



MODEL BYLAW

Large-Scale Ground-Mounted Solar Photovoltaic Installations

Background

Climate change is transforming Cape Cod. Land use patterns and ways of living dictate greenhouse gas (GHG) emissions, the leading cause of the global climate crisis. Climate action is necessary to slow the effects of climate change and improve the region's resilience to its impacts.

Transitioning from GHG-emitting to renewable forms of energy to power homes, businesses, institutions, and vehicles will help us decrease regional GHG emissions. Solar energy is one form of renewable energy that can help governments, businesses, and individuals mitigate the impacts of climate change. However, large-scale solar photovoltaic projects need to be sited and regulated as necessary to protect public health, safety and welfare resulting from impacts to Cape Cod's unique resources.

Effective local action related to solar energy development requires a clear understanding of the federal and state laws and initiatives within which communities may act, including both the limits and opportunities for local action. As a signatory to the Paris Agreement¹, the United States is expected to take significant actions towards reducing GHG emissions and furthering the development of renewable energy resources over the coming decades. These efforts may include programs promoting solar development that could have impacts at the state or local level. At present, the main policy supporting solar development at the federal level is the Investment Tax Credit (ITC)². The ITC has historically provided strong incentive for the development of solar photovoltaic systems by homeowners and businesses.

State policies play an influential role in solar development, often including stipulations affecting the placement, timing, or economics of solar installations. It is therefore important to understand the ramifications of state policies that can affect solar development and incorporate relevant components into local planning efforts.

¹ [The Paris Agreement | UNFCCC](#)

² [Residential and Commercial ITC Factsheets | Department of Energy](#)

In Massachusetts, the Renewable Portfolio Standard³ requires utilities obtain a specified percentage of their electricity from renewable energy sources by purchasing Renewable Energy Credits (REC) and the requirement for RECs has been increasing by 1-2% per year.

The Solar Massachusetts Renewable Target (SMART)⁴ program is the current program incentivizing solar development throughout the Commonwealth. The SMART regulation provides incentives in the form of direct “tariff” payments to the solar photovoltaic system owner for each kilowatt-hour of power generated, with credit for the renewable content of the electricity going directly to the utility company in the form of RECs.

Other state laws influencing solar development include the 2008 Green Communities Act⁵, 2008 Global Warming Solutions Act (GWSA)⁶, and 2021 Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy (Roadmap)⁷. The Green Communities Act encourages municipalities to become Green Communities to create a clean, affordable, and resilient energy future. Qualifications for becoming a Green Community include the provision of as-of-right siting of renewable energy generating facilities and adoption of an expedited application and permitting process under which these energy facilities may be sited within the municipality. The GWSA mandated the state to cut its GHG emissions by at least 80% from 1990 levels by 2050. The 2021 Roadmap authorizes the Secretary of Energy and Environmental Affairs to set interim limits from 1990 levels, including a 50% reduction for 2030, a 75% reduction for 2040, and a 85% reduction for 2050, 15% of which is to be made up by carbon sequestration and carbon banking, revising the 2008 Global Warming Solutions Act emissions targets. To reach the Roadmap target, the state will require extensive renewable energy development.

When developing local regulations for solar development, it is important to note that the Zoning Act (M.G.L. Chapter 40A Section 3)⁸ specifies that “no zoning bylaw shall prohibit or unreasonably regulate the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare.”

There have been several recent Land Court decisions regarding these Zoning Act specifications.⁹ These cases offer the reminder that a solar bylaw cannot be used either directly or pretextually as a

³ [Renewable Energy Portfolio Standard | Mass.gov](#)

⁴ [Solar Massachusetts Renewable Target \(SMART\) | Mass.gov](#)

⁵ [Session Law - Acts of 2008 Chapter 169 \(malegislature.gov\)](#)

⁶ [Global Warming Solutions Act Background | Mass.gov](#)

⁷ [Session Law - Acts of 2021 Chapter 8 \(malegislature.gov\)](#)

⁸ [General Law - Part I, Title VII, Chapter 40A, Section 3 \(malegislature.gov\)](#)

⁹ See *PLH v. Town of Ware*, Land Court 18 MISC 000648 (December 24, 2019); *Tracer Lane II Realty, LLC, v. City of Waltham*, Land Court 19 MISC 000289 (March 5, 2021); *ASD Three Rivers MA Solar v. Planning Board of Wilbraham*, Land Court 19 MISC 000089 (April 5, 2021).

way to prohibit or ban the use . Municipalities contemplating the adoption of a solar zoning bylaw should review and follow these cases . In general, the courts have been in favor of solar development and have recognized explicitly that the protective provisions of the Zoning Act preclude municipalities from prohibiting solar energy facilities except where necessary to protect the public health, safety or welfare. In addition, unreasonable regulation has generally been determined to be regulation that, as a practical matter, amounts to a prohibition or otherwise undue restriction of a protected use where the application of any requirements of that regulation amounted to an arbitrary denial or an undermining of the protected use. These decisions underscore the need for municipalities to have strong and justifiable findings related to the public health, safety or welfare in their bylaws regulating solar energy systems .

At the regional level, the Cape Cod Commission (Commission)¹⁰ was established in 1990 to promote balanced economic development on Cape Cod and protect the region's unique natural, cultural, and recreational values, among others. The Commission is guided by a Regional Policy Plan (RPP)¹¹, updated approximately every five years. The current (2018) RPP identifies climate change as well as the siting of large-scale solar installations on greenfield sites (large expanses of otherwise undeveloped and unprotected natural or agricultural lands), as major challenges facing the region, heightening the need for thoughtful and balanced planning for solar energy development on the Cape. The RPP identifies recommended actions the Commission must take to address challenges facing the region, which include an action to conduct an analysis to identify potential sites for development of large-scale solar photovoltaic installations or energy storage facilities. The Commission has since conducted that analysis and has developed a Large-Scale Solar Screening Tool¹² for communities to use to inform solar siting decisions.

In 2021, the Commission completed a Climate Action Plan¹³ for the region that also includes a set of recommendations for addressing climate change, including the development of a model bylaw for siting large-scale solar projects to provide guidance to Cape communities as they seek to enhance renewable energy opportunities in appropriate areas. This draft model bylaw is in response to that recommendation.

At the local level, municipalities have a suite of planning documents including, but not limited to, Local Comprehensive Plans, Hazard Mitigation Plans, Municipal Vulnerability Preparedness Plans, and Open Space and Recreation Plans, intended to guide development within their boundaries with climate resilience in mind and highlighting important environmental, recreational, agricultural, and

¹⁰ [Home | Cape Cod Commission](#)

¹¹ [Regional Policy Plan | Cape Cod Commission](#)

¹² [Solar Screening Tool | Cape Cod Commission](#)

¹³ [Climate Action Plan | Cape Cod Commission](#)

cultural resources. These documents provide a context from which solar development in different locations can be considered. Towns may formalize their planning guidance in municipal zoning bylaws that address development generally or contain specific language regarding different types of development, such as solar. As of June 2021, eleven (11) Cape Cod towns are designated Green Communities, meaning they have provisions for as-of-right siting of renewable energy generating facilities, and nine towns have local zoning bylaws for Large-Scale Ground-Mounted Solar Photovoltaic Installations with several of these having established solar overlay districts.

To-date, the Cape has not seen as much large-scale solar photovoltaic development on natural and agricultural lands as other parts of the state, region, or country, likely due to the amount of existing development on Cape Cod, the limited supply and high cost of large parcels of suitable land, and the potential adverse impacts to sensitive resources from development on remaining undeveloped lands. However, as the region works toward meeting decarbonization goals, more proposed solar development of differing scales and in varied locations, including on natural and agricultural lands, is anticipated.

The clearing of vegetation, primarily trees, and disturbance of soils on Cape Cod is a concern. Cape Cod's forests are the product of both natural and cultural influences and many of the forests on the Cape, as in the rest of the Commonwealth, are still recovering from deforestation after European settlement. The Cape's native vegetation and soils are the region's green infrastructure and represent natural climate solutions. These resources serve multiple functions that benefit the health, safety and welfare of the Cape's residents and visitors. These functions include storing and sequestering carbon and therefore mitigating climate change effects, filtering and cleaning air and water, regulating local climates through evaporative cooling, controlling flooding and erosion, and providing habitat for the Cape's rare and common wildlife. The Cape's natural and agricultural lands also present scenic vistas and offer recreational opportunities and sources of locally grown food. Therefore, it is important to enact local zoning and identify locations on Cape Cod for large-scale solar photovoltaic installations that are protective of the community's character as well as natural and agricultural resources and the environmental and cultural services they provide.

