



Duxbury Climate Change Vulnerability Assessment and Adaptation Plan

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Prepared for:

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1.0 INTRODUCTION

The Town of Duxbury is located along the western shoreline of Cape Cod Bay. Duxbury’s coastal areas include residential and commercial districts, open space and conservation areas, and various municipal facilities. Duxbury Beach, a glacial outwash barrier beach and dune system, encloses Duxbury Bay and provides storm protection to Duxbury properties on the western shoreline of the bay. Salt marsh habitats along much of the shoreline, and especially prevalent in northern portions of the bay, provide additional storm surge and wave attenuation. Snug Harbor and upper portions of the Bluefish River are home to concentrations of municipal and private assets in the vulnerable coastal zone that are important economic and social hubs for the Town. In particular, Snug Harbor is the seat of recreational boating, marine education, a vibrant shellfish aquaculture industry, and other commercial interests.



(source: @Dux_HM)

Figure 1-1 Flooding in Snug Harbor along Washington Street, January 4, 2018

Erosion and flooding have impacted the barrier beach and the Duxbury shoreline, and several roadways, homes, businesses, and municipal assets intersect the present-day FEMA 100-year floodplain. Notably, recent Nor’easter storms have flooded Snug Harbor and the Washington Street corridor (Figure 1-1), impacting municipal and commercial operations and disrupting access. While high elevation limits coastal flood exposure for many of Duxbury’s homes, business, and municipal facilities, rising sea levels and increased storm frequencies and intensities associated with climate change will increase the threat of flooding and storm damages in the low-lying and waterfront portions of Town.

1.1 Planning Process and Goals

The Town of Duxbury worked with the Metropolitan Area Planning Council (MAPC) to develop a the “Town of Duxbury Climate Vulnerability Assessment and Action Plan” (MAPC, 2018). This assessment addressed Duxbury’s exposure to climate-related hazards (temperature, sea level rise and storms, and precipitation), and included screening-level social, public health, natural resource, critical infrastructure, economic, utility, transportation, and historic assets vulnerability assessments. The MAPC process specifically noted priority actions related to further assessment of vulnerability and the development of adaptation plans for various infrastructure and natural resource assets, as well as regulatory changes to promote resiliency.



Through the MAPC planning work, the Town received designation from the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) as a certified Municipal Vulnerability Preparedness (MVP) Community. The Town then received a MVP Action Grant, along with a MAPC Accelerating Climate Resiliency Mini-Grant to develop a climate change vulnerability assessment and adaptation plan for municipal infrastructure, private Snug Harbor infrastructure, and natural resources.

The following primary goals were established for this project:

- 1) Identify areas of the Town that are vulnerable to the combined effects of sea level rise and storm surge from extreme storm events;
- 2) Assess the vulnerability of municipally owned public infrastructure and natural resources;
- 3) Identify adaptation strategies that will help to mitigate the near- and long-term effects of sea level rise and storm surge; and
- 4) Educate the public, Town officials, and legislators about those potential impacts.

1.2 Acknowledgements

The Town would like to thank EEA for funding this project through the MVP program, and specifically thank Kara Runsten (MVP Program Manager) and Courtney Rocha (MVP Southeast Regional Coordinator) for their support to the project team.

The Town also wishes to acknowledge the contribution of the Massachusetts Department of Transportation under the direction of Steven Miller, Project Manager, and the Federal Highway Administration related to the modeling associated with the Boston Harbor Flood Risk Model (BH-FRM). The methodology from the BH-FRM was utilized as the basis for the development of the Massachusetts Coastal Flood Risk Model (MC-FRM), which was used for this Study.

The Town of Duxbury selected the Woods Hole Group to conduct this Study. Woods Hole Group team members included:

- Joseph Famely, Climate & Sustainability Team Lead (Project Manager)
- Kirk Bosma, PE, Coastal Engineer and Innovation Director
- Nasser Brahim, Senior Climate Resiliency Specialist
- Brittany Hoffnagle, Environmental Scientist
- Alex Shaw, Coastal Engineer
- Elise Leduc, Coastal Scientist
- Kali Roberts, Permitting Specialist/Environmental Scientist
- Max Reiter, GIS Technician



The Project Team worked closely with Town of Duxbury project Steering Committee:

- Valerie Massard, AICP, CFM, Planning Director (MVP Grant Manager)
- Peter Buttkus, Director of Public Works
- Patrick Caffrey, Police Officer
- Michael Carbone, Deputy Chief of Police
- Brian Cherry, Director of Facilities
- Stephen Dunn, Director of Assessing
- Jake Emerson, Harbormaster
- Gary Glazier, Highway Dept. Operations Manager
- Joe Grady, Conservation Administrator
- Emily Hadley, Planning Administrative Assistant
- Scott Lambiase, Director of Municipal Services
- Peter Mackin, Water & Sewer Superintendent
- Tracy Mayo, Health Agent
- Steve McDonald, Police Chief
- Kevin Nord, Fire Chief
- Nancy O'Connor, Executive Assistant
- René Read, Town Manager
- Jim Savonen, Manager of Buildings & Grounds
- Maryellen Vidito, Police Officer
- Jim Wasielewski, Building Inspector
- Chris West, Deputy Fire Chief

Snug Harbor stakeholder group included:

- Bayside Marine
 - JR Kent
- Duxbury Bay Maritime School
 - Ted Lawson
 - Ali Spolsino
- Duxbury Yacht Club
 - Jon MacCallum
- Island Creek Oysters
 - Matthew D'Amore
 - Chris Sherman
- Sweetser's Building
 - Rob Fawcett



Parallel to this study, the Town was awarded a MAPC Accelerating Climate Resiliency Mini-Grant to conduct outreach with businesses and residents in Snug Harbor about projected sea level rise impacts and opportunities to manage resiliency. Woods Hole Group collaborated with the Town and MAPC on this initiative.

The Snug Harbor Resiliency report (MAPC, 2019) is available at:

https://www.town.duxbury.ma.us/sites/g/files/vyhlf3056/f/uploads/final_snugharborresiliency.pdf



2.0 METHODOLOGIES

Understanding the periodic and episodic impacts of sea level rise and storm surge on infrastructure and natural resources requires a variety of tools. Coastal inundation modeling, based on resilientMA probabilistic sea level rise projections and MassDOT hydrodynamic storm surge and wave modeling, provided inundation projections for the combined effects of sea level rise and storm surge. MACZM ecological modeling of wetland habitat response to sea level rise informed the natural resource vulnerability assessment. A risk assessment framework was implemented to facilitate the prioritization of assets for investment in adaptation over time.

The projections in this report are based on some of the most recent developments in the science of climate change but are not guaranteed predictions of future events. It is recommended that these results be updated over time as science, data and modeling techniques advance.

2.1 Coastal Inundation Modeling

The Massachusetts Coastal Flood Risk Model (MC-FRM) developed by the Woods Hole Group is the most comprehensive and sophisticated model available for anticipating how climate change (specifically sea level rise and coastal storm events) will influence future coastal flood risks in Massachusetts coastal communities (Bosma et al., 2021). MC-FRM was developed for the Massachusetts Department of Transportation (MassDOT) to assess potential flooding vulnerabilities to highways and other transportation infrastructure throughout the coastline of Massachusetts. The model is based on mathematical representations of the hydrodynamic processes that affect water levels along the coast, including tides, waves, winds, storm surge, sea level rise, wave set-up, wave run-up and overtopping, etc. These processes were modeled at a high enough resolution to identify site-specific locations in Duxbury that are vulnerable and may require adaptation responses.

The model is based upon a numerical mesh that provides a digital representation of the geometry of the physical environment. The numerical mesh represents the bathymetry and topography (elevations) of the land, ocean, rivers, and bays at high resolution in order to predict the physical movement of water during coastal storm events (nor'easters, hurricanes, etc.). The model mesh creates discrete nodes at which the governing equations of water flow can be solved. While the model mesh encompasses the entire Atlantic Ocean, the resolution of the model gets finer – meaning the nodes get closer together – as the mesh gets closer to the shoreline. The mesh for the Duxbury study area is shown in Figure 2-1, overlaid on an aerial image. The MC-FRM mesh has a resolution of 10 meters or less between nodal points, and sometimes as low as 2-3 meters to capture important changes in topography and physical processes related to storm dynamics. It includes areas of open water, estuaries, bays, rivers, and upland subject to present and future flooding.



Figure 2-1 Massachusetts Coast Flood Risk Model mesh in Duxbury study area

The MC-FRM is comprised of a tight coupling of the Advanced CIRCulation (ADCIRC) model, which calculates the water levels and velocities, and the UNSWAN model (Unstructured Simulated Waves Nearshore), which calculates wave generation and transformation. These two models dynamically exchange information on physical processes every time step of the model simulation. This allows MC-FRM to provide an accurate representation of the resulting wave surface elevation, waves, winds, and flooding at each node, over each time step, in the model domain. The MC-FRM also includes the addition of wave run-up and overtopping at major coastal structures across the Commonwealth. This added module dynamically calculates the volume of seawater that advances landward over the coastal structure over time. The volume is calculated over each time step and allowed to flow over the landscape. MC-FRM was calibrated and validated to normal tidal conditions (at observation stations from the Caribbean Islands to Canada), as well as to historic storm events that impacted the coastline of Massachusetts (e.g., Hurricane Bob, Perfect Storm, Blizzard of 1978, etc.) Complete details on the development of the Massachusetts Coastal Flood Risk Model (MC-FRM) can be found in Bosma et al. (2021).

2.1.1 Sea Level Rise Projections

The Commonwealth of Massachusetts has developed probabilistic climate change projections and made them available on the Massachusetts Climate Change Clearinghouse (resilientMA.org)



for use by communities in the MVP program. Resilient MA provides projections for relative mean sea level elevation at the Boston tide gage under “Intermediate,” “Intermediate High,” “High,” and “Extreme” RSLR scenarios (DeConto and Kopp, 2017). The approach employed a probabilistic assessment of future relative sea level rise under two greenhouse gas concentration scenarios (RCP 8.5 and RCP 4.5) (Kopp et al., 2014), and two methods for projecting ice sheet loss and its effects – expert elicitation and process-based numerical model simulations (Deconto and Pollard, 2016; Kopp et al., 2017). As summarized in Table 2-1, these scenarios account for a range of assumptions regarding how much global greenhouse gas concentration, ocean thermal expansion, and melting of glaciers and ice sheets will occur and when. All four scenarios anticipate continued acceleration of RSLR.

Table 2-1 Relative mean sea level (ft-NAVD88) projections for Boston, MA

Scenario	Cross-walked probabilistic projections	2030	2050	2070	2100
Intermediate	Unlikely to exceed (83%) under RCP8.5	0.7	1.4	2.3	4.0
	<ul style="list-style-type: none"> Extremely unlikely to exceed (95%) under RCP 4.5 About as likely as not to exceed (50%) under RCP 4.5 when accounting for possible ice sheet instabilities 				
Intermediate-High	Extremely unlikely to exceed (95%) under RCP 8.5	0.8	1.7	2.9	5.0
	<ul style="list-style-type: none"> Unlikely to exceed (83%) under RCP 4.5 when accounting for possible ice sheet instabilities About as likely as not to exceed (50%) under RCP 8.5 when accounting for possible ice sheet instabilities 				
High	Extremely unlikely to exceed (99.5%) under RCP 8.5	1.2	2.4	4.2	7.6
	<ul style="list-style-type: none"> Unlikely to exceed (83%) under RCP 8.5 when accounting for possible ice sheet instabilities Extremely unlikely to exceed (95%) under RCP 4.5 when accounting for possible ice sheet instabilities 				
Extreme (Maximum physically plausible)	Exceptionally unlikely to exceed (99.9%) under RCP 8.5	1.4	3.1	5.4	10.2
	<ul style="list-style-type: none"> Extremely unlikely to exceed (95%) under RCP8.5 when accounting for possible ice sheet instabilities 				
2008 (1999-2017 epoch) mean sea level at Boston tide gage was -0.09 feet (NAVD88)					

The MC-FRM incorporates the “High” scenario projections provided by the State, outlined in dark red in Table 2-1. The “High” SLR scenario was recommended by the MA Office of Coastal Zone Management (CZM) and chosen by MassDOT for the MC-FRM because of the critical infrastructure at stake and the interest in planning for inundation risk probabilities that were



unlikely to be exceeded (there is a 99.5% confidence level that the “High” scenario chosen will not be exceeded).

Selecting the “High” scenario reduces the risk of under-preparing and under-designing for the future, while providing flexibility to move the timeline for adaptation actions further into the future if observed RSLR follows lower trajectories. As highlighted in Table 3 color coding, the “High” results in 2030 are similar to “Intermediate” results in 2050 (blue), the “High” results in 2050 are similar to the “Intermediate” results in 2070 (dark teal), and the “High” results in 2070 are similar to the “Intermediate” results in 2100 (bright red).

Note that the values in Table 2-1 are elevations of the projected mean sea level in future years relative to a vertical datum of NAVD88, not the magnitude of change in elevation. For comparison, the baseline (i.e., year 2008) mean sea level elevation, is -0.09 feet (NAVD88). The projected change in mean sea level is the difference between the year 2008 (present) and 2030, 2050, 2070 and 2100, respectively. These projections were also used to develop tidal benchmark projections for future conditions at Snug Harbor (Figure 2-2) and are consistent with the approach being used across the entire state of Massachusetts.



Figure 2-2 Projected Nuisance Flooding (MHHW elevation in feet NAVD88) for Snug Harbor



2.1.2 Storm Events and Wave Run-up

The storm climatology parameters in MC-FRM include wind directions and speeds, radius of maximum winds, pressure fields, and forward track. MC-FRM requires storm input data to run storm surge simulations and generate flooding results. Without input data, MC-FRM cannot determine which areas of Duxbury will likely be exposed to coastal flooding in the medium- and longer-term future, as much of the community’s flood risk profile is dependent on storms.

As part of the development of MC-FRM, a large statistically robust sample of storms, including tropical (hurricanes) and extra-tropical (nor’easters) storms, was developed specifically for the coast of Massachusetts existing and future climatologies. This storm data set includes historic storm events, as well as future storm conditions, and was used to assess coastal flooding risks in the Present, 2030, and 2070.

To generate future tropical storm conditions, the model utilizes five (5) different global climate models to produce dynamic frequency and intensity of tropical storms based on the changing climate. This means future tropical storms evolve with the predicted climate changes based on these global climate models. This future climatology includes powerful hurricanes as well as reflecting projections that tropical storms will be more intense on average in the second half of the century. This set of tropical storm input data was created by MIT professor Dr. Kerry Emmanuel based on these five (5) global climate model projections.

Fully optimized Monte Carlo simulations were run in MC-FRM using the respective storm sets and SLR projections for present, 2030, and 2070. These simulations importantly included the tide cycle as a dynamic element of the model. In Duxbury, the tide range means that the same storm surge can result in very different flooding outcomes depending on whether it coincides with high, mid, or low tide. Results of the Monte Carlo simulations were used to generate cumulative probability distribution functions of the storm surge water levels at a high degree of spatial precision. In particular, they provide an accurate and precise assessment of the probability of water levels from combined SLR and storm surge exceeding the elevation of the ground at each node in the model.

2.1.3 MC-FRM Outputs

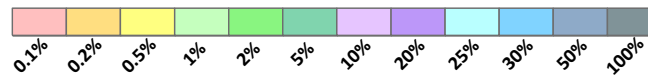
The results of MC-FRM simulations for Present, 2030, and 2070 were used to generate two types of coastal flooding maps for the Duxbury study area: Coastal Flood Exceedance Probability (CFEP) maps and depth of flooding maps. Each of these maps are described in more detail below.

