open space shall be designed first, and the built environment shall be constructed in the remaining area. During the conceptual design review process, the [NAME OF REVIEWING BODY] shall determine whether the open space layout, design, and configuration are appropriate based on purposes to be achieved as part of [NAME OF MUNICIPALITY'S OPEN SPACE/CONSERVATION SUBDIVISION ORDINANCE/SECTION]
 - *Purposes for this provision could include protection of wetlands and shoreland areas, significant habitat corridors, rare or endangered species habitat, and reduction of flood and coastal erosion risks.*
- The [NAME OF REVIEWING BODY] may solicit input on the design from the conservation commission or other appropriate third party qualified to respond to the application in question.
- The open space may be held in fee simple ownership, with a conservation easement granted to a qualified holder, or with deed covenants/restrictions placed upon it.
- The open space shall be owned by the homeowners, the municipality, or other entity acceptable to the [NAME OF REVIEWING BODY].

- There shall be some form of legal arrangement made to ensure there is a place for the use, management, maintenance, and protection of the open space; the owner is responsible for taxes, maintenance, and insurance.

EXAMPLE

York, ME: Subdivision layout rules that provide flexibility in development standards, usually through reduced dimensional standards, result in more open space, shorter road lengths, reduced utility infrastructure length, and sometimes a density bonus when not a conventional subdivision layout. In some cases, the open space must be designed first with priority given to important natural resources, water quality protection, recreation opportunities, public access, and areas vulnerable to flooding.

4.8 INCLUDE SEA LEVEL RISE CONSIDERATIONS IN MUNICIPAL ROAD ACCEPTANCE STANDARDS



Develop municipal road acceptance criteria that require the applicant to demonstrate that surface flooding is not expected to impact the roadway under projected climate change conditions, including more intense precipitation, sea level rise, and storm surge.

Example Ordinance Language

- Any road which is presented for acceptance by [CITY/TOWN] shall meet the following standards: Surface flooding is not expected to impact roadway with [X FEET OF SEA LEVEL RISE, X FEET OF STORM SURGE, and/or PRECIPITATION AMOUNT/FREQUENCY].

4.9 REQUIRE ON-SITE RETENTION AND INFILTRATION OF STORMWATER



Require runoff from impervious surfaces to be retained and infiltrated on site.

Example Ordinance Language

Stormwater standards:

- Stormwater runoff from impervious surfaces shall be retained on site.
- Runoff from traveled ways and parking areas shall be collected and petroleum products removed using Best Management Practices (BMPs) prior to infiltration on-site. On sites where the proposed improvements exceed fifty (50) percent of the assessed value of the property as determined by the CEO, or where repaving is proposed, the Planning Board may also require treatment for storm water from existing impervious areas. All treatment facilities shall be permanently maintained in full working order by the owner(s).

4.10 IMPACT FEE FOR FUNDING COASTAL RESILIENCE



Require applicants to pay an impact fee, based on an established amount or formula, such as cost per square foot or acre of development, to the municipality to fund coastal resilience projects such as elevation of low-lying roads, culvert replacement, and stormwater infrastructure improvements. The enabling ordinance must comply with Title 30-A, §4354.

Key Consideration

Implementing an impact fee would require establishing an enabling policy and fee structure. Cities like Portland have adopted an impact fee ordinance where fees paid by a development project are used to fund services and facilities that serve that development. The ordinance aims to plan for smart and sustainable growth.

5. Zoning

The zoning provisions described below provide a means for municipalities to consider how best to guide development in order to protect the safety, well-being, and interests of their community. Zoning allows municipalities to ensure that land use and development can be complementary and reinforce planning objectives such as resilience to climate change and coastal hazards. The provisions below describe various zoning approaches that municipalities can take, specifically the development of a coastal resilience overlay district and a system to transfer development rights from high-risk coastal areas to lower risk areas.