As noted above, to aid Cape Cod communities in the siting of large-scale solar photovoltaic installations, the Commission developed a Large-Scale Solar Screening Tool, a web-based mapping tool that highlights the relationships between built and natural features at the parcel level. Those parcels, or portions of parcels, with more natural features should be maintained to preserve the functions of those features that benefit the public. Those parcels, or portions of parcels, with large built features may be appropriate for large-scale solar development as these are generally lands without significant natural or cultural resource constraints and are of an adequate size to support such development. Built and natural feature layers, as well as contextual feature layers, are provided in the tool to help inform the siting of large-scale solar photovoltaic projects on Cape Cod. Cape Cod towns should use the Large-Scale Solar Screening Tool to understand the context of

development for large-scale solar photovoltaic installations within their town's boundaries. It is recommended that towns utilize the tool to inform their solar siting and permitting procedures and enable developers to consider the Cape's unique resources in their site selection process. Towns may consider using the tool during their site plan or special permit review process.

To aid communities in regulating and establishing reasonable standards to facilitate development of large-scale solar photovoltaic installations, the Cape Cod Commission prepared this model bylaw. This model was developed by combining and adapting language from model solar bylaws prepared by the Massachusetts Department of Energy Resources¹⁴, Metropolitan Area Planning Council¹⁵, and Pioneer Valley Planning Commission¹⁶, as well as from the Town of Athol's solar bylaw¹⁷ – itself the product of a comprehensive review of existing bylaws from over 100 Commonwealth communities. In addition, information from the nine towns on Cape Cod with existing Large-Scale Ground-Mounted Solar Photovoltaic Installation bylaws was reviewed and incorporated into this model. Cape Cod towns without a Large-Scale Ground-Mounted Solar Photovoltaic Installation bylaw should consider the contents of this model in their development of a local bylaw and those Cape Cod towns with a Large-Scale Ground-Mounted Solar Photovoltaic Installation bylaw to consider the contents of this model in amending their bylaw.

Use of this model and the Commission's screening tool will help communities balance renewable energy development – needed for the reduction of greenhouse gas emissions and production of locally-generated electricity, and conservation of natural and agricultural lands – needed for their carbon storage and sequestration potential as well as the numerous other environmental and societal services these lands provide.

¹⁴ [Microsoft Word - solar-model-bylaw \(mass.gov\)](https://www.mass.gov/info-details/microsoft-word-solar-model-bylaw)

¹⁵ [Solar-Permitting-and-Zoning-Bylaw-Guidance.pdf \(mapc.org\)](https://www.mapc.org/files/Solar-Permitting-and-Zoning-Bylaw-Guidance.pdf)

¹⁶ [Solar Best Practices Guide | PVPC](#)

¹⁷ [Solar | Athol MA \(athol-ma.gov\)](https://www.athol-ma.gov/files/Solar)

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Introduction

Throughout this document, recommended text is in non-italicized font and other information for towns to consider in the development or amendment of their bylaw is in italic ized font and indented, as here.

This bylaw was developed as a model and is not intended for adoption without specific review by town counsel.

Under the State Zoning Act, solarphotovoltaic arrays can be allowed As-of-Right (with a building permit only), allowed As-of-Right (with site plan review), or approved through a special permit (with site plan review). Because the size of these systems can vary so greatly, municipalities often choose to regulate different sizes or types of systems differently.

Solar array project sizes should be definedrelevant to the manner in which they are regulated, and these definitions should be included in the Definitions section of the bylaw. Include a definition for projects that require site plan and/or special permit review. Generally, large systems are referred to as Large-Scale GroundMounted Solar Photovoltaic Installations and are defined as installations with a minimum rated nameplate capacity of 250 kWDC– equivalent to about 1 acre in project footprint. The total project footprint should also be consid ered and should include the entire installation including all solar panels, fenced area, appurtenances including but not limited to battery energy storage systems,buildings, storage areas, construction staging and lay-down areas, and transformers and pole s, and parking along with a perimeter area around all of the above or all areas of disturbed land, whichever is greater.

The town may also choose to limit solar PV projects based on size or locationwhere such limitation is justified for the protection of the public's health, safety or welfare . Additionally, a town may also choosespecial permit versus site plan approval thresholds based on the potential adverse impacts of a project, since impacts tend to increase as the size of the project increases

This bylaw was prepared to establish reasonable standards to facilitate development of Large -Scale Ground -Mounted Solar Photovoltaic Installation s in the Town of [X] .

The town may choose to establish a Large-Scale GroundMounted Solar Overlay District. If so, recommended language follows:

A Large-Scale Ground -Mounted Solar Photovoltaic Installation Overlay District is hereby established, and shall be considered as superimposed over any other districts es tablished by this chapter, and is shown as an overlay on the Official Zoning Map established pursuant to [X], Zoning Map .

-OR-

A Large-Scale Ground -Mounted Solar Photovoltaic Installation Overlay District is hereby established, and shall be considered as superimposed over any other districts established by this chapter, and as shown on the map entitled “ Large-Scale Ground -Mounted Solar Photovoltaic Installation Overlay District ” dated [DATE], on file in the [Town Office] , and included herein .

Purpose

The purpose of this bylaw is to promote the creation of new Large-Scale Ground-Mounted Solar Photovoltaic Installations by providing standards for the placement, design, construction, operation, monitoring, modification, and removal of such installations that address public safety, minimize impacts on scenic, natural, and cultural resources and to provide adequate financial assurance for the eventual decommissioning of such installations.

This bylaw aims to balance the rights of landowners to use their land to develop solar photovoltaic installations while protecting the health, safety and welfare of the public.

This bylaw encourages the use of solar energy systems and protects solar access consistent with Massachusetts General Laws Chapter 40A Section 9B (Solar Access)¹⁸ and Green Communities Act M.G.L. Chapter 25A Section 10. This bylaw is also consistent with [Town]’s Local Comprehensive Plan and [Town]’s Open Space and Recreation Plan [and/or other local plans] that provide guidance on the balance of uses within the town’s boundaries.

The provisions set forth in this section shall apply to the construction, operation, and/or repair of Large-Scale Ground-Mounted Solar Photovoltaic Installations.

APPLICABILITY

This section applies to Large-Scale Ground-Mounted Solar Photovoltaic Installations proposed to be constructed after the effective date of this section. This section also pertains to physical modifications that materially alter the type, configuration, or size of these installations or related equipment.

The requirements of this bylaw shall apply to a Large-Scale Ground-Mounted Solar Photovoltaic Installation regardless of whether it is the primary use of the property or an accessory use.

This bylaw is not intended to regulate systems of less than 250 kilowatt (kW) direct current (DC), roof-mounted systems, or solar parking canopies.

¹⁸ [General Law - Part I, Title VII, Chapter 40A, Section 9B \(malegislature.gov\)](https://malegislature.gov/Laws/GeneralLaws/PartI/TitleVII/Chapter40A/Section9B)

Definitions

As-of-Right Siting: As-of-Right Siting shall mean that development may proceed without the need for a special permit, variance, amendment, waiver, or other discretionary approval. As-of-right development may be subject to site plan review to determine conformance with local zoning ordinances or bylaws. Projects cannot be prohibited, but can be reasonably regulated where necessary to protect public health, safety or welfare by the [Inspector of Buildings, Building Commissioner or Local Inspector, or if there is none in a town, the Select Board, or person or board designated by local bylaw].

As-of-right siting of Large-Scale Ground-Mounted Solar Photovoltaic Installations is not required, and a town should consider whether and where it wants to allow as-of-right siting with or without site plan review or special permit review for such installations.

Battery(ies): A single cell or a group of cells connected together electrically in series, in parallel, or a combination of both, which can charge, discharge, and store energy electrochemically. For the purposes of this bylaw, batteries utilized in consumer products are excluded from these requirements.

Battery Energy Storage Management System: An electronic system that protects energy storage systems from operating outside their safe operating parameters and disconnects electrical power to the energy storage system or places it in a safe condition if potentially hazardous temperatures or other conditions are detected.

Battery Energy Storage System: A battery energy storage system (BESS) is an electrochemical device that charges (or collects energy) from the electrical grid or an electricity generating facility, such as a Large-Scale Ground-Mounted Solar Photovoltaic Installation, and then discharges that energy at a later time to provide electricity or other grid services when needed.

A note on above definitions related to batteries and battery systems– This model bylaw focuses on Large-Scale Ground-Mounted Solar Photovoltaic Installations, some of which may include a battery energy storage system; therefore, battery systems are considered here as a part of the entire solar installation. However, battery energy storage systems may stand alone for example as part of a microgrid or for grid support, and be located on land separate from a solar photovoltaic system, in which case a town may want to consider siting for such stand-alone systems and a separate bylaw addressing stand-alone battery energy storage systems¹⁹. Regarding siting of stand-alone battery energy storage systems, towns may want to consider co-locating such systems

¹⁹ [New York State Battery Energy Storage System Guidebook - NYSDERDA](#)

with emergency shelters, hospitals, longterm care facilities, schools, large businesses or wherever electricity consumption is high, and reliability is essential.

Designated Location: The location[s] designated by [the community's local legislative body], in accordance with Massachusetts General Laws Chapter 40A, section 5, where Large-Scale Ground-Mounted Solar Photovoltaic Installations may be sited as -of-right. Said location[s] [is/are] shown on a Zoning Map [insert title of map] pursuant to Massachusetts General Laws Chapter 40A Section 4. This map is hereby made a part of this Zoning Bylaw and is on file in the Office of the Town Clerk.