Coastal Flood Exceedance Probability:

CFEP maps provide the annual chance of inundation from coastal storm surge across the landscape. These maps show interpolated results of the MC-FRM nodal calculations, and can be used as a screening/planning tool and to inform engineering design criteria since they provide the probability of an event occurring in this changing regime, such as the “new” 1 in 100 year flood event (1% probability). Inundation probabilities are represented as follows:



MC-FRM Coastal Flood Exceedance Probabilities



Coastal Flood Depth:

Depth maps indicate the scale of inundation above the land surface produced by a given probability level event. These maps are developed by subtracting the land surface elevation from the water surface elevation at each model node and interpolating the results of these MC-FRM intra-nodal elevation comparisons. Depth maps are also useful as a screening/planning tool and to inform engineering design criteria since they provide an indication of the severity of flooding under various conditions. For this study, Coastal Flood Depth maps were produced for the 1% (100-year return period) and 0.5% (200-year return period) CFEP levels. Inundation depths are represented as follows:

MC-FRM Coastal Flood Depths



MC-FRM coastal flood maps, including both flood exceedance probabilities and flood depths, are included in Appendix A.

2.1.4 Model Disclaimer

The flood maps and probabilistic data presented in this report are derived from output of MC-FRM for sea level rise and coastal storm simulations. These maps and data are provided without any guarantees or warranty. This information is not intended for use as a flood insurance determination, nor should it be directly related to FEMA FIRM maps or data since these data and FEMA data are for different purposes. This information cannot be used for the purpose of boundary resolution or location.

This public information should be accepted and used by the recipient with the understanding that the maps and data received were developed and collected for future flooding analyses purposes only. No liability is assumed as to the accuracy, sufficiency or suitability of the information contained herein for any other particular use. While every effort has been made to assure the accuracy and correctness of the data presented, it is acknowledged that inherent mapping inaccuracies are present due to interpolation between MC-FRM calculation nodes. Any reliance upon the maps or data presented herein used to make decisions or conclusions is at the sole discretion and risk of the user. This information is provided with the understanding that these data are not guaranteed to be accurate, correct or complete and assumes no responsibility for errors or omissions. Data and documents may not be the most currently available data, and the data is subject to constant change given the changing climate.

Assets located near boundaries of a probability zone may or may not be within the probability zone due to mapping inaccuracies and interpolation between model nodes. MC-FRM nodal



spacing varies throughout the Duxbury study area. The GIS rasters interpolate the values between model nodes and therefore create probabilities that may be inaccurate between model nodes. Care should be taken when using the raster data to evaluate site-specific properties or locations.

The probability maps should not be applied at such a granular level as to assess the fate of individual buildings or properties. Rather, they should be used as a tool to identify areas that may be vulnerable to flooding. Once those areas are identified, detailed information for individual buildings or other infrastructure can then be extracted from the closest model nodes. This approach has been used on many previous vulnerability assessments, including for MassDOT, and is the approach being used for this project. Nodal data are more accurate on a property scale than interpolated values shown on the maps.

2.2 Coastal Wetland Modeling

The methods utilized to evaluate the impacts on coastal wetlands differ from the coastal inundation model for developed areas. Wetland resources are unlikely to convert/change due to an episodic storm event; rather, increasing water levels caused by sea level rise will be the dominant influence on the future location and condition of wetland resources. The results of this ecological assessment and modeling effort are used to answer a number of important questions specific to coastal marsh systems and sea level rise (independent of storm surge). For example, results are used to assess if specific marsh systems have adequate space to migrate landward in response to the changing climate or if their migration may be hampered by topographic features or infrastructure and developed areas. The results are also used to determine the timeframe that a marsh’s accretion rate can no longer be expected to keep up with the rate of sea-level rise, or over what timeframe specific resource areas within a marsh are expected to transition (e.g., high marsh to low marsh, or low marsh to tidal flats, etc.) due to climate change. By identifying a likely timeframe for these changes, coastal managers can plan their monitoring and conservation effects to be most effective.

The assessment of natural resource impacts from sea level rise in Duxbury relies on statewide modeling conducted by Woods Hole Group on behalf of the Massachusetts Office of Coastal Zone Management (Woods Hole Group, 2016), which uses the Sea Level Rise Affecting Marshes Model (SLAMM). In addition to the effects of inundation, second-order effects occurring due to changes in the spatial relationship of various coastal processes are taken into account with this type of modeling. For example, if the fetch for wind-driven waves is greater than 9 km, the model assumes moderate erosion. However, if the area is exposed to the open ocean, severe erosion of wetlands is assumed. Full discussion of marsh migration modeling methodology is provided in the statewide report “Modeling the Effects of Sea-Level Rise on Coastal Wetlands” (Woods Hole Group, 2016).

High resolution elevation data may be the most important SLAMM model data requirement, since the elevation data demarcate not only where saltwater penetration is expected, but also the frequency of flooding for wetlands and marshes when combined with tidal range data. Input



elevation data also helps define the lower elevation range for beaches, wetlands and tidal flats, which dictates when they should be converted to a different land-cover type or open water due to an increased frequency of flooding. For the Massachusetts Office of Coastal Zone Management project (Woods Hole Group, 2016), the most current available elevation data was used.

Accretion, or the deposition and build-up of sediment, is an important process because it may help counter permanent inundation of marshes and beaches from long-term sea level rise, so the model was run in two ways:

- 1) In areas where there are no observed accretion data, the model is run with an accretion rate equivalent to the historic SLR rate, which is a very reasonable assumption given measured accretion rates in the mid-Atlantic and northeast.
- 2) In areas where there are observed accretion data, the model is run with the observed data AND with an accretion rate equivalent to the historic SLR rate.

SLAMM was intentionally run without the limitation that impervious surfaces (roads, parking lots, etc.) would not be subject to change to see how and where the marshes and other natural resources would migrate, if there was no restriction to their migration. As such, the ecological modeling assumes that existing infrastructure may not remain in place. The mapping results therefore do not reflect barriers to migration. An additional post-processing step was applied to overlay the impervious layer to indicate developed areas that are not expected to naturally transition to wetlands.

Appendix B presents the wetland classification areas for 2011 (current conditions, as defined by the National Wetlands Inventory), and the projected 2030 and 2070 wetlands based on the marsh migration modeling (using the “High” SLR projection scenario).

2.3 Asset-Specific Risk Assessment

A risk assessment methodology was utilized to generate risk scores for each asset and assist the Town of Duxbury and participating Snug Harbor stakeholders (Bayside Marine, Duxbury Bay Maritime School, Duxbury Yacht Club, Island Creek Oysters, Sweetser’s) with prioritization of capital projects and long-term adaptation planning. The risk assessment process leveraged the probabilistic results from MC-FRM and is described in the following subsections.

2.3.1 Screening of Critical Assets Subject to Flooding

The project team developed an inventory of Town and Snug Harbor assets that included roads and bridges, buildings, associated infrastructure components (e.g. generators, fuel tanks), septic pump stations, parking lots, coastal infrastructure (docks and piers), open space and recreation areas. Before engaging in asset-specific analyses, the project team pre-screened assets to reduce unnecessary investigations. Any asset that did not intersect with the extent of the MC-FRM model mesh was dropped from the vulnerability and risk assessment. Figure 2-3 shows the assets that screened into this assessment.



Figure 2-3 Duxbury and Snug Harbor asset inventory

2.3.2 Critical Elevation Determination

Critical elevations are defined as the elevation at which flood water will cause the asset to cease to function as intended or sustain significant damage. The critical elevation for a building may be the first floor, or a basement windowsill elevation (above which water could enter the basement and damage critical mechanical equipment). In another case, the critical elevation could be the bottom of an electrical transformer or electrical panel, above which flood water would damage the equipment and shut down the facility or equipment. Bridge critical elevations were low chord elevations (lowest structural element above the footings) upon which hydrostatic forces may act. For other assets, such as parking lots and open space, the critical elevation is the ground elevation.

The project team derived critical elevations from existing documentation wherever available. Existing documentation included as-built plans and FEMA Elevation Certificates. For assets without existing information, Woods Hole Group performed site visits to document critical elevations by survey and field measurement.

A full review of facility drawings, material testing, survey or analysis of a structure’s ability to withstand the projected hydrostatic forces due to flooding were not completed for this Study. The findings include certain assumptions based on reasonable engineering judgment as to the ability of buildings and facilities to resist the projected hydrostatic forces due to flooding. These



assumptions will require additional verification and customization during the design phase of individual projects.

The derivation of each asset’s critical elevation is described in the asset tables (Appendix C).

2.3.3 Extraction of Probability of Exceedance Data

Probability of exceedance data – the probability that storm surge will exceed the critical elevation of the asset – was developed for each asset for Present, 2030 and 2070 planning horizons. Since Duxbury and Snug Harbor stakeholder assets are located throughout the Town, they are exposed to different CFEP profiles, depending on location. Therefore, the project team identified representative MC-FRM nodes (a node is a point in the model at which the governing equations are solved) to analyze asset exposure in a spatially discrete manner. Woods Hole Group reviewed nodal CFEP distribution curves in the vicinity of study assets (see Figure 2-1 for distribution of all nodal points in the study area) to select a subset of individual nodes that best represent the flood exposure profiles for each asset.

Asset critical elevations were compared to water surface elevations (WSE) from the corresponding CFEP distribution curve to extract the probability of coastal flooding exceeding the critical elevation for each asset. Figure 2-4 provides an example of the asset-specific exposure probability assessment process.

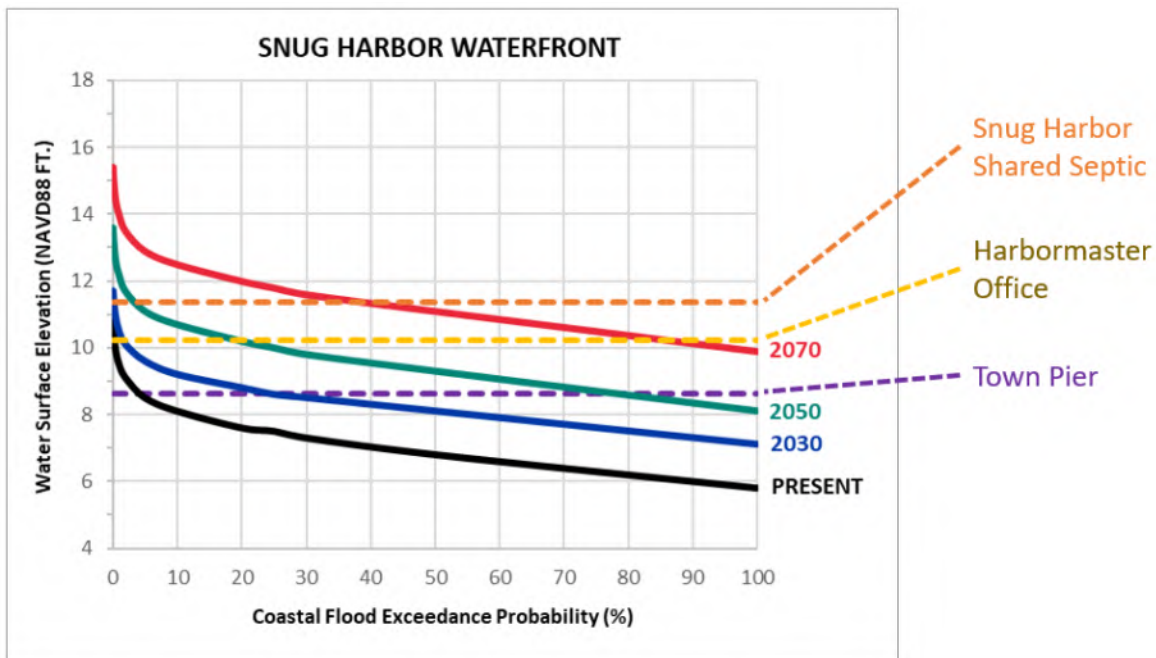


Figure 2-4 Asset-level exposure assessment example (Snug Harbor facilities)

Probabilities of exceeding each asset’s critical elevation during each planning horizon are documented in the asset tables in Appendix C.



2.3.4 Development of Consequence Scores

The consequence scoring methodology and results are important tools for asset managers to discuss, build consensus on, and ultimately use for decision-making. They help answer the questions of which facilities and infrastructure components are most important to maintain in the context of flooding, and why. This process breaks down the higher-level concept of consequence into more easily defined scoring categories and scales, and in doing so, can lead to useful results comparing seemingly disparate systems. An iterative process of adjusting ratings for individual assets relative to others helps calibrate the scores and rankings to better reflect asset owner values and ultimately provides better inputs to the risk assessment. These values influence the priority assigned to investments of time and money, and the same is true for adaptation investment.

The consequence of failure for each asset subject to potential flooding (at or above the critical elevation) was rated on a scale of 0 through 4 (from low to high consequence) for six different potential impacts. The consequence scoring matrix applied to Town assets is shown in Table 2-2. In collaboration with the participating Snug Harbor stakeholders, Woods Hole Group developed a custom consequence scoring matrix focused on two types of impacts from asset loss/damage – direct impacts to operations and finances, and indirect impacts on business activities. Direct impacts included the spatial/organizational extent of service loss, the duration of service loss (time for recovery/repair/replacement), and the cost of damage (cost of recovery/repair/replacement). Indirect impacts included the effect of asset loss on the organization’s ability to conduct business activities such as generating revenue, marketing and planning. The consequence scoring matrix applied to Snug Harbor private assets is shown in Table 2-3.

Table 2-2 Municipal asset consequence scoring matrix

Rating	Direct Impacts			Indirect Impacts		
	Service Loss Extent	Service Loss Duration	Cost of Damage	Public Safety & Emergency Services	Economic Activity	Public Health & Environment
4	Town	>30 d	>\$10M	Very High	Very High	Very High
3	Neighborhoods	15-30 d	\$1M-\$10M	High	High	High
2	Neighborhood	8-14 d	\$100K-\$1M	Moderate	Moderate	Moderate
1	Locality	1-7 d	\$10K-\$100K	Low	Low	Low
0	Property	<1 d	<\$10K	None	None	None

**Table 2-3 Snug Harbor asset consequence scoring matrix**

Rating	Direct Impacts			Indirect Impacts		
	Service Loss Extent	Service Loss Duration	Cost of Damage	Economic Activity	Marketing & Outreach	Planning
4	Snug Harbor & Beyond	>30 d	>\$10M	Severe	Severe	Severe
3	Organization	15-30 d	\$1M-\$10M	High	High	High
2	Facility	8-14 d	\$150K-\$1M	Moderate	Moderate	Moderate
1	System	1-7 d	\$10K-\$150K	Low	Low	Low
0	Component	<1 d	<\$10K	None	None	None

Each impact is rated separately, then a composite Consequence of Failure score is calculated by summing the individual scores, dividing by 24 (the highest total possible), and normalizing to 100 using the following equation:

$$\text{Composite Consequence of Failure Score} = \frac{\sum \text{all six ratings}}{24} \times 100$$

Consequence scores for each asset were developed in coordination with the project Steering Committee, and with each Snug Harbor entity separately. To ensure a consistent understanding of the different scoring categories within each type of potential impact, the Steering Committee and Snug Harbor stakeholders first agreed to a basic set of assumptions for each type of asset, and then reviewed and adjusted draft scores based on local and institutional knowledge.

Composite consequence scores can be as low as 0 and as high as 100. The higher the rating, the greater the impact of asset inundation to the organization.

Individual and composite consequence scores for each asset are documented in the asset tables in Appendix C.