5.1 AMEND EXISTING DEFINITIONS AND ADOPT NEW DEFINITIONS TO SUPPORT RESILIENCE OBJECTIVES

Amend the definition of “critical rural area” to incorporate reference to flood prone and flood buffer areas; and “rural area” to include erosion mitigation and water retention to be consistent with State law approved April 2022 (Chapter 590 Public Law). Consider developing and adopting new definitions for terms that help the municipality better implement coastal resilience and incorporate climate considerations into land use regulations.

Key Consideration

Ensure that definitions are consistent and do not conflict with state laws and rules and the municipality’s existing ordinances and definitions.

Example Ordinance Language

- *Accommodation zone* - a municipally or multi-municipally designated coastal hazard area designed to allow for continued development while requiring that structures be sited and built to be more resilient to impacts. This area could include areas with intense to moderate existing development, some ecologically sensitive resources, and limited viability for hard-shoreline armoring.
- *Coastal hazard area* – areas susceptible to a combination of future sea level rise, erosion, landslides, and flooding from storm surge.

- *Frontline communities* – people and communities that experience the consequences of climate change first and to a greater degree than other people and communities.
- *Hard armoring* - protecting the shoreline from erosion using physical barriers, including but not limited to the construction of bulkheads, seawalls, revetments, dikes, and groins.
- *Living shoreline* - (1) has a footprint that is made up mostly of native material; (2) incorporates vegetation or other living, natural “soft” elements alone or in combination with some type of harder shoreline structure (e.g., oyster reefs or rock sills) for added stability, and (3) maintains continuity of the natural land–water interface and reduce erosion while providing habitat value and enhancing coastal resilience.
- *Conservation zone* – a municipally or multi-municipally designated coastal hazard area designed to facilitate protection of natural resources and provide for the gradual relocation of development in highly vulnerable areas. This area could include highly vulnerable areas that have sensitive natural resources and that are suitable for implementation of living shorelines and unsuitable for hard shoreline protection (such as sea walls and bulkheads).

5.2 ESTABLISH NEW COASTAL HAZARD ZONE OF SEA LEVEL RISE AREAS AND APPLY FLOODPLAIN DEVELOPMENT REQUIREMENTS



Establish a coastal hazard zoning district that includes areas subject to flooding from sea level rise and storm surge to serve as a buffer zone, allow for flooding in the event of severe storms or sea level rise, and provide recreational open space for public use and access to the water during ‘dry’ times.

Example Ordinance Language

- See information in Section 5.6 regarding coastal overlay.

EXAMPLES

Boston, MA: Established a 'Waterfront Area' to serve as a buffer zone; allow for implementation of the Resilient Boston Harbor Plan and creation of Flood Resilience Zones; protect isolated vegetated wetlands, vernal pools, and vernal pool habitat; allow the Conservation Commission to develop standards for projects in the floodplain to ensure resiliency measures are incorporated; and expressly directs the Commission to consider climate change, sea level rise, and climate resiliency.

Beverly, MA: The Chubbs Brook Drainage Project involved a playground and park area designed to be floodable during storm events. The primary element of the project was to build flood storage areas near a wetland. The second phase was to line drainage pipes and replace a culvert to expand the previous storage capacities.

5.3 TRANSFER OF DEVELOPMENT RIGHTS

Transfer of development rights (TDR) is a land use mechanism that encourages the permanent removal of development rights in defined "sending" districts/areas, and allows those rights to be transferred to

defined "receiving" districts/areas. The system relies on market forces to redistribute development potential from vulnerable or sensitive areas toward areas with appropriate infrastructure to accommodate increased development potential.

Applicants that extinguish development rights in a designated coastal hazard area or "sending district" by restricting density of development in that district are eligible for a density bonus of [X]% for development in designated receiving districts and/or areas identified by the municipality as target areas for growth and increased density. Applicants may also extinguish development rights in a designated coastal hazard area or "sending district" by acquiring open space conservation easements.