Designating as-of-right locations for solar development in a town is not required. However, if a town chooses to designate such locations, it is not a de facto prohibition on solar development in other locations in the town as solar development is a protected use under the Zoning Act and cannot be prohibited or unreasonably regulated except to protect the public health, safety or welfare. For example, in the recent land court decision Tracer Lane II Realty LLC v. City of Waltham²⁰, the municipality had designated its industrial district as the location where solar development was allowed. The judge found that Waltham's prohibition against solar energy facilities in all but industrial zoning districts, ran afoul of M.G.L. Chapter 40A Section 3 despite their allowance by right. In this case, the judge considered the "geographic extent" of Waltham's industrial zoning districts and noted that solar energy facilities are allowed as a matter of right on less than 2% of that municipality's land area, in effect prohibiting solar energy facilities on more than 98% of the city's total land area. This categorical exclusion of the vast majority of the municipality's area from even consideration of solar energy facilities, regardless of the surrounding built environment, the topography, and other considerations typically considered in site plan review or special permit review, was found by the judge in this case to violate the requirement that municipalities not "prohibit or unreasonably regulate" such facilities.

Large-Scale Ground-Mounted Solar Photovoltaic Installation: A solar photovoltaic system that is structurally mounted on the ground and has a minimum nameplate capacity of 250 kW DC.

It is often advised to include definitions of solar PV array system sizes in the bylaw, as they relate to how different systems are regulated (e.g., as-of-right, site plan review, or special permit). Also, project size can be defined by solar PV system capacity (kW DC), the area occupied by solar PV panels, or the project footprint. For example: A ground-mounted solar photovoltaic installation that occupies 40,000 square feet or more of surface area of solar panels. – OR – A ground-mounted solar photovoltaic installation with a rated nameplate capacity greater than 250 kW DC or that occupies more than one (1) acre of land.

²⁰ Tracer Lane II Realty, LLC, v. City of Waltham, Land Court 19 MISC 000289 (March 5, 2021)

On-Site Solar Photovoltaic Installation : A solar photovoltaic installation that is constructed at a location where other uses of the underlying property occur.

Off-Grid System : A solar photovoltaic installation where all energy generated on the installation site is consumed on that site and does not send any energy into the electrical grid for distribution.

Rated Nameplate Capacity : The maximum rated output of electric power production of the solar photovoltaic system in Direct Current (DC).

Small-Scale Ground-Mounted Solar Photovoltaic Installation : A solar photovoltaic system that is structurally mounted on the ground and has a minimum nameplate capacity of under 250 kW DC and less than one acre in size.

Solar Energy : Radiant energy received from the sun that can be collected in the form of heat or light by a solar energy system.

Solar Energy System : A device or structural design feature, a substantial purpose of which is to provide daylight for interior lighting or provide for the collection, storage, and distribution of solar energy for space heating or cooling, electricity generation, or water heating.

Solar Photovoltaic Array : An arrangement of solar photovoltaic panels.

Solar Photovoltaic Installation : A solar energy system that converts solar energy directly into electricity through an arrangement of solar photovoltaic panels.

Solar Photovoltaic Installation Site Plan [or Special Permit] Review : A review by the site plan reviewing authority [or special permit granting authority] to determine conformance with the town's zoning bylaws.

A town should designate who is the site plan review or special permit granting authority for Large-Scale Ground-Mounted Solar Photovoltaic Installations. In general, the Planning Board should be the site plan reviewing/special permit granting authority.

General Requirements

The following are suggestions. The town should evaluate what is appropriate within its jurisdiction.

DIMENSIONAL REQUIREMENTS

Setbacks

Minimum setbacks can be established to meet standards already required by the town, based on its desire to preserve viewsheds and character as outlined in local plans (for example, Local

Comprehensive Plan, Open Space and Recreation Plan) along roadways that currently have a wooded character, or along any designated scenic roads within municipal limits, and to prevent the project from creating a visual obstruction on a public roadway, such as blocking intersections or creating blind curves. Some municipalities require buffering from adjacent residential properties that exist at the time of permitting, along with larger setbacks from the right-of-way or other zoning district. In general, these setbacks should be consistent with other use types. Larger setbacks may be considered for Large-Scale Ground-Mounted Solar Photovoltaic Installations, if there is a compelling reason to do so where necessary to protect public health, safety or welfare.

For Large-Scale Ground-Mounted Solar Photovoltaic Installations, front, side, and rear setbacks shall be the same as required in the zoning district.

-OR-

For Large-Scale Ground-Mounted Solar Photovoltaic Installations, front, side, and rear setbacks shall be as follows:

- Front yard: The front yard depth shall be at least XX [Models and Cape Cod bylaws range 10-100] feet; provided, however, that where the lot abuts a [Conservation, Recreation, Residential, and/or other] district, the front yard shall not be less than XX [50-100] feet.
- Side yard. Each side yard depth shall be at least XX [15-100] feet; provided, however, that where the lot abuts a [Conservation, Recreation, Residential, and/or other] district, the side yard shall not be less than XX [50-100] feet.
- Rear yard. The rear yard depth shall be at least XX [25-100] feet; provided, however, that where the lot abuts a [Conservation, Recreation, Residential, and/or other] district, the rear yard shall not be less than XX [50-100] feet.

-OR-

For all Large-Scale Ground-Mounted Solar Photovoltaic Installations, minimum setbacks shall be as follows: Front Setback 100 feet, Rear Yard 100 feet, Side Yard 100 feet, Perimeter Setback 100 feet.

Minimum Lot Size

In general, minimum lot size should be consistent with requirements for other types of development within the zoning district. Separate minimum lot size may be imposed if there is a compelling reason to do so where necessary to protect public health, safety or welfare.

The minimum lot size shall be the same as required in the [X] zoning district.

Maximum Lot Coverage

In general, maximum lot coverage should be consistent with requirements for other types of development within the zoning district. Separate maximum lot coverage may be imposed if there is a compelling reason to do so where necessary to protect public health, safety or welfare.

Maximum lot coverage shall be [X]%. The coverage area should include the entire installation including, but not limited to, all solar panels, fenced area, appurtenances including but not limited to battery energy storage systems, buildings, storage areas, construction staging and lay-down areas, and transformers and poles, site access roads, and parking along with a perimeter area around all the above or all areas of disturbed land, whichever is greater.

Height

In general, height standards and measurements should be consistent with requirements for other types of structures within the zoning district. Separate height requirements may be imposed if there is a compelling reason to do so where necessary to protect public health, safety or welfare. For example, the town may consider limiting the height within/adjacent to scenic resources or where visual impacts may be significant.

The height of any structure associated with a Large-Scale Ground-Mounted Solar Photovoltaic Installation shall not exceed [X] feet.

-OR-

Solar photovoltaic arrays shall not exceed [X] feet in height off the ground at their tallest orientation as measured at the [average or highest] point of the ground under the array.

APPURTENANT / ACCESSORY STRUCTURES

Regulations governing appurtenant/accessory structures are typically contained in a town's zoning bylaw and should be referenced here.

All appurtenant structures to Large-Scale Ground-Mounted Solar Photovoltaic Installations shall be subject to reasonable regulations concerning the bulk and height of structures, lot area, setbacks, open space, parking and building coverage requirements. All such appurtenant structures, including but not limited to, equipment shelters, storage facilities, transformers, and substations, shall be screened from view by vegetation or structures using traditional development forms and materials. Whenever reasonable, structures should be joined or clustered to avoid adverse visual impacts.

Battery Energy Storage Systems

Battery Energy Storage Systems may not be located in Massachusetts Department of Environmental Protection designated Zone 1 Wellhead Protection Areas²¹ or in the Federal Emergency Management Agency designated Flood Hazard Area²².

The system must be contained within a structure with the following features: a temperature and humidity-maintained environment; an impervious floor with a containment system for potential leaks of hazardous materials; a smoke/fire detection, fire alarm, and fire suppression system; a thermal runaway system; and a local disconnect point or emergency shutdown feature. The containment area must be designed so that in event of a fire, fire extinguishing chemicals will be completely contained.

The structure and systems must be approved by the [Town] Fire Chief and must be designed and installed in accordance with all applicable State codes and safety requirements as well as safety measures recommended by the National Fire Protection Association's Standard for the Installation of Stationary Energy Storage Systems²³. The applicant shall provide for annual training of [Town] Fire Department staff in coordination with the Fire Chief. Periodic inspections to ensure the integrity of the batteries, other equipment, and the containment system may be required as conditions of the site plan review [or special permit].

Battery energy storage units shall be limited to only those needed to support the solar installation at the site, their total maximum power output may not exceed the nominal rated kW generating capacity of the installation as measured in direct current, and the storage capacity should not be larger than that required to provide electricity at that maximum power output for a period of [X] hours.

Spent or expired battery units must be immediately removed from the site and disposed of in accordance with applicable local, state, and federal hazardous waste disposal laws and regulations.