2.3.5 Risk Calculations and Rankings

A risk assessment was completed to determine the specific, asset-level vulnerabilities of institutional assets. Risk is defined as the probability of an asset flooding, multiplied by the consequence of that asset failing or ceasing to function as intended. A risk score was calculated for each asset subject to flooding in each time horizon using the following equation:

$$R_{tn} = P_{tn} \times C_{tn}$$

Where:

R_{tn} = Risk Score at a given time horizon

P_{tn} = Probability of Exceedance at a given time horizon

C_{tn} = Consequence of Failure rating at a given time horizon

tn = Time horizon n (Present, 2030, 2050 or 2070)



Using risk to assess the vulnerability of infrastructure allows one to take into account both how likely a damaging flood event is, and what the consequence of that damaging flood is to the institution. These risk scores can be ranked to assist each organization with the prioritization of adaptation investments over time.

Risk scores for each asset are documented in the asset tables in Appendix C.

2.3.6 Culvert evaluations

Stormwater system vulnerability to coastal inundation and drainage backup was evaluated outside the risk-based framework by comparing culvert obvert elevations (measured by Planning Department staff) to storm surge WSE distribution curves. Without a piped infrastructure model, it is difficult to determine the WSE at which stormwater begins to back up in upgradient drainage areas due to increased hydraulic pressure on the drainage outfall exerted by coastal storm surge. This stormwater system vulnerability assessment approximates potential impact with a simple screening comparison of hydraulic heads. If the elevation of the culvert obvert was below a projected water surface elevation from a MC-FRM storm surge distribution curve, the culvert was judged to have “potential” vulnerability to backup at the associated probability level, because coastal storm surge would be exerting some unknown pressure from the outfall up the drainage pipe and possibly inhibiting some degree of drainage from the catch basin. Further investigation into the connected infrastructure and pressure differentials between draining stormwater and storm surge will be required to better assess these vulnerabilities.



3.0 RISK AND VULNERABILITY ASSESSMENT RESULTS

The risk and vulnerability assessment was prepared using the methodologies described in Section 2 and was guided by discussions with the Steering Committee and Snug Harbor stakeholders. These public and private representatives noted that several areas of Town have already been impacted by climate changes in the form of sea level rise and more intense coastal storms. These concerns have also been raised in the Town’s climate change planning documents. Acknowledging the current and potential future exposure in the low-lying coastal areas of Duxbury, it is also important to note that many critical municipal assets (including Town Hall, the Police and Fire Stations, and Water Department infrastructure) are all located in the upland area well outside the area of potential coastal vulnerability. Additionally, municipal facilities at the Bluefish River complex (including the schools, pool, and library) do not have a very high risk of inundation.

3.1 Natural Resources

Impacts to natural resources, including beaches, salt marsh, coastal ponds, and other coastal wetlands, from sea level rise were assessed on a semi-quantitative basis. Woods Hole Group recently completed a project for the Massachusetts Office of Coastal Zone Management (CZM) to model the effects of sea level rise on coastal wetlands and natural resources statewide, using the Sea Level Rise Affecting Marshes Model (SLAMM).

SLAMM results were produced for the coastal areas of the Town. Figures 3-1 through 3-3 depict the present day wetland classifications, as well as the 2030 and 2070 projected wetland areas, respectively.

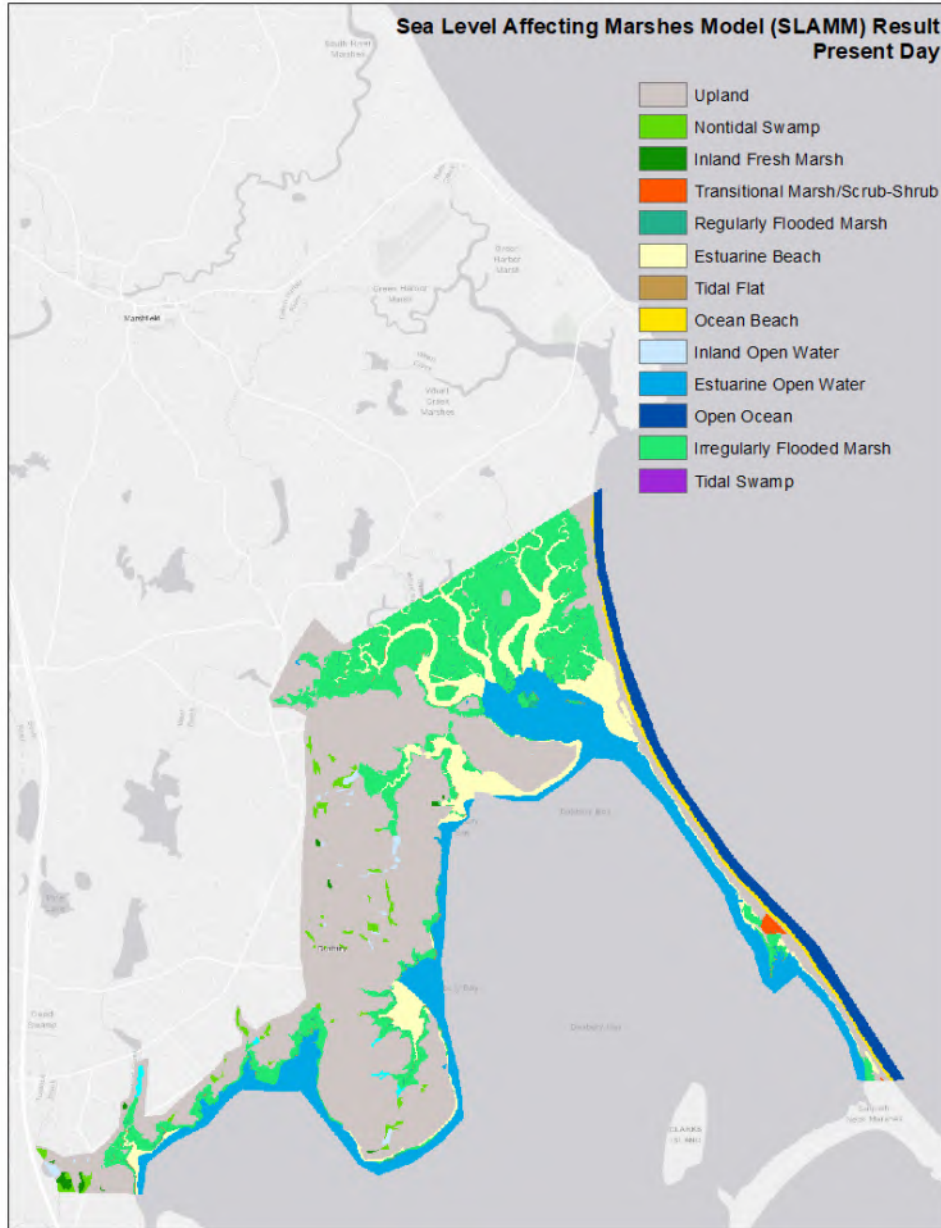


Figure 3-1. Duxbury SLAMM wetland classifications (Present)

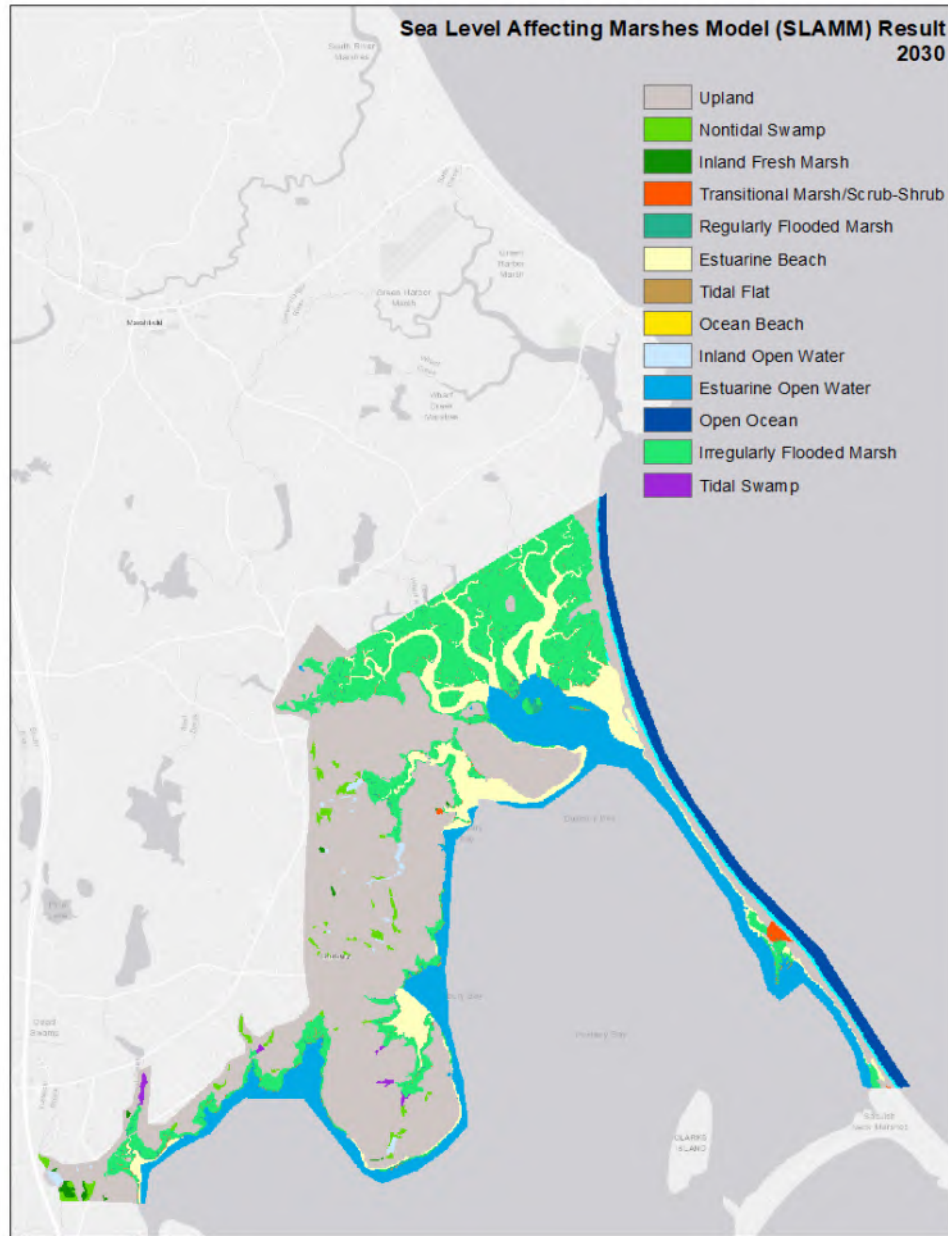


Figure 3-2. Duxbury SLAMM wetland classifications (2030)

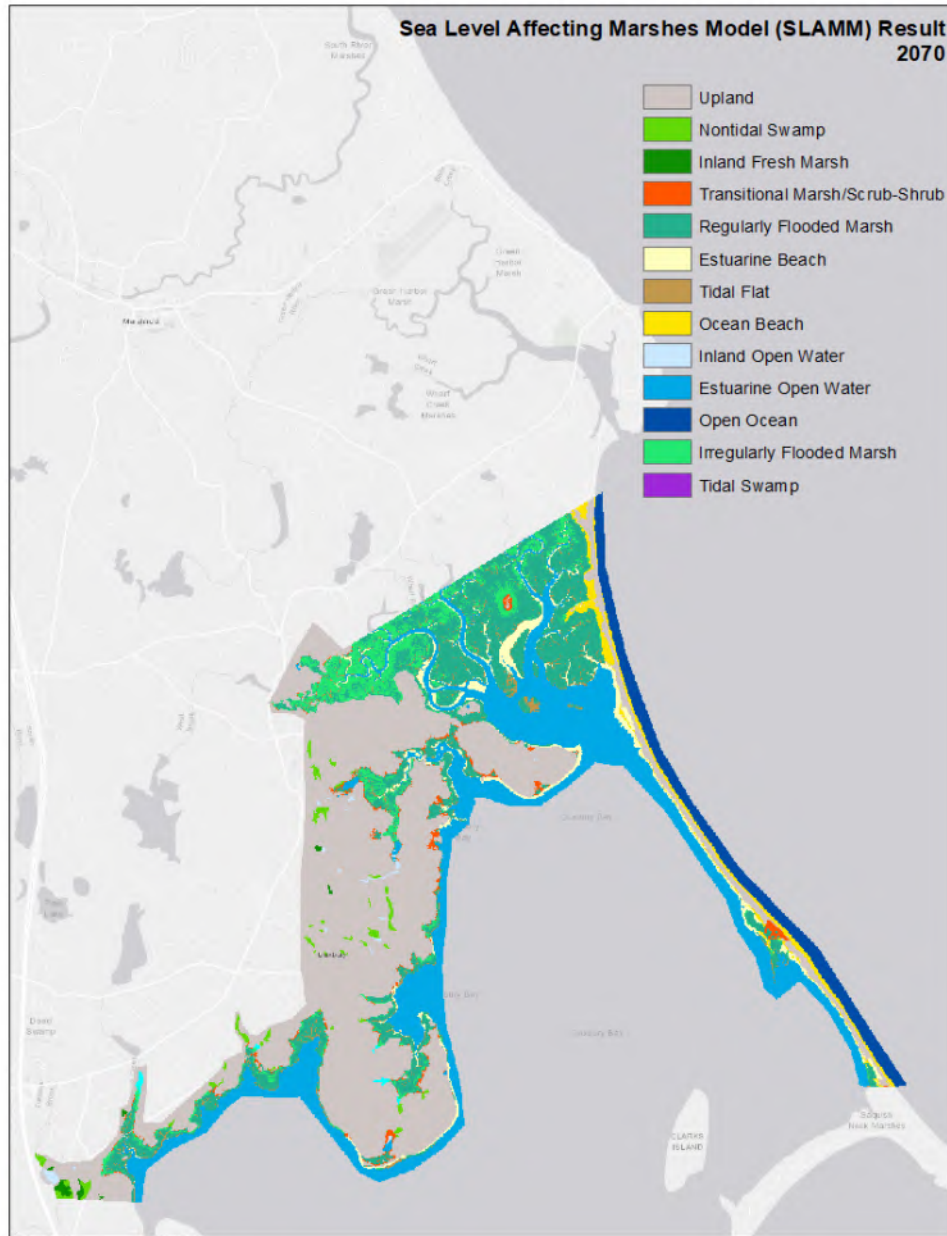


Figure 3-3. Duxbury projected SLAMM wetland classifications (2070)

Areas of each type of wetland classification are summarized in Table 3-1.

One of the major habitat changes that is projected to occur between now and 2070 is a significant transition from a mostly irregularly flooded marsh (high marsh) to a regularly flooded marsh (low marsh). Overall, the total area of Duxbury’s salt marsh remains relatively stable over this time period, only experiencing a slight decrease in area (2%). Figure 3-4 shows the combined areas of both irregularly and regularly flooded salt marsh in present day, 2030 and 2070. In present day, the combined total area for high and low salt marsh areas is 1,031 acres. By 2030, the overall salt



marsh area has decreased by 7 acres, resulting in only a slightly increased high marsh to low marsh ratio. By 2070, the overall salt marsh area increased by a total of 18 acres compared to present day. However, over this time period, the habitat experiences a significant shift in the percentage of high and low marsh; this is due to high marsh converting to low marsh as sea-level rises.

Another major trend to note is the change in the total area of combined open water habitats and combined wetland habitats (Figure 3-5), as well as the associated change that infers on the total upland area. Between present day and 2070, the combined open water areas in Duxbury are expected to increase by 293 acres (from 905 to 1,198 acres). This increase in open water corresponds with a decrease of 130 acres in wetland (from 1,625 to 1,495 acres) and a loss of 163 acres of upland by 2070 (2,234 to 2,071 acres).