EXAMPLE

Falmouth, MA: The Town adopted one of the first TDR Bylaws in Massachusetts, which establishes "donor" and "receiving" districts based on a variety of criteria. It is designed to protect coastal ponds and groundwater recharge areas to protect water quality. In addition, it encourages the permanent protection of other land with important natural resources by granting tax relief when owners voluntarily agree to temporary development restrictions. The program can only function as part of a subdivision application and adds a Special Permit requirement. However, this additional requirement is streamlined by having the Planning Board named as the permitting authority for both requirements. Furthermore, incentives are added in the form of density bonuses. Bonuses vary between 20 to 40%, depending on which area is sending and which area is receiving. Example: McKenna Ridge Road Subdivision: The donor parcel was in the Water Resource Protection District and covered approximately 12.5 acres. Yield calculations developed for the parcel showed that six lots could be developed under the standard subdivision process. Because the developer was using the TDR Program, he was granted a 20% increase on this base yield value, bringing the yield value up to eight lots. The receiving subdivision was a 16.4-acre parcel just outside the donor district boundary in a residential area. The site plan development process showed that seven lots would have been a reasonable expectation for this parcel under standard zoning provisions. The result was a 15-lot subdivision that used approximately half the space normally required under existing regulations and permanent protection of more than 12 acres of open space in the Water Protection District.

5.4 PROHIBIT NEW DEVELOPMENT IN AREAS VULNERABLE TO FUTURE FLOODING



Prohibit new residential dwelling units in areas vulnerable to future flooding (sea level rise) and in the regulatory floodplain. This requires adopting a supplemental map, in addition to the FIRM, showing areas subject to projected future sea level rise, and updating the floodplain management ordinance accordingly.

Example Ordinance Language

- New construction of residential structures is prohibited within V and VE Zones of the SFHA and within areas impacted by [X] feet of sea level rise [AS IDENTIFIED ON AN OFFICIAL MUNICIPAL SEA LEVEL RISE MAP].
- Any lot or lots shown on a plan endorsed by the Planning Board or duly recorded at the Registry of Deeds as of [DATE ORDINANCE ADOPTED], shall be eligible to apply for a special permit to transfer a portion or all of the development rights on said lot or lots (hereinafter called "donor lots") to a different location and different zoning district (hereinafter called "receiving district") to be included as part of a subdivision requiring approval under [REFERENCE SUBDIVISION ORDINANCE] provided that the following requirements are met: [OUTLINE CONDITIONS MET].
 - *One possible condition:* The owner or owners of the donor lot(s) must record a covenant at the Registry of Deeds running in favor of the [NAME OF TOWN/MUNICIPALITY] prohibiting the construction or placement of any structure on said donor lot(s).

5.5 APPLY EROSION-BASED SETBACK FOR DEVELOPMENT

Implement an erosion-based setback requirement to regulate development on lots created on or after a selected date, which could be the date of adoption of this provision.

Example Ordinance Language

- Lots created on or after [DATE OF ORDINANCE/AMENDMENT APPROVAL] shall utilize an erosion rate setback factor [HISTORICAL LOCAL EROSION RATE MULTIPLIED BY X (50, 100, OTHER) YEARS, OR INTENDED LIFESPAN OF THE STRUCTURE] in the calculation of the development setback. If the application of the erosion rate setback factor in the calculation of the development setback would preclude the placement of permanent buildings, then the erosion rate in effect at the time that the lot was created may be utilized in the calculation of the development setback, provided that the development conforms to all other development requirements in the [TOWN/CITY] of [NAME OF MUNICIPALITY]'s land use ordinances.

Key Consideration

This provision requires determination of the historical erosion rate at a development site, which may be quite technical and costly. An alternative to using the historical erosion rate is to consider general erosion risk using best available data and site-specific conditions.