COMPLIANCE WITH LAWS, ORDINANCES AND REGULATIONS

The construction and operation of all Large-Scale Ground-Mounted Solar Photovoltaic Installations shall be consistent with all applicable local, state, and federal requirements, including but not limited to all applicable safety, construction, electrical, and communications requirements. All buildings and

²¹ [MassGIS Data: MassDEP Wellhead Protection Areas \(Zone II, Zone I, IWPA\) | Mass.gov](#)

²² [FEMA Flood Map Service Center | Welcome!](#)

²³ [NFPA 855: Standard for the Installation of Stationary Energy Storage Systems](#)

fixtures forming part of a Large-Scale Ground -Mounted Solar Photovoltaic Installation shall be constructed in accordance with the State Building Code.

BUILDING PERMIT

If a town has an existing building permit provision , reference it here.

No Large-Scale Ground -Mounted Solar Photovoltaic Installation shall be constructed, installed , or modified as provided in this section without first obtaining a building permit.

FEES

If a town has an existing schedule of development fees, reference it here.

The application for a building permit for a Large-Scale Ground -Mounted Solar Photovoltaic Installation must be accompanied by the fee required for a building permit.

Site Plan Review and Performance Standards

If a town has existing site plan review or special permit procedures elsewhere in its zoning bylaw, reference those here. Bylaw authors should cross-reference such procedures with other sections of this or other town bylaws, while being mindful of potential conflicts in such procedures under this bylaw and the town's zoning bylaw.

Large-Scale Ground -Mounted Solar Photovoltaic Installations shall undergo site plan review by the Planning Board prior to construction, installation , or modification as provided in this section. The Planning Board shall consider and apply the requirements set forth in this bylaw in reviewing and deciding an application for site plan [or special permit] approval. If the provisions of site plan review under this bylaw are in conflict with the site plan review of the [Town] zoning bylaw, the regulations pertaining to site plan review of the Large-Scale Ground -Mounted Solar Photovoltaic Installation shall apply.

For designated Green Communities, in accordance with Section 10(c) of the Massachusetts Green Communities Act, the solar photovoltaic installation application and permitting process shall be expedited, and shall not exceed one (1) year from the date of initial application to the date of final approval. Regardless of any Green Communities designation, towns may choose to include a provision for expedited permitting of solar photovoltaic installations in accordance with law.

The applicant shall participate in a pre -application conference with the Planning Board prior to the submittal of a formal application to discuss required documents, including site -specific analyses.

All plans and maps shall be prepared, stamped , and signed by a Professional Engineer licensed to practice in Massachusetts. All applications and plans shall be filed with the Planning Board , along with the applicable [filing , review] fee.

The application packet must contain all the appropriate application fees, forms , and number of copies of all plans and supporting documentation , as well as required additional information . The application packet shall be submitted to the Town Clerk who shall stamp the application with the date received and shall immediately notify the Chair of the Planning Board of a submitted application packet.

The Planning Board shall, within thirty (30) calendar days of the receipt of the application by the Town Clerk, determine whether the application is complete or incomplete and shall notify the applicant in writing by certified mail. If the Planning Board determines the application to be incomplete, the Board shall provide the applicant with a written explanation as to why the application is incomplete and request the information necessary to complete the application. Any additional information submitted by the applicant starts a new thirty (30) calendar day completeness review.

Upon receipt of an application, the Planning Board may engage, at the applicant's cost, professional and technical consultants, including legal counsel, to assist the Planning Board with its review of the application, in accordance with the requirements of M.G.L. Chapter 44 Section 53G²⁴. The Planning Board may direct the applicant to deposit funds with the Planning Board for such review at the time the application is determined to be complete and may direct the applicant to add additional funds as needed upon notice. Failure to comply with this section shall be good grounds for denying the application. Upon approval of the application, any excess amount attributable to the application processing by the Planning Board, including any interest accrued, shall be refunded to the applicant.

Regulation is defined as unreasonable if it "imposes excessive costs on the applicant" and therefore, Planning Boards should be cognizant of this limitation when establishing fair costs for any consultants.

The Planning Board may impose reasonable terms and conditions on the construction, installation , or modification of any Large-Scale Ground-Mounted Solar Photovoltaic Installation , but it shall not have discretionary power to deny the use.

The Planning Board may want to include required findings or specify matters it will consider in its approval or denial of a permit as consistent with the public health, safety and welfare provisions of the Zoning Act. Such findings or matters may include, but are not limited to :

²⁴ [General Law - Part I, Title VII, Chapter 44, Section 53G \(malegislature.gov\)](https://malegislature.gov/Laws/General-Laws/Part-I/Title-VII/Chapter-44/Section-53G)

1. *The proposed development's consistency with the [Town] Local Comprehensive Plan [and/or any other local planning documents such as Open Space and Recreation Plan or Vision Plan]*
2. *The proposed development's consistency with local zoning (while being cautious of potential conflicts in provisions of site plan review under this bylaw and site plan review of the [Town] zoning bylaw);*
3. *The proposed development's consistency with the general purpose and intent of this bylaw;*
4. *The proposed development's consistency with the character and scale of other developments permitted in the same district and the maintenance of the community's character in the area surrounding the site;*
5. *The rights of abutting and neighboring landowners to live without undue disturbance or exposure to pollutants from the development;*
6. *The protection of natural, cultural and scenic resources on and around the site.*

REQUIRED DOCUMENTS

Bylaw authors should cross-reference required documents with other sections of this or other town bylaws that describe those documents in more detail, as applicable, while being mindful of potential conflicts in provisions of site plan review under this bylaw and site plan review of the town's zoning bylaw.

The town may want to specify that the applicant should include details about the qualifications and/or resumes of the project team(s) for specific plans, reports or assessments (e.g. Stormwater Management Plan, Visual Impact Assessment)

Pursuant to the site plan review process, the project proponent of a Large-Scale Ground-Mounted Solar Photovoltaic Installation shall provide the following documents:

1. An existing conditions plan with property lines and physical features, including abutting land uses and location of structures within [X] feet of the site, topography and roads, characteristics of vegetation (mature trees, shrubs, open field, etc.), and wetlands, for the project site;
2. Proposed changes to the landscape of the site including grading, vegetation clearing and planting, exterior lighting including locations, type and wattage, screening vegetation or structures, sign(s) location(s), service vehicle parking and access roads, and storm water management systems. The square footage of each disturbed area shall be identified on a plan, and details of any site alteration, including number, sizes, and species of trees to be removed, shall be provided. A calculation of slopes throughout the site as a percentage over consecutive 100-foot distances;
3. Blueprints or drawings of the solar photovoltaic installation signed by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts showing the proposed layout of the system, any potential shading from nearby structures or vegetation, the distance between the

- system and all property lines, existing on-site buildings and structures, and the tallest finished height of the solar array;
4. One- or three -line electrical diagram detailing the solar photovoltaic installation, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and overcurrent devices ;
 5. Documentation and technical specifications of the major system components to be used, including the photovoltaic panels, mounting system, inverter (s), and any storage batteries ;
 6. Proposed wattage of the solar photovoltaic installation solar power generation indicated in both direct current (DC) and alternating current (AC) – a notation shall be included explaining the difference, e.g. loss in conversion from DC to AC;
 7. Locations and details of all security measures for the site;
 8. Name, address, and contact information for proposed system installer ;
 9. Name, address, phone number, and signature of the project proponent, as well as all co - proponents or property owners, if any ;
 10. The name, contact information and signature of any agents representing the project proponent ;
 11. Documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed solar photovoltaic installation ;
 12. A plan for the operation and maintenance of the solar photovoltaic installation ;
 13. Zoning district designation for the parcel(s) of land comprising the project site (submission of a copy of a zoning map with the parcel(s) identified is suitable for this purpose) ;
 14. A utility connection plan, and an acknowledgment of application from the electric utility ;
 15. A list identifying all off -site electrical system improvements necessary to the electrical grid to accommodate the power from the proposed installation and identification of what entity is paying for such improvements. ;
 16. Proof of liability insurance. The owner or operator of the Large-Scale Ground-Mounted Solar Photovoltaic Installation shall provide the Town Clerk with a certificate of insurance showing that the property has sufficient liability coverage pursuant to industry standards ;
 17. A public outreach plan, including a project development timeline, which indicates how the project proponent will meet the required site plan review notification procedures and otherwise inform abutters and the community ;
 18. Description of financial surety ;
 19. Proof that the project proponent will meet the required site plan review notification procedures ;
 20. Pre-construction photos from the right -of-way and nearest abutters. These photos should include tree coverage ;
 21. A visualization (rendering or photo simulation) of post -construction solar development, including perspectives from right -of-way(s), nearest abutting properties or residential structures, and tree coverage. The Planning Board may determine additional visualizations and/or visual impact

analysis to be submitted for review in cases where the Planning Board or Town staff determine the project is likely to be visible from significant areas;

22. A glare analysis and proposed mitigation, if any, to minimize the impact on affected properties and roads ;
23. Documentation by an acoustical engineer of the noise levels projected to be generated by both the installation and operation of the facilities ;
24. Location and approximate height and percent tree cover on the site at the time of application filing. Trees with a diameter at breast height (DBH) of [X]" or greater within project parcel(s) shall be identified to determine tree loss, along with inventorying of diseased or hazard trees slated to be removed due to proposed development ;

Defining a specimen tree on Cape Cod will vary depending on the species of tree, but typically softwoods greater than 18" DBH and hardwoods greater than 12" DBH are considered specimens.