Table 3-1. Summary SLAMM results for wetland areas in Duxbury

Wetland Categories	Area (acres)		
	Present	2030	2070
Upland	2234.1	2235.3	2071.4
Nontidal Swamp	52.8	53.1	45.4
Inland Fresh Marsh	12.1	11.2	10.2
Transitional Marsh/Scrub-Shrub	9.0	11.6	56.6
Regularly Flooded Marsh	41.2	49.9	792.2
Estuarine Beach	441.8	443.4	166.3
Tidal Flat	15.5	25.7	72.0
Ocean Beach	53.2	47.6	88.8
Inland Open Water	20.8	21.1	13.0
Estuarine Open Water	681.8	680.3	976.3
Open Ocean	202.7	201.8	209.1
Irregularly Flooded Marsh	990.2	974.3	256.6
Tidal Swamp	9.7	9.6	6.9

These trends indicate some resilience in Duxbury’s salt marsh systems, although they may not be able to keep pace with sea level rise if it continues to accelerate past 2070. These findings are consistent with other marshes in areas of larger tide ranges within Massachusetts (where salt marshes tend to be more resilient to water level changes, with most locations able to maintain a great deal of low marsh through 2070). Still, it will be important for the Town to support salt marsh migration where it can occur by removing barriers and limiting development in potential future salt marsh areas. Additionally, any actions to further increase salt marsh resilience and stem the conversion from high marsh to low marsh (and, eventually, to tidal flat or open water) will preserve important marsh ecosystem services, such as coastal flood protection. On the other hand, it is notable that a loss of 163 acres of upland may have environmental, social, and/or economic impacts depending on the nature and disposition of the upland converted to wetland area.

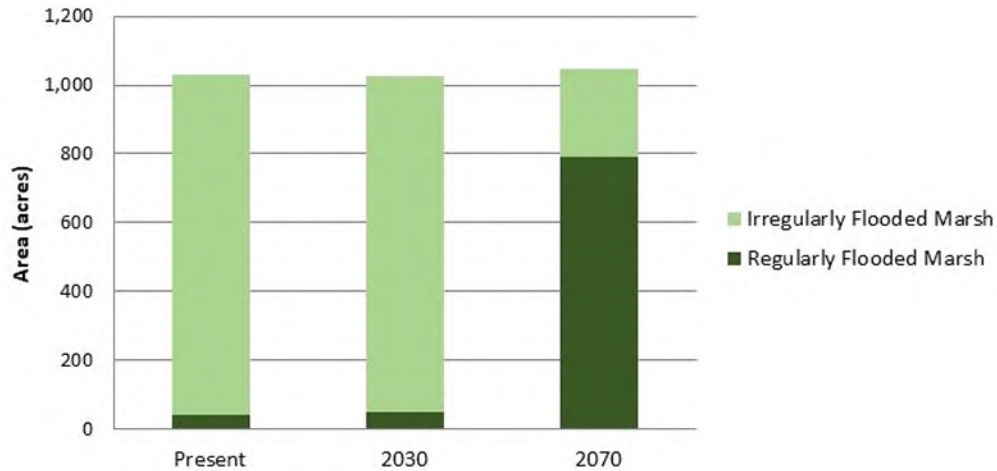


Figure 3-4. Summary of Duxbury salt marsh area changes

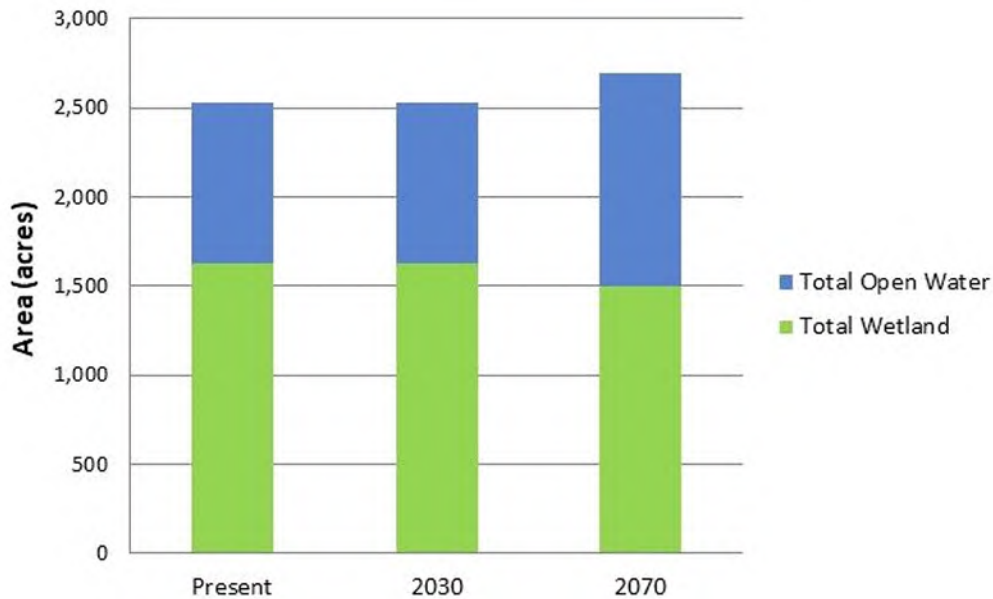


Figure 3-5. Summary of Duxbury open water and wetland area changes over time

Map-based SLAMM profile results for Duxbury, as well as area summary tables, are included in Appendix B.

3.2 Vulnerability in Low-Lying Developed Areas

Flooding issues resulting from long-term shifts in tidal datums due to sea level rise and increasing risk of coastal storm surge may significantly impact infrastructure, roadways, and low-lying developed areas in the Town of Duxbury.



A preliminary screening indicates that the potential vulnerability and exposure of structures and roadways to nuisance and storm surge flooding is moderate. Presently only 7 structures and approximately 0.4 road miles are exposed to daily tidal flooding. MC-FRM projections indicate this potential exposure to nuisance flooding may increase to 274 structures and approximately 6.35 road miles by 2070. Most structures potentially exposed to future nuisance flooding are along the coastline surrounding Duxbury Bay and the bay side of Gurnet Road running north towards Marshfield. Neighborhoods along Gurnet Road and Marginal Rd include several structures susceptible to nuisance flooding in the future. Most roads exposed to future nuisance flooding include Marginal Road and Gurnet Road leading north to Canal Street, and the intersections of Washington Street, Powder Point Ave, and King Caesar Road.

The 10% chance event was used to screen the number of structures and roadways vulnerable to storm surge flooding, since the cumulative risk of this event occurring over the typical lifespan of a mortgage or roadway is nearly 100%. Currently, 354 structures and 7.3 miles of roadways are potentially exposed to the 10% chance event. MC-FRM projections indicate this exposure could increase to 715 structures and 13 road miles by 2070.

Potential exposure to storm surge associated with the 1% chance event was also evaluated, since the 1% probability level is used in FEMA mapping and familiar to the general public. Currently, 540 structures and 10 road miles are potentially exposed to the 1% chance event. MC-FRM projections indicate this exposure could increase to 807 structures and 15 road miles by 2070.

The full results for structures and roadways potentially exposed to nuisance and storm surge flooding are presented in Table 3-2

Table 3-2. Duxbury screening level Town vulnerability profile

Potential vulnerability and exposure of structures and roadways in Duxbury	Present Day		2030		2050		2070	
	Quantity	Percent	Quantity	Percent	Quantity	Percent	Quantity	Percent
Structures (Total 7341)								
Nuisance Flooding (MHHW)	7	0.1%	20	0.3%	94	1.3%	274	3.7%
Storm Surge (10% Chance)	354	4.8%	526	7.2%	587	8.0%	715	9.7%
Storm Surge (1% Chance)	540	7.4%	602	8.2%	711	9.7%	807	11.0%
Roadways (Total 183 miles)								
Nuisance Flooding (MHHW)	0.39	0.2%	0.65	0.4%	2.73	1.5%	6.35	3.5%
Storm Surge (10% Chance)	7.31	4.0%	9.79	5.3%	11.1	6.1%	13.21	7.2%
Storm Surge (1% Chance)	10.13	5.5%	11.31	6.2%	13.3	7.3%	14.98	8.2%

As a whole, Duxbury contains many low-lying developed areas that may experience increasing nuisance and storm surge flooding over time with possible impacts including damage to infrastructure and isolation (if they are linked by low-lying roadways). The following section describes the low-lying areas of Duxbury that could experience daily nuisance flooding issues and impacts from storm surge.



Snug Harbor and the Long Point Marine area are two low-lying areas that are vulnerable to nuisance flooding. Snug Harbor and the adjacent local businesses along Washington Street provide significant economic and recreational value to the Town of Duxbury but could experience nuisance flooding by 2050 and through 2070 as seen in Figure 2-2. Long Point Marine supports a variety of boating and recreational activities in the Town of Duxbury and is vulnerable to nuisance flooding by 2050.

Nuisance flooding, in general, can present access and safety/evacuation issues for low-lying roadways in Duxbury. Consequently, flooding of low-lying roadways that serve as throughways can prevent critical access to Town services, cause neighborhoods to become isolated, and prevent access to important economic and recreational drivers for the Town. Gurnet Road, Washington Street, King Caesar Road and Powder Point Ave (which all serve as critical links to neighborhoods, businesses along Washington Street, and Duxbury Beach) are extremely vulnerable to nuisance flooding by 2050. Finally, flood inundation along Landing Road in 2050 could prevent access to a small neighborhood.

Episodic impacts from more frequent and more intense coastal storms present a significant threat to the infrastructure that supports all these important activities and uses in Duxbury.

The Snug Harbor area is extremely vulnerable to the impacts of wave action, flooding, and damage to infrastructure from coastal storms. Critical municipal infrastructure and private Snug Harbor businesses supporting the harbor could be impacted by power outages, damage of waterfront roadways, and damage to buildings if exposed to more frequent and intense storms. Sustained impacts from coastal storms can greatly reduce the potential economic activity of the harbor.

Impacts to low-lying roadways from more intense coastal storms is not limited to roadway flooding but also includes the threat of coastal erosion, undermining of the roadway, and damage to the road surface preventing access to low-lying areas and neighborhoods in Duxbury. Residents living along Powder Point Ave, King Caesar Road, and Bay Pond Road are vulnerable to storm surge in Present Day. Road segments along Washington Street near Long Point Marine and Snug Harbor are also vulnerable to storm surge in Present Day potentially preventing access to the waterfront and local businesses. Flooding along Canal Street and south to Gurnet Ave can restrict access to small neighborhoods and Duxbury Beach. Neighborhoods along Bay Road, Landing Road, Grandview Avenue, Wirt Way, and Marshall Street are vulnerable to isolation from roadway flooding.

Another area with significant vulnerability to more intense coastal storms is Duxbury Beach, which provides significant economic, recreational and storm protection value to the Town. Duxbury beach provides protection for waterfront homes, businesses, and commercial activities from the impacts caused by storm surge and wave action. Duxbury Beach is extremely vulnerable to flood inundation, shoreline erosion, sand over wash events, and storm surge on the backside of the beach. Erosion, inundation, and over wash of the low-lying roads along Duxbury Beach



(Gurnet Road) can prevent access to Duxbury Beach and coastal neighborhoods located on the northern and southern end of the beach (some of which are located in Marshfield and Plymouth).

3.3 Asset-Specific Risk Assessment

To understand the episodic impacts from more frequent and more intense coastal storms on municipal infrastructure and Private Snug Harbor assets, an asset specific risk assessment was performed. This section provides an overview of the risk-based vulnerability assessment which utilized asset-owner consequence scoring and the MC-FRM projections over the next 50 years. A total of 144 municipal facilities and assets, 158 miles of roadways, and 66 privately owned Snug Harbor assets were evaluated in the risk assessment. Seven culverts in the coastal zone were also evaluated outside the risk-based framework.

3.3.1 Municipal Facilities and Assets

Many of Duxbury assets vulnerable to coastal storm surge include assets in and around Snug Harbor, businesses along Washington street, and low-lying bridges along the coast. These vulnerable facilities and assets provide recreational access to water and transportation links to various parts of Town that support general economic activity and/or direct revenue generation for the Town.

Based on Present Day conditions, some of the top infrastructure and assets most vulnerable to coastal flood inundation include:

- 1) Public Bridges
 - a. Harrison St. Bridge
 - b. Washington St. Bridge
- 2) Coastal Assets
 - a. Harbor Master Float
 - b. Town Pier
 - c. Town Float
- 3) Parking Areas
 - a. Mattakeeset Parking

Bridges were assessed using the low chord elevation to understand their vulnerability to storm surge. Flooding up to the low chord elevation can lead to potential structural issues. Both Harrison Street and Washington Street bridges are low-lying bridges that serve as connectors between neighborhoods and the recreational and commercial waterfront areas. Harrison Street bridge is the most vulnerable bridge to flooding above the low chord elevation by the annual storm in Present Day. Washington Street bridge is vulnerable (storm surge higher than the low chord elevation) in Present Day at the 30% chance event, increasing to 50% by 2030 and 100% by 2070. The asset tables and profiles also provide information to evaluate the risk of flooding the surface of each bridge, would have impacts to transportation and accessibility during a storm event.



Many of the coastal assets vulnerable to storm surge are located along the Snug Harbor waterfront and support economic and recreational activities. The Harbormaster Float is the most vulnerable (30% chance event in Present day, 100% chance event by 2030). The Town Float and Pier are less vulnerable in Present Day and 2030 (2% and 25% chance events, respectively) but are highly vulnerable (100% chance event) by 2070. The Mattakeeset Parking area provides parking for the harbor waterfront and Town Pier utilized by residents, businesses and visitors. In Present Day, the parking area is vulnerable to flood inundation by the 10% chance event and increases to 50% in 2030 and 100% by 2070.

Review of the vulnerability of municipal infrastructure and assets using the MC-FRM highlights the importance of the working waterfront, and services in support of Town revenue generation. The importance of these assets to Town functionality is reflected in the high consequence scores these vulnerable assets received. After assessing the vulnerability of assets and assigning consequence scores, the full risk assessment was conducted to help the Town prioritize investments in adaptation over time.

All Present Day, 2030, and 2070 municipal infrastructure and asset risks in the Town of Duxbury are presented in Figures 3-6 through 3-8. The full results of the risk assessment are provided in Appendix C-1 tables which are sorted in descending order of Present Day risk.



Figure 3-6. Present Day municipal infrastructure and asset risk



Based on Present Day conditions, the Top 10 municipal facilities and assets at risk to storm surge are:

1. Harrison St. Bridge
2. Washington St Bridge
3. Island Creek Bridge
4. Marshall St Bridge
5. Harbormaster Float
6. Mattakeeset Parking Area
7. Blue Fish Fire Station Parking Area
8. Town Pier
9. Town Float
10. 447-449 Washington Street Parking Area



Figure 3-7. 2030 municipal infrastructure and asset risk



Based on 2030 conditions, the Top 10 municipal facilities and assets at risk to storm surge are:

1. Harrison St. Bridge
2. Marshal St Bridge
3. Harbormaster Float
4. Mattakeeset Parking Area
5. Washington St Bridge
6. Island Creek Bridge
7. Town Pier
8. Town float
9. 447-449 Washington Street Parking Area
10. Blue Fish Fire Station Parking Area



Figure 3-8. 2070 municipal infrastructure and asset risk



Based on 2070 conditions, the Top 10 municipal facilities and assets at risk to storm surge are:

1. Mattakeeset Parking Area
2. Town Pier
3. Harrison St. Bridge
4. Washington St. Bridge
5. Island Creek Bridge
6. Marshall St. Bridge
7. Canal St Bridge (MSH)
8. Harbor Master Float
9. Town Float
10. Duxbury Beach 1 Parking Area

Asset risk is projected to increase through time as coastal storms become more frequent and more intense. However, the list of high-risk assets is generally similar over time and includes primarily waterfront assets in the Snug Harbor area and coastal bridges throughout town.