EXAMPLE

Maui, HI: Maui's erosion-based setback is based on the local annual erosion rate multiplied by 50 years (average lifetime of a structure) with an added 25 feet. The municipality has three approaches include restoring and protecting coastal dunes, updating erosion-based shoreline setbacks, and planning for post-disaster reconstruction. The original erosion-based setback rules were adopted in 2003. Maui's proposed new setback rules are based on a new statistical methodology for reporting the rate of beach erosion. The new formula would increase the considered lifetime of a structure by which the erosion rate is multiplied, increase the minimum setback to account for episodic events, and add a buffer for accelerated sea level rise. The formula would increase the setbacks on most parcels compared to the existing setbacks.

5.6 ESTABLISH A COASTAL RESILIENCE OVERLAY ZONING DISTRICT AND STANDALONE ORDINANCE



Establish a new coastal resilience overlay zoning district that includes areas subject to existing and future coastal hazards, such as sea level rise, storm surge, marsh migration, and erosion. The general goals of the overlay zoning district are to: (a) identify areas that may be subject to chronic coastal natural hazards including ocean flooding, beach and dune erosion, dune accretion, bluff recession, landslides, inlet migration; and marsh migration; (b) assess the potential risks to life and property posed by chronic coastal natural hazards, including erosion and earth movement; (c) minimize potential public and private risks and losses to life and property due to chronic hazards through hazard avoidance and development requirements consistent with State planning goals; (d) protect barrier beach and dune systems; (e) create incentives for development that can withstand sea level rise and increased flooding associated with frequency and intensity of storms; (f) promote 'green buildings' as defined in ordinance. Identified green building performance elements include incorporation of on-site retention, detention, and LID treatment of stormwater runoff and on-site and off-site stormwater drainage sized to accommodate effects of sea level rise, flooding, and increased frequency and intensity of storm events; and (g) impose additional regulations on an existing zone based on special characteristics in that zone, such as for natural, historical, or cultural resources protection.

Key Consideration

Creating a coastal overlay zoning district could be achieved by establishing a new district, or by expanding and amending existing zoning overlay districts, such as a Shoreland Zoning District.

See *Section 6* for information about mapping future hazard areas for purposes and land use requirements and development standards.

Core components to consider and address with a coastal resilience overlay zoning district:

- Define the area of the overlay zoning district in narrative form and create a map that delineates the area. Create accompanying development standards and land use regulations for the overlay zoning district.
- Direct new development toward areas that have lower risk of natural hazards.
- Phase out development in vulnerable coastal areas experiencing sea-level rise, recurrent flooding, and land loss by limiting or prohibiting new development or redevelopment, particularly in a post-disaster context, above a specified legal threshold (e.g., “substantial damage”) or by requiring development setbacks or the removal or relocation of structures upon the occurrence of future physical impacts or “triggering” events.
- Prohibit hard or ‘gray’ shoreline armoring structures and promote the use of living shorelines with natural or nature-based features. Facilitate the construction of natural shoreline protection measures to enable coastal ecosystems to maintain their connectivity to the surrounding ocean and coastal environment. Remove structural barriers to inland ecosystem migration as sea levels rise and coasts are eroding.
- Protect inland habitat and species migration corridors and establishment areas on higher ground to support and sustain migrating habitats and species.
- Allow increased density in appropriate areas, such as areas of low flood risk, higher ground, or inland areas.
- Require and incentivize design standards that increase the resilience of developed areas to coastal hazards and climate change.
- Incentivize voluntary resilience measures for commercial and residential development.
- All of the provisions listed in this document could be included in an overlay zoning district. Key overlay zoning district provisions include:
 - Require buildings in the 100-year regulatory floodplain and areas subject to flooding from sea level rise to be elevated at least [X] feet (e.g., 3 feet) above the 100-year base flood elevation (BFE). Require buildings in the 100-year regulatory floodplain and areas vulnerable to flooding from future sea level rise to be elevated [X] feet (e.g., 3 feet) above natural grade if the BFE has not been determined.
 - Require construction in the 500-year (0.2% chance) floodplain to be elevated or floodproofed to [X] feet (e.g., 1.5 feet) above the 500-year flood elevation.
 - If the municipality has mapped the flood elevation of sea level rise scenario(s) of interest to the community, require structures in those areas to be elevated to at least [X] feet above the highest ground adjacent to the structure or [X] feet above the projected flood elevation in areas subject to future sea level rise.
 - Use permeable surfaces on new parking spaces to support stormwater infiltration; maintain open space; and set limits on paved parking spaces that cannot absorb rainwater.