25. Documentation of all soils types, as identified on the United States Natural Resources Conservation Service soils survey, on all land involved with the project;
26. Locations of natural and cultural resources based on reviews of publicly available data or consultation with Town staff and state agencies. Such locations to include:
 - o Active farmland, cranberry bogs, and prime farmland soils; floodplains; wetlands and vernal pools; wellhead protection areas; permanently protected open space; Natural Heritage & Endangered Species Program (NHESP) Estimated and Priority Habitats, BioMap2 Critical Natural Landscape and Core Habitat;
 - o Locations of inventoried historic buildings, Local or National Register Historic Districts, and Scenic Roads or Byways; and archaeologically sensitive areas.

These locations can be identified using the Cape Cod Commission's Large-Scale Solar Screening Tool; MassGIS²⁵; the Massachusetts Historical Commission's (MHC) Massachusetts Cultural Resources Information System (MACRIS)²⁶ and through filing a Project Notification Form (PNF)²⁷ with MHC; reviewing local plans such as [Town] Local Comprehensive Plan and [Town] Open Space and Recreation Plan; and through consultation with Town staff. The Planning Board, at its discretion, may require these locations be described on a map and/or in a narrative depending on the sensitivity of the resources identified;

27. Stormwater management and erosion and sediment control plans;
28. A complete list of chemicals, fuels, and any other hazardous materials to be used in both the construction and operation phase;

²⁵ [OLIVER \(state.ma.us\)](http://oliver.state.ma.us)

²⁶ [Welcome to MACRIS \(mhc-macris.net\)](http://welcome-to-macris.mhc-macris.net)

²⁷ [pnf.pdf \(state.ma.us\)](http://pnf.pdf(state.ma.us))

29. A calculation of earthwork operations listing the amount of soil and /or rock to be imported or exported from the site. If any material is to be imported, such material shall be clean and without contamination by hazardous substances or invasive species and must be obtained from a source(s) approved by the [Town] DPW.
30. Provision of water including that needed for fire protection;

Upon the applicant's written request submitted as part of the application, the Planning Board may waive any documentary requirements as it deems appropriate.

A town may consider recommending Pollinator-Friendly Certification through UMass Clean Energy Extension²⁸, and, if so, could include: "For those projects seeking Pollinator-Friendly Certification through the UMass Clean Energy Extension, the Large-Scale Ground-Mounted Solar Photovoltaic Installation shall not be constructed until proof has been given to the Planning Board that the project proponent has obtained such Certification at a minimum of the [Certified, Silver, or Gold] Certification Level, or other equivalent certification as determined by the Planning Board. This certification must be maintained throughout the life of the installation. "

A town may consider including language regarding consultation with other departments and entities and, if so, could include: "No building permit shall be issued and no application for such permits shall be accepted for construction, exterior alteration, relocation, or change in use except where noted in Section [X], unless a site plan has been endorsed by the Planning Board, after consultation with other boards, including but not limited to the following: Building Inspector, Board of Health, Select Board or Town Council, Historical Commission, Historic District Commission (if applicable), Conservation Commission, Department of Public Works, Fire Department, and Police Department. The Planning Board may waive any or all requirements of site plan review for external enlargements of less than 10% of the existing occupied area."

SITE CONTROL

The project proponent shall submit documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed Large-Scale Ground-Mounted Solar Photovoltaic Installation.

OPERATION AND MAINTENANCE PLAN

The project proponent shall submit a plan for the operation and maintenance of the Large-Scale Ground-Mounted Solar Photovoltaic Installation, which shall include measures for maintaining safe

²⁸ [Clean Energy: Pollinator-Friendly Solar PV for Massachusetts | UMass Center for Agriculture, Food and the Environment](#)

access to the installation, storm water controls, storm preparedness and response, hazardous materials and waste management, as well as general procedures for and frequency of operational maintenance of the installation. A signed agreement with a maintenance company shall be included, as applicable.

The Operation and Maintenance Plan shall include measures for maintaining year-round safe access for emergency vehicles, snow plowing, storm water controls, and general procedures, and a yearly schedule for the operation and maintenance of the facilities including fencing, and maintenance of landscaping. As much as possible, consideration should be given to performing operations and maintenance using electric vehicles and equipment to decrease noise and air pollution.

The Operation and Maintenance Plan should include a training component and schedule for emergency services staff along with any designees the Planning Board deems necessary.

UTILITY NOTIFICATION

No Large-Scale Ground-Mounted Solar Photovoltaic Installation shall be constructed until evidence has been given to the Planning Board that the utility company that operates the electrical grid where the installation is to be located [Eversource] has been informed of the solar photovoltaic installation owner or operator's intent to install an interconnected customer-owned generator as well as documentation from said utility that it will connect the proposed customer-owned generator into its power grid. Off-grid systems shall be exempt from this requirement.

DESIGN STANDARDS

Access Roads

Access roads shall be planned and constructed in consultation with the Department of Public Works and to minimize grading, stormwater runoff, removal of trees, and to minimize impacts to natural or cultural resources. At the Planning Board's discretion, roads should be curved to limit direct views into the project, especially from scenic roads.

Lighting

Lighting of solar photovoltaic installations shall be consistent with local, state, and federal law. Lighting of other parts of the installation, such as appurtenant structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Where feasible, lighting of the solar photovoltaic installation shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

Lighting of solar photovoltaic installations shall be limited to night-time maintenance and inspections by authorized personnel. All lighting shall comply with International Dark Sky Standards Fixture Seal of Approval²⁹ certification requirements. There should be no illumination when personnel are not on the site.

Signage

Signs on Large-Scale Ground-Mounted Solar Photovoltaic Installations shall comply with [Town] sign bylaw. A sign consistent with [Town] sign bylaw shall be required to identify the owner and provide a 24-hour emergency contact phone number of the installation owner or operator. Solar photovoltaic installations shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the solar photovoltaic installation.

Towns may want to include exceptions for no-trespassing signs and any signs required to warn of danger. Towns may also want to consider educational signs providing information about the project. If the town's sign bylaw does not already address educational signage, the town should define appropriate size, materials, and placement. As much as possible, signs should be grouped together to reduce sign clutter.

Utility Connections

Reasonable efforts, as determined by the Planning Board, shall be made to place all utility connections from the solar photovoltaic installation underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

Glare

Solar panels, to the maximum extent feasible, shall be positioned and landscaped so as not to create glare and to minimize glare on surrounding occupied structures. The Large-Scale Ground-Mounted Solar Photovoltaic Installation shall be positioned to minimize glare on any residence or public way. The applicant should submit a ratings and technical specifications for the solar panels to ensure minimal reflectivity.

The design of the installation shall prevent reflected solar radiation or glare from becoming a public nuisance or hazard to adjacent buildings, roadways, or properties. Design efforts may include, but not be limited to, deliberate placement and arrangement on the site, anti-reflective materials, solar glare modeling, and screening in addition to required landscaping.

²⁹ [Fixture Seal of Approval | International Dark-Sky Association \(darksky.org\)](#)

Any ground -mounted solar photovoltaic array installation proposed within a 5 -mile radius o f an airport shall be analyzed for glare utilizing any glare analysis compatible with FAA policy³⁰.

Visual Impact

Guidance for conducting a visual impact assessment can be found in the Cape Cod Commission's Technical Bulletins for Visual Impact Assessment (VIA) Methodology for Offshore Development³¹ and Guidelines for DRI Review of Wireless Communication Towers³² – although prepared for other types of development, these methods and guidelines can be adapted to large-scale ground-mounted solar photovoltaic development.