Appendix D-1 provides specific asset profiles (including impact probability, depth above the critical elevation, consequence scoring, and risk assessment results) for 35 priority municipal assets.

3.3.2 Roadways

Duxbury roads serve as important transportation linkages between residential, commercial, and recreational areas in Duxbury. Many of these coastal roads are low-lying which increases their vulnerability to coastal flood inundation. This section provides an overview of the storm surge vulnerability and total risks of Duxbury roadways under Present Day and future climate conditions. Overall, a total of 40 miles of roadways in the Town of Duxbury were evaluated in the risk assessment. Roadway vulnerability to flooding was assessed under the assumption that roadways become impassable with six inches of flooding or more across the road.

Some areas that include low-lying roads most vulnerable to coastal flood inundation include:

- 1) Washington Street and Powder Point Avenue leading to Powder Point Bridge
- 2) Intersection of Harrison St and Mattakeeset Parking Area
- 3) Bay Road leading south to Duxbury Town Line
- 4) Gurnet Road along Duxbury Beach to the Duxbury town line

Washington Street and Powder Point Avenue are both critical roadways along the Blue Fish River that provide access to Duxbury Beach and are vulnerable to flood inundation at the 100% chance event in Present Day. Harrison Street intersects Washington Ave in the Snug Harbor Area which serves as an economic and recreational hub for Duxbury. This road is also extremely vulnerable to flood inundation in Present Day by the 100% chance event.



Bay Road is a low-lying coastal roadway that is adjacent to Kingston Bay. This section of road provides a critical transportation corridor in southern portions of the Town. While parts of the roadway are elevated on hills, some low-lying segments are subject to flood inundation now and increasingly in the future.

Gurnet Road on Duxbury Beach serves as a critical access roadway for two neighborhoods located in the area. Gurnet Road leading south to King Arthur Road is critical for access and evacuation of the Saquish neighborhood in Plymouth. Additionally, this section of Gurnet Road is unpaved which increases the risk to wave action, flooding inundation, and geomorphic change. Gurnet Road running north to the Canal Street bridge at the Marshfield line supports access to multiple neighborhoods and has high vulnerability to coastal flood inundation now through 2070.

Review of the vulnerability of Duxbury Roads using the MC-FRM highlights the importance of critical access to and from centers of Town activity, and access to isolated neighborhoods.

After assessing the vulnerability of Duxbury roads, the roadways received consequence scores reflecting their critical important to town function, safety, and economic activity. Using this information, the full risk assessment was conducted.

All Present Day, 2030, and 2070 low-lying roadway risks in the Town of Duxbury are represented in Figures 3-9 through 3-11. The full tables of Present, 2030, and 2070 road risk scores are presented in Appendix C-1.

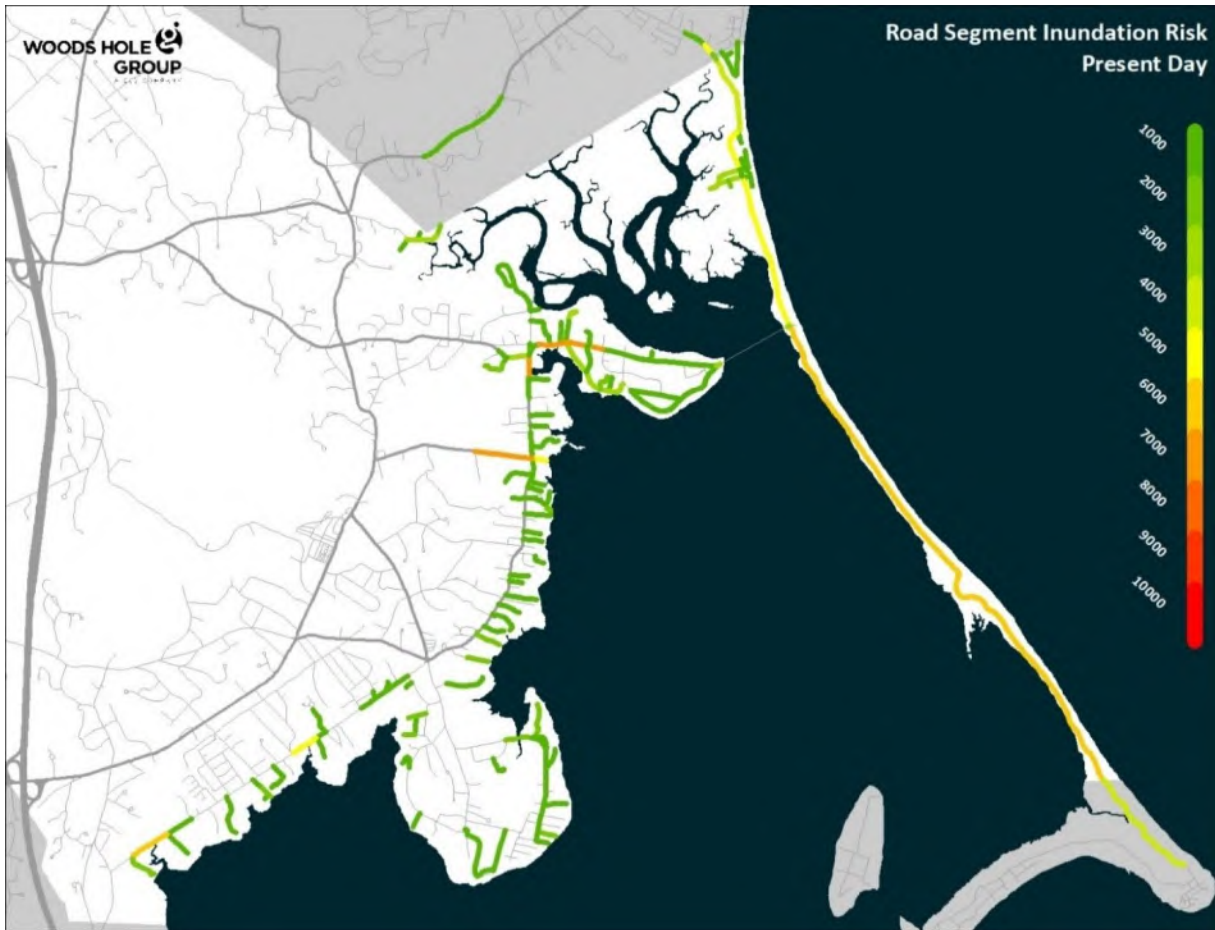


Figure 3-9. Present Day roadway specific risk results

Based on Present Day conditions, the Top 10 roadways at risk to storm surge are:

1. Washington Street
2. Powder Point Ave
3. Harrison Street
4. Bay Road
5. King Arthur Road
6. Canal Street
7. Gurnet Road
8. Mattakesset Court
9. King Caesar Road
10. Saint George Street

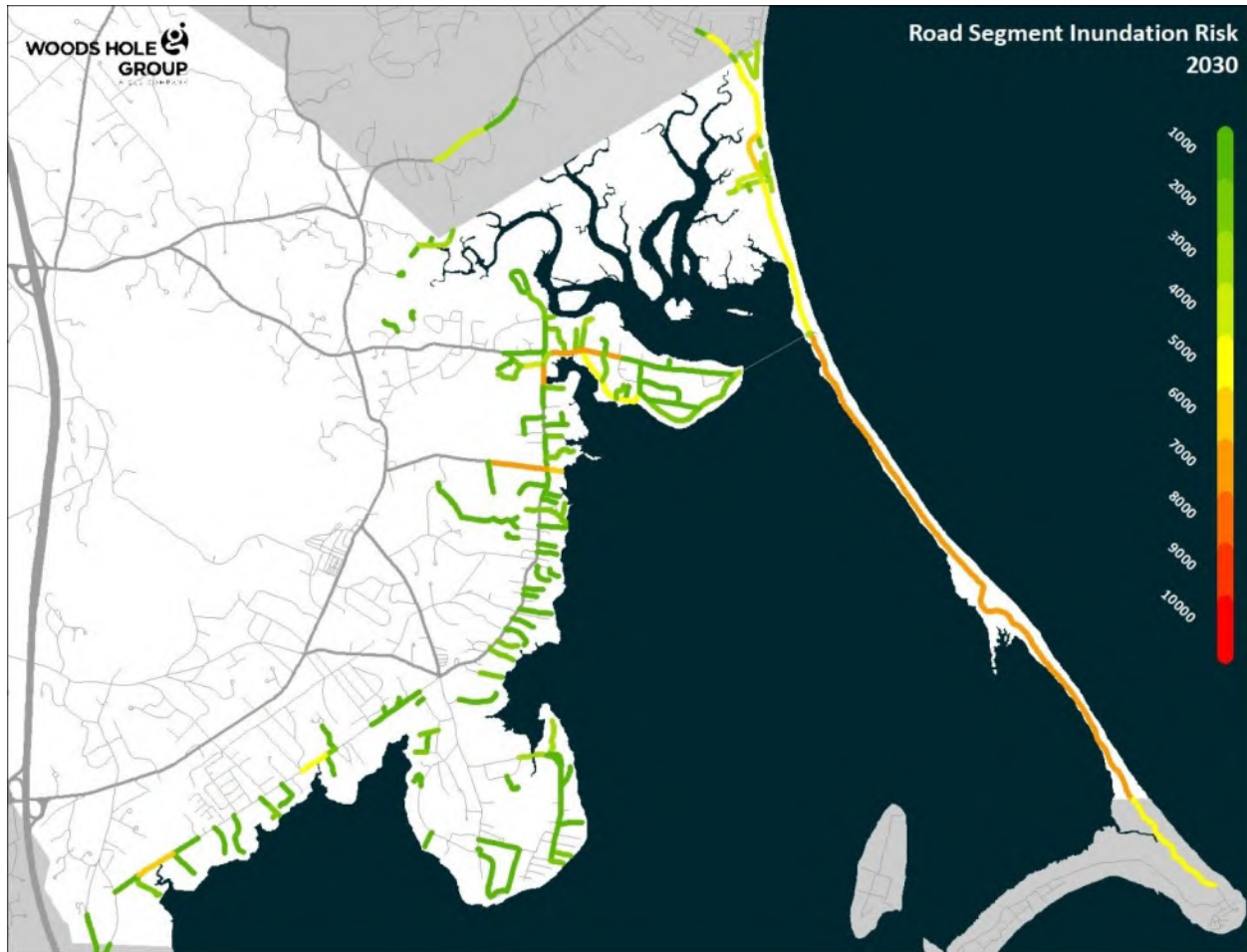


Figure 3-10. 2030 roadway specific risk results

Based on 2030 conditions, the Top 10 roadways at risk to storm surge are:

1. Washington Street
2. King Arthur Road
3. Powder Point Ave
4. Harrison Street
5. Bay Road
6. Gurnet Road
7. Mattakesset Court
8. Canal Street
9. King Caesar Road
10. Marginal Road

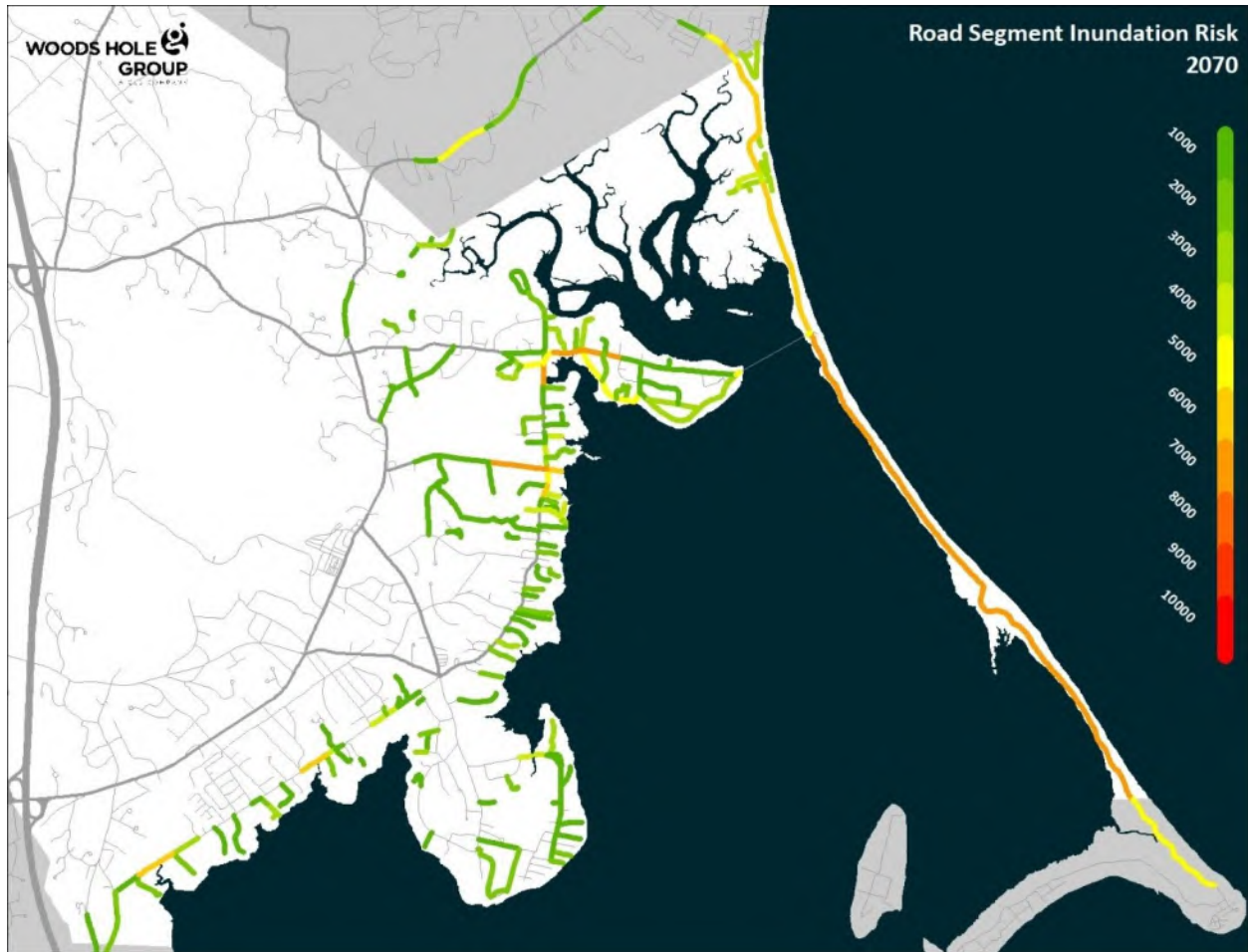


Figure 3-11. 2070 roadway specific risk results

Based on 2070 conditions, the Top 10 roadways at risk to storm surge are:

1. King Arthur Road
2. Washington Street
3. Powder Point Ave
4. Harrison Street
5. Bay Road
6. Mattakesset Court
7. Canal Street
8. Gurnet Road
9. Powder Point Bridge
10. Careswell Street

Roadway risk is projected to increase through time as coastal storms become more frequent and more intense. However, the list of high-risk roadways is generally similar over time and includes



primarily the intersections of Washington Street, Powder Point Ave, and King Caesar Ave, and the critical access roads of Gurnet Road, Canal Street, King Arthur Road, and Bay Road.

3.3.3 Culverts

A total of 7 culverts were evaluated in the vulnerability assessment. Assessment of the potential inundation of a culvert was evaluated based on a critical elevation defined as the obvert (i.e. the top of the culvert). Flooding over the top of a culvert can pose significant physical and environmental problems. Wave action and inundation can damage the culvert itself or undermine the associated roadway above the culvert. If the culvert is connected to a stormwater drainage system, inundation of the culvert may cause backups at upgradient catch basins that flood upland areas. The culverts included in this assessment are presented in Figure 3-12.