- Prohibit basements and raise electrical system components [X] feet above the lowest finished floor in areas at-risk of flooding and sea level rise.
- Require that landscaping consist of salt-tolerant, native, and/or climate resilient species.

EXAMPLE

Norfolk, VA: Coastal Resilience Overlay requirements include the use of permeable surfaces on new parking spaces; stormwater infiltration; maintenance of open space; and limits on paved parking spaces that cannot absorb rainwater. Basements are prohibited, and electrical system components must be raised one foot above the finished floor. Landscaping must consist exclusively of salt-tolerant and native species.

6. MAPPING RESOURCES AND MORE INFORMATION

The resources listed below are organized by hazard and/or impact and offer a starting place to find data and mapping tools to inform planning and policies related to climate change impacts and coastal hazards.

A NOTE ON MAPPING FUTURE HAZARDS

Decisions to link land use regulations to mapped areas of future hazards, such as sea level rise, and/or include additional flood hazard areas in the floodplain ordinance and regulatory flood maps should consider technical mapping information, how flood information will be depicted, and how to apply development standards. Flood Insurance Rate Maps (FIRMs) issued by FEMA show the horizontal extent, or horizontal boundaries, of different flood zones of the 100-year floodplain, as well as vertical flood boundaries, identified as the base flood elevation (BFE), or expected floodwater depth, for some locations. Maps showing future flood hazards associated with sea level rise can follow a similar approach and show both horizontal inundation boundary(ies) and associated flood depths. The latter approach requires more technical, and likely expensive, modeling and mapping, as determining flood elevation that accounts for sea level rise at a given location is not as straightforward as adding the projected sea level rise scenario (e.g., 3.0 feet) to the underlying, FEMA-determined BFE.

The mapping approach a municipality selects will dictate how regulations and development standards are applied to areas impacted by future sea level rise. Showing just the horizontal boundary works best for regulations that are based on whether a development site is located within that horizontal boundary of the inundation zone, following a regulatory structure similar to Shoreland Zoning. Alternatively, showing both the horizontal boundary and vertical flood depths works best for standards that address not only the horizontal position of a development site or structure in relation to a horizontal flood boundary, but also elevation standards that are based on projected vertical flood depths of a site, similar to freeboard requirements of a floodplain management ordinance.





Coastal Flooding

- Maine Sea Level Rise/Storm Surge scenarios (Maine Geological Survey (MGS)):
https://www.maine.gov/dacf/mgs/hazards/slr_ss/index.shtml
- Floodplain Maps (Maine Floodplain Management Program/FEMA):
<https://www.maine.gov/dacf/flood/mapping.shtml>
- Maine Flood Hazard Map (Maine Floodplain Management Program/FEMA):
<https://www.arcgis.com/apps/webappviewer/index.html?id=3c09351397764bd2aa9ba385d2e9efe7>
- Sea Lake and Overland Surges from Hurricanes (SLOSH) map (MGS):
<https://www.maine.gov/dacf/mgs/hazards/slosh/index.shtml>
- Maine State flood hazard disclosure: <https://www.nar.realtor/national-flood-insurance-program/state-flood-hazard-disclosures-survey>
- Coastal Undeveloped Habitat Blocks After 1 Meter of Sea Level Rise Map (MNAP):
https://www.maine.gov/dacf/mnap/assistance/coastal_blocks_1m_slr.htm
- Road and culvert map: <https://www.maine.gov/mdot/mapviewer/>
- Maine Coastal Flood Risk Model (*coming in 2023/2024*)