A visual impact assessment shall be conducted that follows established protocols . Such assessment should include the following:

1. Design Narrative . A narrative that describes how the project has been configured or located and how it avoids or minimizes visual impacts. Maps and documentatio n of the analysis conducted shall accompany the narrative and be used to generally describe the anticipated visibility of the project. The narrative should provide details concerning alternative configurations or sites that were evaluated in the design pro cess and the design/mitigation strategies employed to reduce any visual impact to sensitive resources .
2. Inventory. An inventory and description of the cultural and scenic resources located within the viewshed of the proposed activity , including historic structures and historic districts ; scenic roads, cultural landscapes, and vistas (open areas that are visible from public roads); and recreational area s. Information on these resources may be found by searching MACRIS and the Cape Cod Commission's Large-Scale Solar Screening Tool, and by reviewing [Town]'s Local Comprehensive Plan, Open Space and Recreation Plan, and other local plan s.
3. Visualizations and simulations. With input from the Planning Board, the applicant shall utilize tools such as photo -simulations and/or viewshed analyses through renderings, line -of-sight studies, and/or two - or three -dimensional visualizations (i.e., photomontage, video montage, animation produced through Spatial Information Systems (SIS) and Geographic Information Systems (GIS)) to assess the visual impacts and describe the anticipated effect of the proposed project on the region's scenic and cultural resources. The number of simulations required will depend on the anticipated impact and the sensitivity of the resources present . The visual impact assessment should include consideration of all parts of the project, including all associated

³⁰ [2021-09862.pdf \(govinfo.gov\)](#)

³¹ https://www.capecodcommission.org/resource_library/file/?url=/dept/commission/team/Website_Resources/regulatory/VIA_TechBulletin12_001_Final.pdf

³² [Microsoft Word - WirelessTechBulletin093010.doc \(capecodcommission.org\)](#)

infrastructure. In the event more than one alternative is being considered, the visual impact of all alternatives should be evaluated by the applicant. The assessment should map locations along local public ways where the solar installation is visible above visual horizon and anticipate locations, such as high elevation points or across waterbodies, where distant views are possible. Confer with [Town] staff to identify points of view of particular interest or concern to be documented at the time of the visual impact assessment.

4. Mitigation. Proposed mitigation measures, as applicable. Mitigation may include careful siting, siting away from scenic resources and key viewsheds, curvilinear access roads, and screening.

Fencing

Appropriate measures shall be taken to prevent the solar arrays from being damaged or tampered with by individuals trying to access the area of the installation. The method of securing the site shall be subject to the approval of the Planning Board.

The need for fencing shall be determined by the applicant unless such fencing is needed to comply with town bylaws and/or as required per the National Electrical Code. If installed, such fencing shall be no more than 10 feet tall, shall be placed at least 6 inches off the ground to allow migration of wildlife, and shall have an Emergency Access System padlock or box at each gate. The fence shall be consistent with the character of surrounding properties, set back from roadway frontage and public areas, and screened by vegetation.

Screening

The Large-Scale Ground-Mounted Solar Photovoltaic Installation shall be designed to minimize its visibility, including preserving natural vegetation to the maximum extent possible, blending in equipment with the surroundings, adding vegetative buffers and/or fencing to provide an effective visual barrier from adjacent roads and driveways, and from abutting dwellings.

The installation shall be effectively screened year-round from all public and private ways and from adjacent residential lots. The Planning Board may alter or waive this requirement if such screening would have a detrimental impact on the operation and performance of the array.

Where existing vegetation in the setbacks is insufficient to achieve year-round screening, additional screening shall be provided including, but not limited to, planting of dense vegetative screening, fencing, berms, use of natural ground elevations, and/or land contouring, all depending on site specific conditions. Tree cutting within the required setback area shall not be permitted if it would reduce to any degree the effectiveness of the year-round screening.

If additional plantings are required for screening, a planting plan shall be submitted showing the types, sizes, and locations of material to be used, using a diversity of plant species native to Cape

Cod or New England and shall be subject to the approval of the Planning Board. Plantings shall include a variety of native trees and shrubs of varying heights, staggered to effectively screen the installation from view during construction and operations. The depth of the vegetative screen shall be a minimum of [X] feet. At least 75% of the plantings shall consist of evergreens and shall be evenly spaced throughout the setback area.

A recommendation for the minimum depth of the vegetative screen is 50 feet depending on required setbacks and at the discretion of the Planning Board.

Additional plantings should include native plants that provide food, pollen, and/or shelter for native wildlife and/or follow a “food forest” model, integrating trees, shrubs, perennial plants and groundcovers to mimic a native woodland that creates habitat for local wildlife and provides food for humans and wildlife.

Use of invasive plants, as identified by the most recent version of the “Massachusetts Prohibited Plant List” maintained by the Massachusetts Department of Agricultural Resources, is prohibited. Cultivars of native plants may be acceptable if sourcing of native species is not possible.

Planting of the vegetative screening shall be completed prior to connection of the installation. Plants shall be maintained and replaced if unhealthy by the owner/operator of the installation for the life of the installation.

Large-Scale Ground -Mounted Solar Photovoltaic Installations shall not be approved unless the system design provides screening and buffers to protect scenic vistas and view sheds from residential uses, public streets and any waterways or water bodies.

SAFETY AND ENVIRONMENTAL STANDARDS

Emergency Services

The Large-Scale Ground-Mounted Solar Photovoltaic Installation owner or operator shall provide a copy of the project summary, electrical schematic, and site plan to the local Fire Chief. Upon request the owner or operator shall cooperate with local emergency services in developing an emergency response plan, which may include ensuring that emergency personnel have immediate, 24-hour access to the facility. All means of shutting down the solar photovoltaic installation shall be clearly marked on the plan. The owner or operator shall identify a responsible person for public inquiries throughout the life of the installation, whether or not operational. These components shall be included in the Operation and Maintenance Plan.

The Operation and Maintenance Plan shall periodically be jointly reviewed and updated as necessary by the operator of the installation and the [Town] Fire and Police Departments at a frequency to be determined by the [Town] Fire Department. Safety personnel may request at any

time that the operator provide onsite training in accessing and shutting down the operation of the installation.

The operator shall identify a qualified contact person who will provide assistance to local officials during an emergency. The operator shall update the contact information whenever there is a change in the contact person.

Storm Preparedness

Large-Scale Ground-Mounted Solar Photovoltaic Installations shall include racking, foundations, and module connection systems designed to withstand sustained hurricane-force winds or damage from wind-blown debris. Storm preparedness and response considerations shall be included in the Operation and Maintenance Plan.

Land Clearing

Archaeological Impacts

Any work on undeveloped properties, or on land that has not been disturbed in recent history, requires consideration of archaeological resources to determine whether significant resources are present. All archaeological investigations and site work requires a permit from the State Archaeologist at MHC. MHC maintains an inventory of known archaeological sites and uses that information to build a predictive model to estimate where other archaeological sites are likely to be found. Depending on the amount of ground disturbance proposed, if a property is thought to be archaeologically sensitive, or likely to contain archaeological resources, an archaeological survey may be required – tree removal and re-grading would require an archaeological survey, whereas projects with minimal ground disturbance and using minimal soil impact methods may not.

Natural Resources Impacts

At the Planning Board's discretion, the applicant may be required to provide a natural resources inventory describing the soils, vegetation, wildlife, and wetlands on and around the site that may be adversely impacted by the development and to help inform project design and mitigations. Guidance for conducting such an inventory can be found in the Cape Cod Commission's Wildlife and Plant Habitat Technical Bulletin³³.

Clearing of natural vegetation and soils shall be limited to what is necessary for the construction, operation, and maintenance of the proposed installation or otherwise prescribed by applicable laws, regulations, and bylaws.

³³ [Wildlife and Plant Habitat Technical Bulletin \(capecodcommission.org\)](https://www.capecodcommission.org/wildlife-and-plant-habitat-technical-bulletin)

Existing vegetative cover, root structures, flat field or gravel areas, and topsoil shall be maintained to the maximum extent practicable to prevent soil erosion. Any displaced soils shall be returned to the areas affected, except soils likely to be infested with invasive plants seeds which should be disposed of in a manner that does not allow seeds or vegetative material contained within the soil to regrow. Ground surface areas beneath solar arrays and setback areas shall be pervious to maximize on-site infiltration of stormwater. Where removal of naturally occurring vegetation such as trees and shrubs is planned, the owner of the installation must demonstrate that the removal of this vegetation is necessary, and its presence adversely affects the performance and operation of the installation.

To avoid or minimize greenhouse gas emissions from cleared trees and shrubs and the need to transport these to landfills or other distant disposal sites, as practicable and depending on site conditions and in accordance with local, state, and federal waste disposal regulations, consideration should be given to the reuse on site of tree and shrub debris as wildlife habitat features, landscaping mulch, and/or for erosion and sediment control.

Applicants should be encouraged to explore opportunities to repurpose downed trees into durable wood products to retain stored carbon. As an alternative to transporting tree and shrub debris to be burned at a waste-to-energy facility off-Cape, applicants should endeavor to make suitable firewood available to residents of the local community who heat their homes with wood.

Ballasts, screw-type, or post driven pilings and other acceptable minimal soil impact methods that do not require footings or other permanent penetration of soils for mounting are required, unless the need for alternatives can be demonstrated. Any soil penetrations that may be required for providing system foundations necessary for additional structural loading or for providing system trenching necessary for electrical routing shall be done with minimal soils disturbance, with any displaced soils to be temporary and recovered and returned after penetration and trenching work is completed. No concrete or asphalt shall be allowed in the mounting area other than ballasts or other code required surfaces, such as transformer or electric gear pads. The use of geotextile fabrics shall be limited.

A Large-Scale Ground-Mounted Solar Photovoltaic Installation shall, to the greatest extent practicable, be clustered and located in or adjacent to areas of the site where the land has already been cleared of vegetation to avoid habitat fragmentation.