Figure 3-12. Locus map of assessed coastal culverts in the Town of Duxbury

Out of the seven culverts, only three exhibited potential exposure to coastal flood inundation. Results of the assessment are found in Table 3-3.



Table 3-3. Culvert exposure to coastal flooding

Culvert ID	Culvert Name	X Coord	Y Coord	Critical Elevation (ft, NAVD88)	Inundation Probability (%)			
					Present	2030	2050	2070
1	Hounds Ditch Lane 1 culvert	-70.6936035	42.0427017	29.81	--	--	--	--
2	Hounds Ditch Lane 2 culvert	-70.6899033	42.042099	22.6	--	--	--	--
7	West St Culvert	-70.7032013	42.0525017	30.72	--	--	--	--
13	Mill Pond Culvert	-70.7106018	42.0166016	21.86	--	--	--	--
14	Bay Road @ Hicks Point Rd	-70.7123032	42.0089989	5.99	50	100	100	100
17	Surplus St Culvert	-70.6768036	42.0326004	7.68	--	--	--	20
21	Bay Road @ Wirt Way	-70.6959991	42.0167999	1.95	100	100	100	100

Based on current knowledge, the three culverts determined to be vulnerable to coastal storm surge inundation are not connected to stormwater drainage systems, but rather are connectors between two segments of a waterway. Therefore, the impacts of flooding should be limited to the culverts themselves (potential undermining), unless some are undersized and would cause flood water to build up and create ancillary flooding issues. Culvert 21 near Wirt Way is a known tidal restriction and further discussion is provided in Section 4.1 regarding the potential for salt marsh restoration.



3.5 Summary

Duxbury’s topography and inland location of many municipal assets leaves Duxbury well protected against the impacts of nuisance and storm surge flooding on the whole, especially since many centers for critical assets and emergency operations are located in these higher elevation areas. However, preliminary screenings of town-wide structures and low-lying roads showed that by 2070, 274 structures and over 6 miles of roads could be at risk to nuisance flooding. By 2070, 807 structures and 15 miles of roads could become inundated by the 1% chance storm event.



The MC-FRM projections from Present Day, 2030, and 2070 were used to assess the vulnerability and total risks from storm surge impacts to municipal infrastructure, and public roadways. The results showed that Town assets and roadways impacted by flooding in the Town are generally limited to a few key areas and asset groups– Snug Harbor waterfront, the intersection of Washington Street, Powder Point Ave, and King Caesar Road, low-lying coastal neighborhoods along Gurnet Road on the northern end of Duxbury Beach, and various low-lying bridges throughout Duxbury.

Many of the coastal bridges in Duxbury including those along Harrison Street, Washington Street, Island Creek, and Marshall Street are extremely vulnerable to storm surge inundation at the low chord (critical) elevation and ranked the highest in the risk assessment. Municipal assets along Snug Harbor, including the Harbormaster Float, Town Pier and Float and Mattakeeset Parking Lot, are extremely vulnerable to storm surge inundation and ranked among the highest assets in the risk assessment. As storms are projected to increase in number and intensity through time, these assets ranked in the top ten in Present Day, 2030, and 2070.

Roadways serve as important corridors through Town and provide links between Town services, Duxbury Beach, Snug Harbor, and coastal neighborhoods. Powder Point Ave, King Caesar Road, and Washington Street, support transportation through Snug Harbor, Downtown areas, and provides critical access to Duxbury Beach and are the highest at-risk roadways. Gurnet Road, Canal Street, and King Arthur Road along Duxbury Beach are vital for Town access and emergency response for coastal neighborhoods. These low-lying roadways are not only extremely vulnerable to flood inundation but are vulnerable to coastal erosion due to wave action along the barrier beach system.

Culverts are also located along many of these low-lying roadways. The culvert assessment showed that 3 culverts are vulnerable to storm surge. The full impact of culvert inundation was beyond the scope of this study, but could include culvert damage and/or potential impacts to upgradient catch basins (if present). The three culverts at risk to storm inundation include Bay Road Culverts at Hicks Point Road and Wirt Way, and the Surplus Street Culvert.

Snug Harbor (including Privately owned assets), Washington Street and Powder Point Ave roadways, and other connecting roadways support many functions (economic, safety, recreational) in Duxbury. The intersection of several Town assets and low-lying roadways with



high vulnerability to storm surge inundation highlights the need for effective planning and adaptation strategies to reduce vulnerability and increase resilience in Duxbury.



4.0 ADAPTATION STRATEGIES

At a conceptual level, there are generally five (5) categories of adaptation strategies to reduce the vulnerability of assets in the coastal zone to sea level rise and storm surge. While numerous implementation approaches are available and vary by context and goal, they all are rooted in one of the following strategies (graphics from CoastAdapt / National Climate Change Adaptation Research Facility):



AVOID – Keep new development away from areas of current and future risk. This may not be applicable to developed waterfronts but could be used to guide planning and development throughout the Town. Duxbury already has regulatory tools to address building in currently vulnerable areas, but (as discussed in Section 4.4) could add consideration of future climate conditions to enhance these frameworks and further reduce community risk.



ACCOMMODATE – Continue to occupy the same area but modify assets to enhance their flood tolerance and resilience. Structures and infrastructure may be elevated above a design flood elevation that may be tied to a certain level of risk tolerance (e.g. a future 1% chance event), and wet floodproofed to allow water to pass through without damage to systems or structures. In some cases, at working waterfronts, adjustments to accommodate sea level rise may be necessary to maintain access to the water, but facilities can be designed to be resilient to storm surge.



PROTECT – Continue to occupy the same area but modify assets or surroundings to keep flood waters out. Such measures may include building-level dry floodproofing techniques such as façade sealing, window and door barriers, and deployable barriers. Additionally, flood protection may be applied at a landscape scale using hard structures (e.g. modular seawalls) or soft solutions (e.g. dunes and vegetated berms).



ADVANCE – Land reclamation may be used in extenuating circumstances to build seaward protection (hard structures or soft solutions) where other options are limited. This strategy is generally very costly and has significant environmental impacts, making it difficult (if not impossible) to permit.



RETREAT – Move existing at-risk assets to higher ground to reduce exposure to flooding. This strategy assumes that upland areas have been identified and can be designated as receiving areas for facilities and uses currently located in vulnerable parts of Duxbury. Retreat may be infeasible for water-dependent uses or location-specific infrastructure (e.g. shared septic pump), and requires upland sending areas for non-water-dependent uses (the Town and some Snug Harbor stakeholders do own land in higher elevation parts of Duxbury). Pulling development back from vulnerable areas not only reduces risk, but also allows for wetland migration as sea levels rise. This strategy, by abandoning some land at the water’s edge, may also provide an opportunity to build a regional protection strategy for other landward assets that may be vulnerable under future conditions.

4.1 Natural Resources Strategies

Coastal natural resources such as beaches, dunes and salt marsh habitat are important assets for Duxbury because they provide multiple streams of ecosystem services, including recreation and storm protection, and are also part of the identity of the town. Facing climate challenges like sea level rise and increasing storms in the coming decades, it will be important to support and preserve these resources and the services they provide as systems change.

Based on the review of marsh migration projections, erosion patterns and local knowledge, the following strategies are recommended to support the long-term maintenance of coastal wetland resources in Duxbury:

Plan for salt marsh migration where possible

Although there are few opportunities for natural salt marsh migration in Duxbury due to topography that rises relatively steeply at the edge of most salt marshes today, there are a few locations where this natural progression can occur as sea level rises. Some of these locations are on Town owned land at the upstream end of the Bluefish River behind the schools (Figure 4-1), and some are on private property. For the Town owned parcel, salt marsh migration is expected to happen naturally once daily tidal elevations are high enough to overtop the dam. However, salt marsh creation could be accelerated by eliminating the dam and actively managing this area for salt marsh establishment. A more passive approach would be to ensure that the area surrounding the existing pond remains undeveloped; steps could be taken to provide additional protections to this area if they are not already in place.

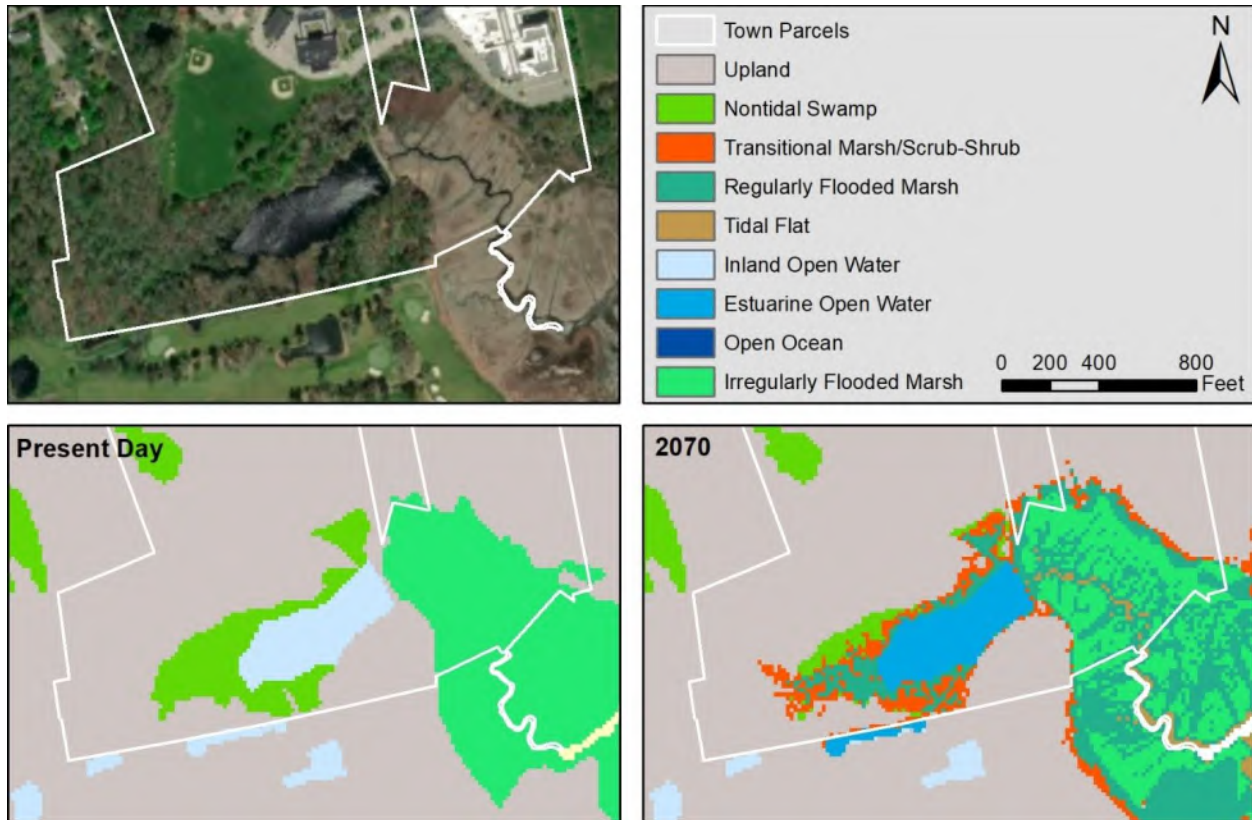


Figure 4-1. Salt marsh migration opportunity

For privately owned parcels with the potential to support future salt marsh migration, the Town can take steps ensure these areas remain undeveloped. First, the Town can communicate with private homeowners and make them aware of these potential future opportunities for salt marsh migration. Not only will avoiding development in these areas today promote salt marsh migration in the future, but it is also in the homeowners’ best interest to avoid developing portions of their property that will likely be intertidal in the coming decades. Second, the Duxbury Conservation Commission may want to review their existing buffer zone regulations to determine if the currently required setbacks are sufficient to protect these areas. If not, consideration should be given to revise the local wetlands bylaw.

Finally, there are a few locations where salt marsh migration is projected to occur in areas of development. Although this migration will not be possible while paved roads, houses and other infrastructure persist, these locations highlight areas that present both future opportunities for salt marsh expansion and future flood risks for existing occupants. Overtime, as daily high tides begin flooding buildings and other structures and affecting safe and reliable access along roadways, owners may find these areas too risky to stay in. If that happens, all hard infrastructure should be removed from these sites to allow successful establishment of salt marsh vegetation.



In Duxbury, areas where development intersect projected salt marsh migration include:

- Landing Road vicinity
- Goose Point / Allens Pond area
- Eagles Nest Point
- Snug Harbor
- Long Point Marine
- Southern lobe of Powder Point neighborhood

As coastal communities face these challenges, some novel approaches are being considered. For example, Oak Bluffs is considering the adoption of a District of Critical Planning Concern (DCPC) in coordination with their regional planning agency whereby the Town would have the right of first refusal to purchase homes fronting a coastal embayment for the purpose of un-development to facilitate salt marsh migration. Ancillary benefits of this program include reducing nitrogen inputs to the pond and making salvaged houses available to the local affordable housing agency.

Address tidal restrictions at undersized culverts

Tidal restrictions often cause hydrological changes that can reduce the upstream tidal range and affect salinity upstream. As a result, upstream vegetation and biotic communities are also altered, and common reed (*Phragmites australis*) and other invasive species that are more tolerant of brackish conditions often displace native saltmarsh grasses and rushes. Depending on the size the restriction, culverts can also prohibit or dramatically reduce fish passage, which is particularly problematic for anadromous species that need to travel up these coastal stream systems to spawn. In addition to the array of present-day problems that can result from a tidal restriction, undersized culverts can also inhibit future salt marsh migration and expansion.

One of the most problematic existing culverts in Duxbury is the culvert under Bay Road just west of Wirt Way. This creek connects a small, tidally restricted wetland to Kingston Bay. The tidal creek is an active anadromous fishway. The culvert under Bay Road is listed in the Atlas of Tidal Restrictions on the South Shore of Massachusetts (MAPC, 2001) as Tidal Restriction Site DUJR4. The Atlas notes that 3-5 acres of upstream wetland are affected by this restriction. This location could be addressed by replacing the existing culvert, which currently consists of a 31-inch partially collapsed concrete culvert.

Cooperate with and support Duxbury Beach Reservation with ongoing resiliency efforts

Duxbury Beach is a critically important resource affording shoreline protection to the Town and neighboring communities, supporting threatened and endangered species habitat, enabling diverse recreation opportunities, and supporting economic vitality. The following is already stated as a priority action in the Town of Duxbury Climate Vulnerability Assessment and Action Plan (MAPC, 2018):



Collaborate with and provide financial support to the Duxbury Beach Reservation, Inc. for ongoing beach nourishment, sacrificial dunes, sand fences, road improvements, and other coastal infrastructure investments to ensure Duxbury remains protected from high energy storm surge into the future while protecting an important recreational and economic amenity.

Not only is Duxbury Beach one of the premiere recreational beaches on the South Shore, but it is also an indispensable asset to the towns of Kingston, Duxbury, and Plymouth for the wave attenuation, energy dissipation, and storm surge protection it affords to the towns, providing protection for waterfront homes, businesses, and commercial interests. As sea level rises, and the inner coastline of Duxbury also becomes increasingly vulnerable to flooding, reliance on the protection afforded by the Duxbury Beach barrier will be even greater. However, Duxbury Beach is already vulnerable to erosion and storm damage, processes that will be further exacerbated by sea level rise. In 2007, FEMA declared Duxbury Beach ineligible for post-disaster restoration funding because it was deemed a “recreational resource” rather than a “shoreline protection resource”. Funding and municipal collaboration from the three towns is critical to supporting the Duxbury Beach Reservation’s long-term maintenance and coastal adaptation of the beach and dunes to ensure its viability as a recreation and climate resilience resource into the future.