Shoreline Change

- Beach Mapping Shoreline Change (MGS):
https://www.maine.gov/dacf/mgs/hazards/beach_mapping/index.shtml
- Potential Tidal Marsh Migration (Maine Natural Areas Program (MNAP)):
https://www.maine.gov/dacf/mnap/assistance/marsh_migration.htm
- Erosion data and information: <https://www.maine.gov/dacf/mgs/hazards/erosion/index.shtml>
- Coastal Sand Dune boundaries:
<https://www.arcgis.com/home/item.html?id=97493f585eac4542af250694aad5662d>
- Bluff Stability and Landslide Maps (MGS):
<https://www.maine.gov/dacf/mgs/pubs/digital/bluffs.htm>

7. GENERAL RESOURCES

Floodplain Management

- Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium. FEMA.
<http://www.carteretcountync.gov/DocumentCenter/View/2238/Benefits-of-Freeboard>

Climate Change

- Maine Won't Wait: A Four-Year Plan for Climate Action:
https://www.maine.gov/future/sites/maine.gov/future/files/inline-files/MaineWontWait_December2020.pdf
- Scientific Assessment of Climate Change and Its Effects in Maine:
https://www.maine.gov/future/sites/maine.gov/future/files/inline-files/GOPIF_STS_REPORT_092320.pdf
- Maine Scientific and Technical Committee:
<https://www.maine.gov/future/initiatives/climate/climate-council/scientific>
- Map of Historic and Cultural Resources:
<https://www.maine.gov/mhpc/programs/protection-and-community-resources/climate-change>
- NOAA Atlas 14:
https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html
- Northeast Regional Climate Center:
<https://www.nrcc.cornell.edu/>

Open Space And Conserved Lands

- Maine Conserved Lands Map (MNAP):
<https://www.maine.gov/dacf/mnap/assistance/conslands.htm>
- Maine Natural Resources Protection Act: <https://www.maine.gov/dep/land/nrpa/>
- Open Space Subdivision:
https://www.maine.gov/dacf/municipalplanning/docs/Open_Space_Subdivisions_presentation_2010_10_07_withnotes.pdf

Stormwater

- Low Impact Development Practices:
<https://www.maine.gov/dep/land/stormwater/stormwaterbmps/vol3/chapter10.pdf>
- Maine Stormwater Best Management Practices (BMP) manual:
<https://www.maine.gov/dep/land/stormwater/stormwaterbmps/>

Comprehensive Planning / Land Use / Zoning And Wetlands

- Title 30-A
<https://legislature.maine.gov/statutes/30-A/title30-Ach0sec0.html>
- Sewage Disposal rules:
<https://www.maine.gov/dhhs/mecdc/environmental-health/dwp/documents/SubsurfaceWastewaterDisposalRulesProposal.pdf>
- Beginning with Habitat data and maps:
<https://www.maine.gov/dacf/mnap/assistance/bwh.htm>
- Maine Wetland Information:
<https://www.maine.gov/dep/water/wetlands/index.html>
- Maine Natural Areas:
https://www.maine.gov/dacf/mnap/features/invasive_plants/imap.htm
- Maine Municipal Climate Adaptation Guidance Series: Shoreland Zoning:
[CAGS 07 Shoreland Zoning.pdf \(maine.gov\)](#)
- Maine Municipal Climate Adaptation Guidance Series: Subdivision Ordinances:
[CAGS 09 Subdivision.pdf \(maine.gov\)](#)
- Maine CoastWise Principles:
<https://www.maine.gov/dep/land/grants/coastwise-short-brief-20200901.pdf>
- Maine Stream Smart Crossing Principles:
https://www.maine.gov/dacf/mfs/policy_management/water_resources/stream_smart_crossing_s.html