Vegetation Plantings and Plant and Animal Management

The open areas within the solar array and between the array and any vegetated buffers, including stormwater management areas, shall be seeded with a native seed mix, with a preference for native groundcovers and deep-rooted native grasses suitable for site stabilization and erosion control and adapted to the Cape's poor acidic and sandy soils, and that are low-maintenance (i.e., requiring no fertilizers, pesticides, or herbicides; no irrigation except as may be necessary for initial plant

establishment; and no or minimal mowing), drought-tolerant, and attractive to native pollinators and other wildlife, and maintained as plant, bird and insect habitat. A diversity of plant species native to Cape Cod or New England shall be used. Use of invasive plants, as identified by the most recent version of the "Massachusetts Prohibited Plant List" maintained by the Massachusetts Department of Agricultural Resources, is prohibited.

Alternative vegetation or cover options may be proposed by the applicant in consideration of soil type and quality, subject to the approval of the Planning Board. Such alternatives may include agricultural crops, for example on sites with Prime Farmland Soils.

Existing gravel areas that are well drained and stable do not require the addition of topsoil. To avoid the introduction of invasive plant seeds, topsoil shall not be imported into any project sites unless there is a demonstrated engineering need and must be approved by the Planning Board prior to any introduction.

Mowing may only be done to retain a natural functioning of the landscape. Plants shall be maintained and replaced as necessary by the owner of the Large-Scale Ground-Mounted Solar Photovoltaic Installation for the life of the installation.

Herbicides, rodenticides, or any other pesticides may not be used to control vegetation or animals at a Large-Scale Ground-Mounted Solar Photovoltaic Installation, except where herbicide use has been approved by the Planning Board for control of invasive species [and consistent with all applicable town bylaws and policies]. In a dual-use agriculture and solar photovoltaic installation, the agricultural operator, but not the solar installation operator, is exempt from this restriction. The plan for vegetation control, and if applicable, animal control, shall be included in the Operation and Maintenance Plan.

The introduction of invasive species shall be prevented to the greatest extent practicable during any construction, maintenance, or removal of a solar photovoltaic installation, through the use of current best practices.

Additional considerations to protect the water supply in zoning regulations: Require planting of low growing groundcovers or grasses or regular mowing of other types of grasses to ensure minimal fuel for wildfires in areas around panels.

Storm water Management

If a town has an existing stormwater management bylaw, reference it here. The following is included for consideration for those municipalities without a separate stormwater management bylaw. If a town chooses to include a stormwater management section in its solar bylaw, it should be careful it does not conflict with any of its other stormwater management regulations.

Effective storm water and erosion controls shall be maintained at all times. All storm water control measures shall either maintain or diminish preexisting runoff conditions.

A Stormwater Management Plan must be submitted with the stamp and signature of a Registered Professional Engineer (PE) who is licensed in the Commonwealth of Massachusetts. The Stormwater Management Plan shall conform to the more stringent of any conditions or standards of this subsection and the Massachusetts Department of Environmental Protection's Stormwater Handbook³⁴, as amended. The Stormwater Management Plan shall contain sufficient information for the Planning Board to evaluate the environmental impact and effectiveness of the measures proposed for retaining stormwater on the parcel site and shall fully describe the project in drawings, narrative, and calculations. It shall include:

- a) The site's existing and proposed topography;
- b) All areas of the site designated as open space;
- c) A description and delineation of existing stormwater conveyances, impoundments, environmental resources on or adjacent to the site into which stormwater flows;
- d) A delineation of 100-year flood plains, if applicable;
- e) Estimated seasonal high groundwater elevation in areas to be used for stormwater retention, detention, or infiltration;
- f) Existing and proposed vegetation and ground surfaces with runoff coefficients for each;
- g) Calculations for the 2-, 10-, and 50-year return period utilizing NRCS TR-55 Handbook³⁵. Pipe sizes, depth of flow, capacities and velocities shall be included;
- h) A drainage area map showing pre- and post-construction watershed boundaries, drainage area and stormwater flow paths, including municipal drainage system flows, at a scale that enables verification of supporting calculations;
- i) A recharge analysis that calculates pre- and post-construction annual groundwater recharge rates on the parcel;
- j) A description and drawings of all components of the proposed stormwater management system;
- k) Hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in the Massachusetts Stormwater Handbook;
- l) Soils information from test pits performed at the location of proposed stormwater management facilities, including soil descriptions, depth to seasonal high groundwater and depth to bedrock. Soils information will be based on site test pits logged by a Massachusetts Certified Soil Evaluator;

³⁴ [Massachusetts Stormwater Handbook and Stormwater Standards | Mass.gov](#)

³⁵ [TR-55 Cover \(hydrocad.net\)](#)

m) Any construction phasing proposed to mitigate stormwater impacts .

All stormwater infrastructure shall be owned and maintained by the owner of the installation and shall be located on the same parcel as the solar installation.

All post-development stormwater, up to and including a 50 -year return frequency 24 -hour storm, shall be retained on the parcel site and infiltrated into the soil through low-impact development, retention and infiltration basins. At no time may stormwater be carried off site.

Emergency overflows for storms in excess of the 50 -year return frequency may be permitted provided it is demonstrated that no flooding or damage would be caused by the overflow. Attenuation of the discharge may be required as needed as determined by the Planning Board .

All pipes, catch basins and other materials utilized in the stormwater facilities shall be approved by the [Town] Department of Public Works, or designee.

To ensure proper containment and stabilization of the site during the construction phase, a Stormwater Pollution Prevention Plan to control construction -related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities , shall be developed and implemented. Such plan shall be developed to document compliance with the Massachusetts Stormwater Handbook.

A Long-Term Stormwater Operation and Maintenance Plan shall be developed and implemented to ensure that stormwater management systems function as designed. Such plan shall be developed to document compliance with the Massachusetts Stormwater Handbook.

The Long-Term Stormwater Operation and Maintenance Plan shall at a minimum include:

- a) Stormwater management system(s) owners;
- b) The party or parties responsible for operation and maintenance of all aspects of the stormwater management system;
- c) The routine and non -routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;
- d) A plan that is drawn to scale and shows the location of all stormwater control measures;
- e) A schedule for routine inspections as well as a description of storms that would trigger immediate inspections following the storm;
- f) An inspection and maintenance log form ;
- g) An estimated stormwater operations and maintenance budget ;
- h) Permission from the operator to allow agents of the Town of [X] to enter and inspect the premises to evaluate and ensure that the responsible party complies with the Long -Term Stormwater Operation and Maintenance Plan requirements for each measure .

During times of construction and post-construction where stormwater generated from the project area may inadvertently enter the public way, the owner shall be responsible for direct costs incurred by the town, including but not limited to stormwater related clean up, sanding, salting, street sweeping or other necessary management when required for the protection of public health and safety.

Hazardous Waste

No hazardous waste shall be discharged on the site. Hazardous materials stored, used, or generated on site shall not exceed the amount for a Very Small Quantity Generator of Hazardous Waste as defined by the Massachusetts Department of Environmental Protection pursuant to 310 CMR 30.000³⁶ and shall meet all requirements of the Department of Environmental Protection including storage of hazardous materials in a building with an impervious floor that is not adjacent to any floor drains to prevent discharge to the outdoor environment.

If any hazardous materials, including, but not limited to, lithium-ion storage batteries, are used within the solar electric equipment, then impervious containment areas capable of controlling and containing any release of hazardous materials to the environment and to prevent potential contamination of groundwater are required.

To mitigate the potential for hazardous materials release from any proposed transformers, only non-toxic biodegradable transformer fluid or dry cooled transformers are to be used.

A list of any hazardous materials proposed to be located on the site and a plan to prevent their release shall be provided to the Planning Board and Fire Chief.

Mitigation

Mitigation for Loss of Wildlife Habitat within the Installation

If undeveloped forested land is proposed to be converted to a Large-Scale Ground -Mounted Solar Photovoltaic Installation, the plans shall show mitigation measures that create a native wildlife habitat within and immediately around the installation and a successional forest in the surrounding areas managed to prevent shading until the installation is decommissioned and the site restored to forest.

Mitigation for Loss of Carbon Sequestration and Forest

If undeveloped forested land is proposed to be converted to a Large-Scale Ground -Mounted Solar Photovoltaic Installation, the plans shall designate an area of unprotected land (i.e., land that could

³⁶ [310 CMR 30.000: Massachusetts Hazardous Waste Regulations | Mass.gov](https://www.mass.gov/info-details/310-cmr-30.000-massachusetts-hazardous-waste-regulations)

otherwise be developed under current zoning) on contiguous parcels or nearby, or location within the municipality agreed upon by the Planning Board in consultation with the Conservation Commission, under common ownership that comprise the project site, and of a size equal to [X] times the total area of such forest conversion. Such designated land shall remain in substantially its natural condition without alteration except for routine natural resources management practices until such time as the installation is decommissioned and the site restored to forest. The special permit may be conditioned to effect and make enforceable this requirement.