4.2 Low-Lying Developed Area Strategies

This assessment highlighted the Snug Harbor area as a highly vulnerable district in the Town of Duxbury with a concentration of important community assets (both public and private). The Harbormaster’s center of operations and the Town Pier and boat ramp are at the end of Mattakeeset Court, and project stakeholders included organizations with operations (in many cases water-dependent) in Snug Harbor: Bayside Marine, Duxbury Bay Maritime School, Duxbury Yacht Club, Island Creek Oysters, and Sweetser’s. The assets in Snug Harbor under the control of these stakeholders and the Town are collectively the driver of significant cultural, recreational, and economic activity in the Town.

Some specific near-term strategies for adaptation have been provided to these stakeholders (summarized in Section 4.3), but coordinated action may also be necessary to address these risks as climate change evolves, since there is shared vulnerability and risk across facilities and the potential for cascading impacts among organizations as well as throughout the community. Apart from a few especially low-lying areas where flood entry points are defined (at the Mattakeeset boat ramp and the top of the basin between Bayside and DBMS), future flood exposure in Snug Harbor is widespread. This pattern of vulnerability suggests the need for coordinated district-level solutions so that private actions to reduce vulnerability are effective and do not have unintended consequences for neighbors.

To support planning for future conditions and coordinated action in Snug Harbor, Woods Hole Group developed design flood elevations to inform future development and initiated conceptual level adaptation plans on the district-scale to reduce exposure to sea level rise and storm surge inundation.



A Design Flood Elevation (DFE) is the anticipated flood elevation to which an asset should be designed in order to protect the asset from inundation. The DFE is typically at least a base flood elevation plus freeboard, as required by the building code, but DFEs produced from MC-FRM according to the RMAT Climate Resilience Design Standards and Guidelines also incorporates projected wave heights from the design storm. Note that the DFEs being developed specifically for RMAT and EEA (in progress as of the writing of this report) will use a statistical approach and results may vary for Snug Harbor from the DFEs provided here. The water surface elevations and wave heights provided here represent the DFE information at the shoreline specifically, and therefore should not be applied further inland than the immediate Snug Harbor area. If assets are removed from direct wave exposure, the stillwater elevation alone may be applied for planning purposes. A target (2070, 1%) and flexible (2050, 1%) DFE are provided in Table 4-1 for Snug Harbor, consistent with the flexible design approach in RMAT. Flexible values can be used if target DFEs are unreasonable to meet given surrounding infrastructure and conditions. Finally, these DFEs are presented without any freeboard. Freeboard should be added to the values if deemed appropriate based on the criticality of the asset being evaluated.

Table 4-1. Snug Harbor climate resilient design flood elevations

Scenario	Stillwater Elevation (ft. NAVD88)	Approximate Wave Height (ft.)	Design Flood Elevation (ft. NAVD88) (no freeboard)
2070 1% (Target)	14.0	5.1	16.8
2050 1% (Flexible)	12.2	4.9	14.9

Considering future nuisance flooding (mean higher high water tidal benchmarks) and storm surge water levels projected by MC-FRM, Woods Hole Group developed three concepts of district-level adaptation for Snug Harbor. In some cases these district-level plans could eliminate the need for building level adaptation (e.g. elevation or floodproofing) by keeping coastal inundation out of the Snug Harbor area. In other cases, a less invasive approach was prescribed that would require asset owners to decide at some point in the future whether to elevate, protect, or move each asset to avoid impact. The three concept plans are presented below. Depending on Town and stakeholder preferences, budget, future regulatory landscape and climate conditions, it may be possible to incorporate elements from different themes into one approach. If concerted district-wide action is to be initiated, it will be critical to have agreement and buy-in from all parties since coordination is key to district-wide success and resilience.

Protect the Edge and Curate Marsh Migration

The “Protect the Edge” concept plan (Figure 4-2) leverages the economy of putting protection out front rather than tracing every undulation of the harbor’s waterfront. There are two contrasting approaches at work to address mid-term nuisance flooding – at the Town boat ramp, targeted elevation of the ramp and the Mattakeset lot is recommended to maintain the function



of this important waterfront infrastructure; in the basin between DBMS and Bayside, developed areas are pulled back to allow salt marsh to migrate with rising tides (initially lateral migration, but could also be vertical with thin layer deposition from local dredging sources). Over time, to preserve ideal conditions for salt marsh sustainability, water levels could be modulated by a tide control structure. This approach preserves near- to mid-term daily use by ensuring all developed areas level up above the projected 2050 MHHW elevation (7.8 ft. NAVD88). Depending on the rate of sea level rise, the projected useable life with this minimal intervention could be longer.

To protect Snug Harbor operations from the impacts of coastal storm surge, a system of modular walls with rising gates and deployable barriers, plus a landscaped berm is proposed to be protective of the 2050 1% chance event (12 ft. NAVD88), which is also protective of the 2070 10% chance event. Tidal and surge control for the basin between DBMS and Bayside would be provided by an operable gate.

Some concessions associated with this protection scheme include the loss of some operational area and the need to move a low-lying facility at Bayside, and the need to relocate the DBMS Guzzle Float seaward of the existing bulkhead. Additionally, the landscape berm is currently designed to protect the Bayside yard, the Island Creek Oyster Pumphouse and two vulnerable Island Creek buildings (Admin and Chem North). In order to extend storm surge protection to the Island Creek’s critical Hatchery building, the berm would have to extend south past the patio and tie back to other high ground or the Hatchery would need to be floodproofed.

Protection above and beyond the 2050 1% level would require additional height on the modular wall and berm, which might interfere with the character of the harbor if exceeding four feet. If sea level rises to the 2070 level, Snug Harbor would have to choose between widespread landform elevation (and attendant raising of edge treatments to accommodate larger storms) or closing off the access points (boat ramps) at the water’s edge, which would significantly alter harbor operations.

Mid-Century Phased Migration

The “Mid-Century Phased Migration” concept plan (Figure 4-3) is a strategy that minimizes broad and coordinated interventions but provides sustainable daily access through the 2050 sea level rise projections by leveling up low-lying areas to 8.0 feet NAVD88. Limited area of salt marsh migration is ceded in some of the already low-lying portions of Bayside’s lot.

In this scenario, all vulnerable structures and assets throughout the harbor would need individual adaptations (floodproofing) through the 2050 horizon, and then some (purple buildings in Figure 4-3) would need to respond to nuisance flooding as conditions evolve. The choice indicated by mid-century phased migration is that those assets exposed to daily flooding would either have to elevate the asset or the landform to maintain usability, or alternatively would have to retreat. Strategic interventions to elevate or cordon off some operational areas might be possible, but since no storm surge interventions are included any remaining facility would have to also increase



storm protection over time. If not coordinated, this approach could severely limit the functionality of the harbor.

Since this strategy does not provide storm surge protection, the Town would need to elevate a portion of Washington Street to solve access issues across this important roadway. Elevating this portion of Washington Street for storm protection also would solve the 2070 daily inundation issue, thereby providing long term connectivity, though not necessarily long-term use of the Harbor.

Transform

The “Transform” concept plan (Figure 4-4) reimagines and reorients the harbor in order to maximize its useful life and its scenic amenities. In this approach, the existing basin between DBMS and Bayside is expanded by un-developing and dredging already vulnerable low-lying areas. This would result in the loss of some of Bayside’s operational areas and facilities, but would potentially be offset by the ability to substitute slips for rack storage, thereby freeing up other land. The expanded harbor would feature an elevated bulkhead, set to accommodate 2070 MHHW and equipped with an additional 5 foot integrated flood barrier in the walkway that could be deployed for storms.

The material generated by the expanded harbor could be used to provide elevation to the two layout areas adjacent to the boat ramps (at Mattakeeset and Bayside) as well as to build the living shoreline terraced modular harborwalk on either side of the harbor. This harborwalk would be designed as a recreational amenity, and would tie into Island Creek’s existing patio to provide storm protection over the long-term. The harborwalk could be built in a modular fashion to respond to evolving storm conditions and harbor protection needs. As with the Protect the Edge concept, the ultimate location of the modular wall to the north and harborwalk to the south could be adjusted to integrate other vulnerable facilities, such as the Duxbury Yacht Club and Island Creek’s Hatchery.

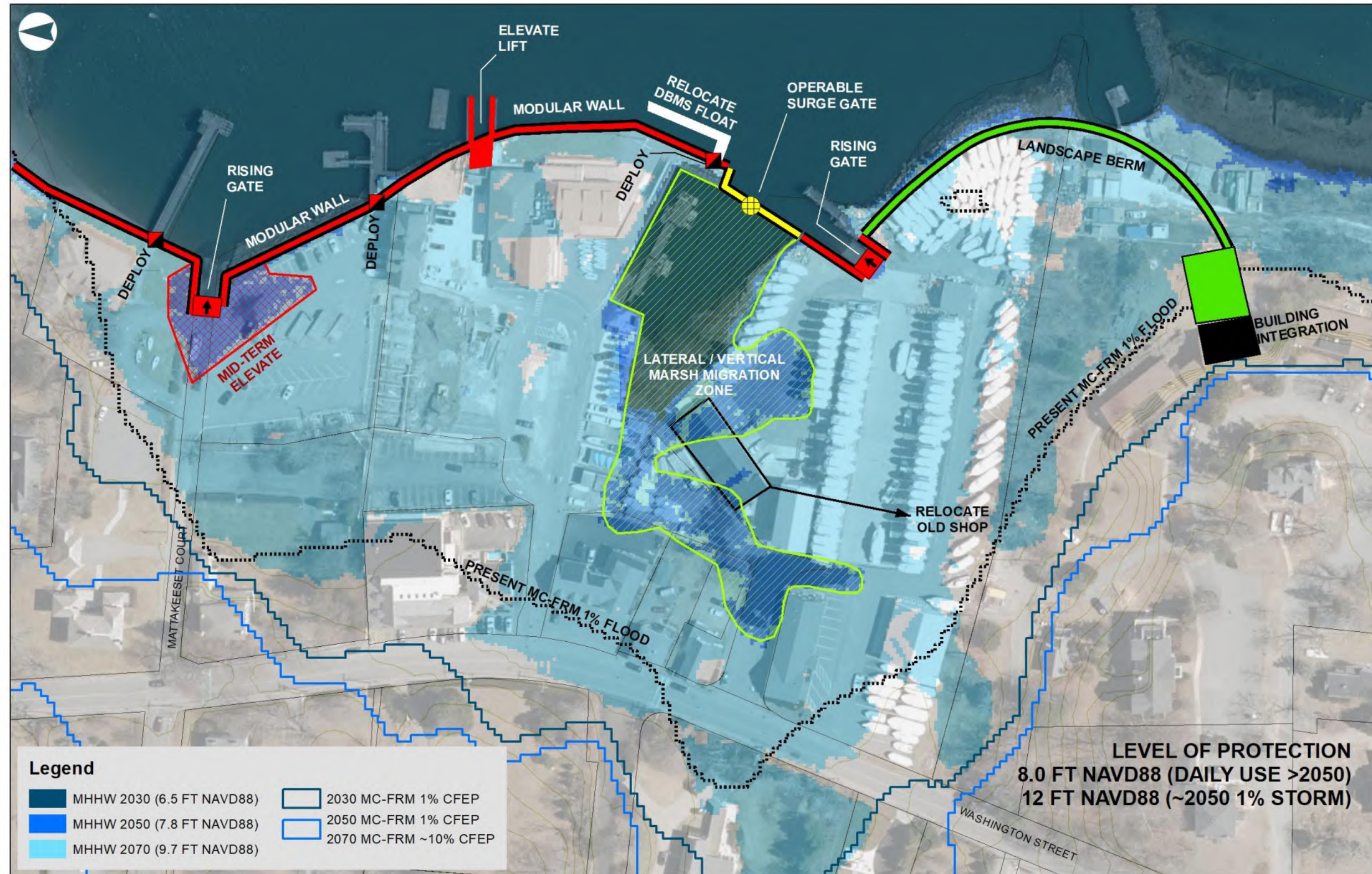


Figure 4-2. Snug Harbor District Strategy - Protect the Edge and Curate Marsh Migration