As an alternative to forest protection, municipalities can also consider a tree replacement bylaw for solar development that clears large acreages of trees. This can be applied to all types of development that are regulated by the zoning code. For an example tree replacement bylaw, see Appendix E in the Pioneer Valley Planning Commission's Solar Best Practices Guide.

Sound

If the town has an existing noise bylaw, reference it here.

Noise generated by ground-mounted solar photovoltaic installations, cooling fans, inverters, associated equipment, and machinery shall conform at a minimum to applicable state and local noise regulations, including the Department of Environmental Protection's Division of Air Quality noise regulations (310 CMR 7.10)³⁷.

The sound levels under normal operating conditions, measured at the boundary of the lot on which the installation is sited, shall not be more than [X] decibels greater than would otherwise exist in the absence of such a facility.

Noise reduction shall be considered and incorporated as needed during the design phase of the installation including the location of the noise generator, shielding, noise cancellation, filtering, and noise suppression.

MONITORING AND MAINTENANCE

Construction Monitoring

The Planning Board may require a third-party inspector, selected by and acting under the direction of the Building Commissioner, to be employed to monitor compliance with all approvals and conditions during the Large-Scale Ground-Mounted Solar Photovoltaic Installation's construction at the applicant's expense.

³⁷ [310 CMR 7.00: Air Pollution Control | Mass.gov](#)

Maintenance

The Large-Scale Ground-Mounted Solar Photovoltaic Installation owner or operator shall maintain the facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, and integrity of security measures. Site access shall be maintained to a level acceptable to the local Fire Chief and Emergency Medical Services. The owner or operator shall be responsible for the cost of maintaining the solar photovoltaic installation and any access road(s), unless accepted as a public way. As much as possible, consideration should be given to performing operations and maintenance using electric vehicles and equipment to decrease noise and air pollution.

Reporting

The owner or operator of a Large-Scale Ground-Mounted Solar Photovoltaic Installation shall submit an annual report demonstrating and certifying compliance with the Operation and Maintenance Plan, the requirements of this bylaw and approvals granted hereunder, including but not limited to continued management and maintenance of vegetation, compliance with the approved plans and any permit conditions, continuation of liability insurance, adequacy of road access, and functionality of stormwater management systems. The annual report shall also provide information on the maintenance completed during the year and the amount of electricity generated by the facility. The report shall be submitted to the Select Board, Planning Board, Fire Chief, Building Commissioner, Board of Health, and Conservation Commission (if a wetlands permit was issued) no later than 45 days after the end of the calendar year.

MODIFICATIONS

All material modifications to a Large-Scale Ground-Mounted Solar Photovoltaic Installation made after site plan review [or special permit] approval or issuance of the required building permit shall require approval by the Planning Board.

TRANSFER OF OWNERSHIP

If the Large-Scale Ground-Mounted Solar Photovoltaic Installation is sold, all municipal permits, conditions, and associated documentation shall remain in effect, provided that the successor owner or operator assumes in writing all the obligations of the site plan approval [or special permit], and shall be provided in both digital and hard copy format to the new owner, including [add specific documents as needed]. A new owner or operator of the installation shall notify the Planning Board and the Building Inspector of such change in ownership or operator within 30 days of the ownership change. Failure to notify the Planning Board and Building Inspector within 30 days of the transfer of ownership shall be considered abandonment in accordance with the Abandonment section of this bylaw.

The site plan [or special permit] and all other local approvals for the installation would be void if a new owner or operator fails to provide written notification to the Planning Board and the Building Inspector in the required timeframe. Reinstatement of a site plan approval [or void special permit] and any other local approvals will be subject to the same review and approval processes for new applications under the Town of [X] bylaws and regulations.

The Planning Board must be provided with updated contact information for the new owner, including name, address, telephone number, and e-mail address. Authorities having jurisdiction, including local emergency personnel, must be provided with updated emergency contact information, including an emergency contact number that is staffed 24 hours a day. The new owner must abide by all conditions as detailed in the final permit. Any proposed changes to the project shall require approval as described in the Modifications section of this zoning bylaw.

ABANDONMENT OR DECOMMISSIONING

Removal Requirements

Any Large-Scale Ground-Mounted Solar Photovoltaic Installation, or any substantial part thereof, not used in the production of electricity for a period of one continuous year or more without written permission from the Planning Board, or is operating at less than 25% of its nameplate capacity, or that has reached the end of its useful life, or has been abandoned consistent with the Abandonment section of this bylaw, shall be considered discontinued and shall be removed.

Upon written request from the Building Inspector, addressed to the contact address provided and maintained by the owner or operator as required above, the owner or operator shall provide evidence to the Building Inspector demonstrating continued use of the installation. Failure to provide such evidence within 30 days of such written request shall be conclusive evidence that the installation has been discontinued.

The owner or operator or landowner shall physically remove the installation no more than 150 days after the date of discontinued operations. The owner or operator or landowner shall notify the [Town Clerk, Planning Board, and/or Building Inspector] by certified mail of the proposed date of discontinued operations and plans for removal. Removal shall consist of:

- a) Physical removal of all Large-Scale Ground-Mounted Solar Photovoltaic Installation structures, equipment, security barriers, and transmission lines from the site.
- b) Recycling of all possible materials and removal of all remaining solid and hazardous waste in accordance with local, state, and federal waste disposal regulations.
- c) Stabilization or revegetation of the site as necessary to minimize erosion and prevent impacts to wetlands or water bodies. The Planning Board may allow the owner or operator to leave landscaping or designated below-grade foundations (provided they are filled in) to minimize

erosion and disruption to vegetation. This requirement may be waived if the landowner submits a plan for re-use of the site.

- d) Any site that was deforested for the installation shall be restored to encourage native tree growth, including the planting of seedlings, if necessary, to establish growth. The cost of plant replacement shall be incorporated into the financial surety.

Abandonment

Absent notice to the Planning Board of a proposed date of decommissioning or written notice of extenuating circumstances, the Large-Scale Ground-Mounted Solar Photovoltaic Installation shall be considered abandoned when it fails to operate for more than one year without the written consent of the Planning Board. If the owner or operator of the solar energy system fails to remove the installation in accordance with the requirements of this section within 150 days of abandonment or the proposed date of decommissioning, the town retains the right, after the receipt of an appropriate court order, to enter and remove an abandoned, hazardous, or decommissioned large-scale ground-mounted solar energy system. As a condition of Site Plan Approval, the applicant and landowner shall agree to allow entry to remove an abandoned or decommissioned installation. The town may use the financial surety as stipulated in Financial Surety section for this purpose.

FINANCIAL SURETY

Recognizing that other remedies, such as a tax lien, are available to communities in the event an abandoned facility is legitimately putting public safety at risk, the Massachusetts Department of Energy Resources model zoning does not require the provision of surety to cover the cost of removal in the event the town must remove the installation and remediate the landscape. Communities can, however, require surety in circumstances where a valid planning purpose for doing so exists to protect the public health, safety or welfare.

Proponents of Large-Scale Ground -Mounted Solar Photovoltaic Installation projects shall provide a form of surety, either through cash, certified bank check, escrow account, bond, or otherwise held by and for the Town of [X], to cover the cost of installation removal and stabilization of the site in the event the town must remove the installation and remediate the landscape, in an amount and form determined to be reasonable by the Planning Board, but in no event to exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein, as determined by the project proponent. Such surety will not be required for town - or state -owned facilities.

The project proponent shall submit a fully inclusive estimate of the costs associated with removal, prepared by a qualified engineer. Such estimate shall be reviewed by the Town of [X] and adjusted as needed to reflect the opinion of the town as to fair costs. The amount shall include a mechanism

for prorating removal costs as costs may be affected by inflation and/or changes to disposal regulations. Salvage for solar panels and/or for other components of the installation may be included at the discretion of the Planning Board.

This surety will be due and payable at the issuance of the building permit. Proof of payment in the form of a receipt from the Town Treasurer will be shown to the Building Inspector before the permits are issued. The financial surety shall be maintained by the proponent for the lifespan of the facility, with annual certification notices from the surety company or bank for surety bonds submitted to the Planning Board. As a condition of approval, an applicant shall bind itself to grant the necessary license or easement to the town to allow entry to remove the structures and stabilize the site. The town shall have the right but not the obligation to remove the facility.

TAXES OR PAYMENT IN LIEU OF TAXES

If the project would otherwise be exempt from the payment of personal or real property taxes, the applicant shall enter into a tax agreement or a payment in lieu of taxes (PILOT) agreement with the Town of [X] that provides an equivalent amount of tax revenue to the town as determined by the Board of Assessors. Any tax-related agreement or PILOT shall be approved by the Board of Assessors prior to the issuance of the Building Permit.

SEVERABILITY

If any provision of this bylaw is held invalid by a court of competent jurisdiction, the remainder of the bylaw shall not be affected thereby.

APPEALS

Any person aggrieved by a decision of the Planning Board may appeal to the [Board of Appeals] as provided under M.G.L. c. 40A of the Commonwealth of Massachusetts. Any appeal from the decision of the Board must be filed within twenty (20) days of filing of the decision with the Town Clerk.