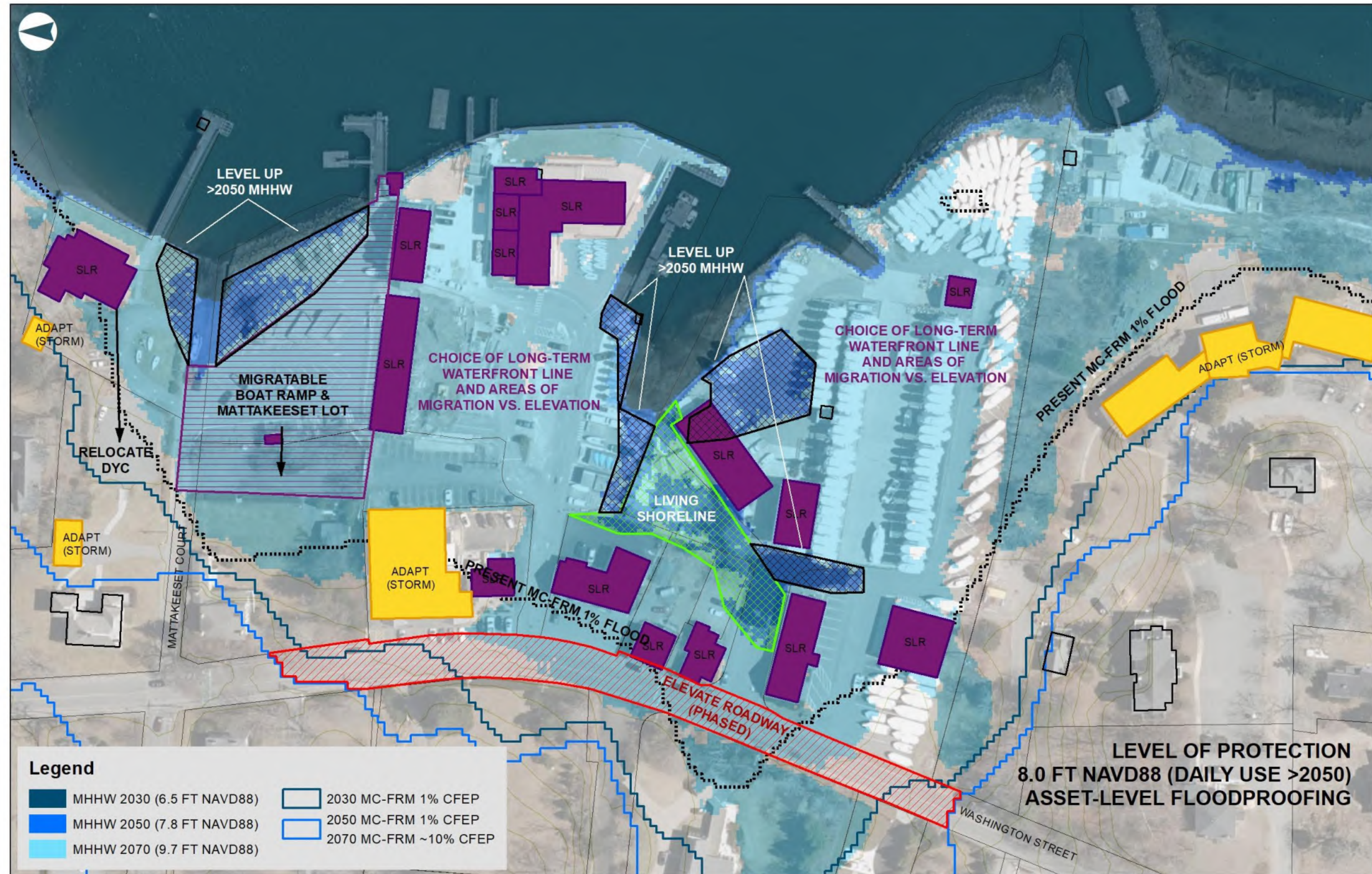


Figure 4-3. Snug Harbor District Strategy - Mid-Century Phased Migration

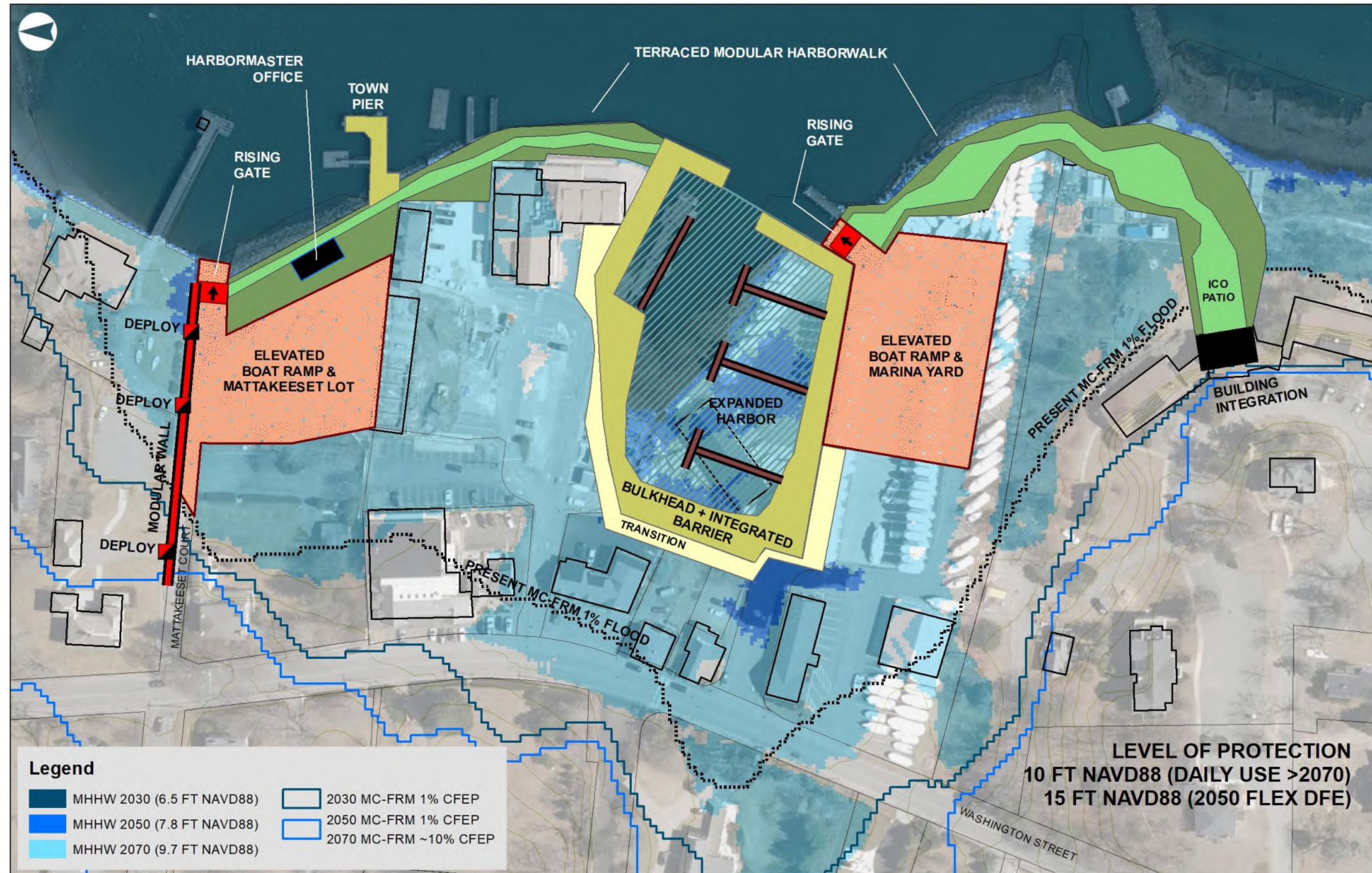


Figure 4-4. Snug Harbor District Strategy - Transform



4.3 High Risk Priority Asset Strategies

A variety of options exist for asset-specific (buildings or mechanical infrastructure components) adaptations. These strategies may be applied as needed to vulnerable facilities as well as to other assets in Town, following further site-specific investigations and suitability analyses. These asset-specific strategies are intended to reduce damages caused by flooding and range from major building modifications to interior modifications. These general asset adaptation strategies include:

- *Full Structure Elevation:* If a building or structure has a high probability of flood inundation, consideration should be given to elevating the entire structure above the projected target flood elevation to avoid critical damage from sea level rise and storm surge. Depending on the construction type and architectural style of the structure, it could be elevated on stilts or pilings (allowing water to pass under the structure without causing structural damage) or on a solid concrete foundation. Any elevation project will require the installation of additional stairs or a ramp to access the new elevated entryway.
- *Interior Elevation:* If a building or structure has a high probability of flood inundation, but full building elevation is not possible, consideration could instead be given to elevating just the first floor from the interior. This strategy is most appropriate for buildings constructed of a non-porous, flood-resistant material (e.g., masonry), where the most significant risk comes from flood water entering the structure through openings in the building (e.g., doorways, windows, etc.). This is a particularly attractive option when there is a strong desire to maintain the existing aesthetic of the building's exterior, such as with historic preservation sites. However, interior elevation only works if there is an adequate floor to floor height to accommodate the floor elevation.
- *Dry Floodproofing:* Dry floodproofing involves using multiple strategies to ensure that no flood water enters through the exterior of the building, the basement, or any of the building's openings. This might involve installing deployable flood shields at any doors or windows below the projected target flood elevation. Traditional flood shields require permanent hardware to be installed on the frame of the opening so that barriers can be easily deployed prior to a flood event. Dry floodproofing can also involve sealing the existing exterior façade of the building with an impervious coating that stops floodwaters from penetrating pre-existing porous materials.
- *Wet Floodproofing:* Unlike dry floodproofing, wet floodproofing does not aim to stop water from entering a building or structure. Instead, it aims to reduce flood damages by allowing flood water to pass through the structure so that the forces of the water on the building's exterior do not cause significant damage to the structure itself. Because of this, wet floodproofing requires retrofitting the building's interior with 'floodable' materials and protecting mechanical and utility equipment so that these components will not suffer permanent damage when water passes through.



- *Mechanical Systems:* Whenever possible, mechanical systems should be elevated above the projected target flood elevation. For low flood inundation probabilities, or if it is not feasible to relocate the mechanical system outside of the lower level, systems should be elevated on a platform to protect from subgrade flooding. Systems should always be anchored so as not to shift during a flood event, damaging other areas.

Transportation systems are also vulnerable to inundation and damage from coastal flooding, causing impacts to access and potentially structural damage. General approaches to roadway and bridge adaptation include elevating as well as rerouting through less vulnerable areas. A variety of treatments are available for side-slopes of elevated roadways to reduce undermining and incorporate nature-based solutions. Additionally, many low-lying roadways coincide with culverts and raising the roadway can also be paired with culvert replacement to restore tidal exchange to upgradient wetlands and promote salt marsh migration.

For both facilities and transportation assets, consideration should be given to nature-based flood protection solutions wherever possible. For instance, vegetated berms and enhanced dunes deployed at scale can provide an elevated natural barrier to flooding that also enhances habitat and ecosystem services.

4.3.1 Prioritized Municipal Asset Strategies

The Steering Committee reviewed the asset specific risk assessment results and selected Gurnet Road, the Marshall Street Bridge, and Powder Point Avenue for the development of preliminary, conceptual level, adaptation strategies. These assets were selected based on vulnerability, risk priority and local knowledge. Each faces unique exposure and vulnerability profiles and therefore can serve as a model for adaptation of other similar road segments and bridges in Town. All three priority assets represent critical linkages that, if inundated or damaged could result in the isolation of neighborhoods and prevent access by emergency services.

For each roadway or bridge adaptation, a target elevation of 10 feet NAVD88 was established to:

- Maintain access and provide storm protection up to a Present Day 0.5% event, a 2030 5% event, a 2050 30% event, and the 2070 annual storm, and
- Maintain daily access (above tidal flooding) through 2070.

The following sections summarize the adaptation strategy for each asset and provide a preliminary opinion of probable cost. Additional analysis and detail for each is provided in Appendix E.

4.3.1.1 Gurnet Road

Gurnet Road north of the Powder Point Bridge (Figure 4-5) provides the only linkage besides the Powder Point Bridge from the mainland to the barrier beach containing Duxbury residential neighborhoods, Duxbury Beach Reservation, and Saquish. This low-lying (roadway critical



elevations range from ~6.0 to ~8.5 feet NAVD88) coastal road runs along the back side of the Duxbury Beach dunes and seawalls north from the Duxbury Beach parking lot (where the first quarter mile is unpaved) to the Marshfield town line. It is primarily exposed to flooding from Duxbury Bay, but may also experience overwash occasionally from the beach side. Annual chance of storm surge inundation is ~5-75% under current conditions, ~75-90% by 2030, and ~75-100% by 2070. The roadway could be exposed to nuisance flooding as early as 2030 in the lowest segments.



Figure 4-5. Gurnet Road adaptation area (with transect locations)

Elevating Gurnet Road to ~10.0 feet across the 6,240 ft span would require approximately 1 to 3.5 feet of fill and paving, depending on existing conditions at each area. Side slope treatments would be designed to transition to existing grade on developed parcels, provide a back dune habitat in some areas, and provide coastal bank living shoreline side slopes on the bay side with potential for wetlands migration over the lifespan of the roadway. Representative cross sections are presented in Figures 4-6 through 4-8, and further detail is provided in Appendix E.

A preliminary opinion of probable cost indicates that the Gurnet Road adaptation project could cost approximately \$1.2M (detailed cost estimate breakdown is provided in Appendix E).

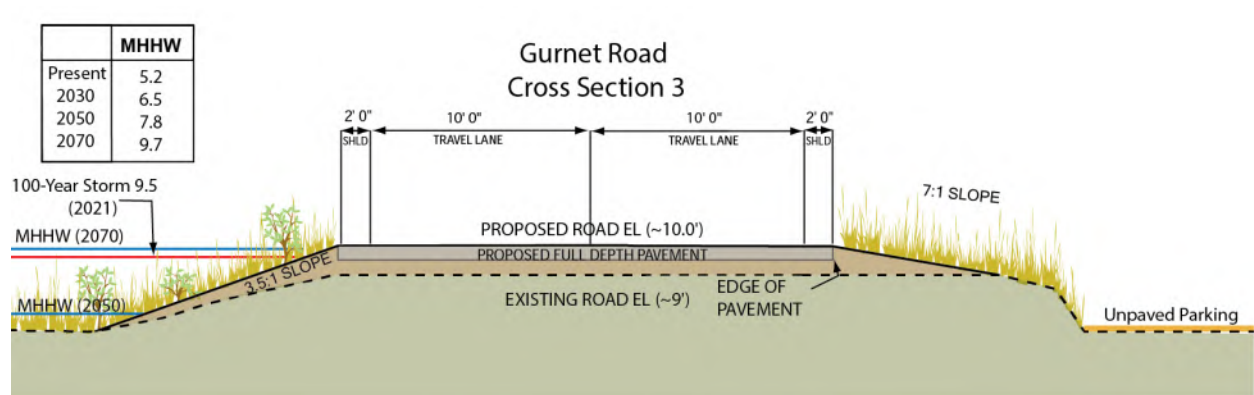


Figure 4-6. Gurnet Road adaptation plan at Cross Section 3

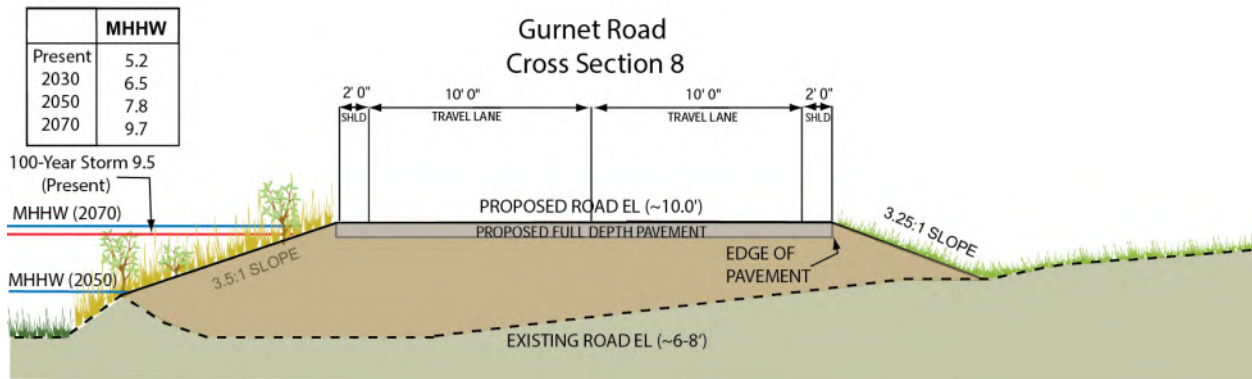


Figure 4-7. Gurnet Road adaptation plan at Cross Section 8

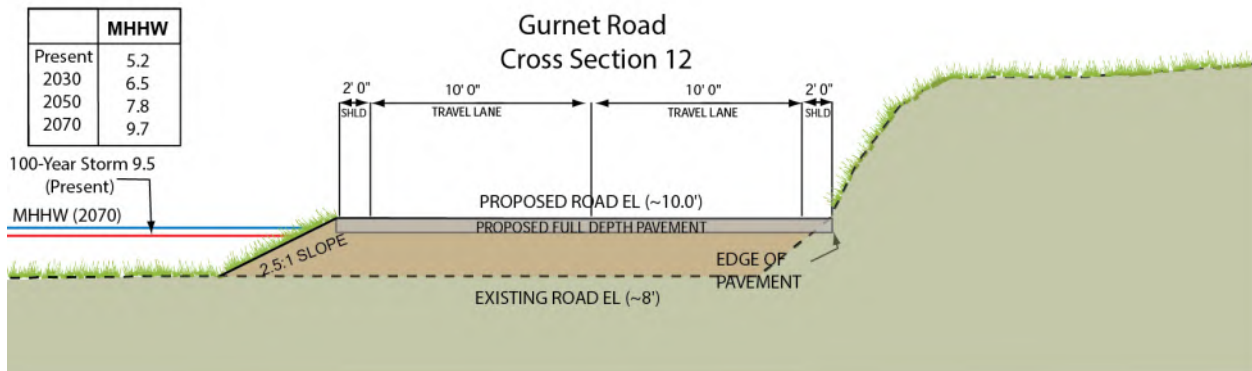


Figure 4-8. Gurnet Road adaptation plan at Cross Section 12

4.3.1.2 Marshall Street Bridge

The Marshall Street bridge (Figure 4-9) crosses the southern end of Eagles Nest Bay connecting the isolated Standish Shores neighborhood to Captains Hill and upland areas of South Duxbury. The critical elevation for the bridge’s structural element is 6.8 feet NAVD88 (low chord elevation), making it vulnerable at the 30% level under current conditions, and 100% by 2030. The critical elevation for connectivity is 10.5 feet NAVD88 at the road surface, making vehicle access over the bridge an issue at the 0.2% probability level today, 1% by 2030, and 50% by 2070.



Figure 4-9. Marshall Street Bridge adaptation area (with transect locations)

Elevating the low chord elevation of the Marshall Street Bridge to ~10.0 feet across the 420 ft span would require new bridge span construction and approximately 3.5 feet of fill and paving, depending on existing conditions, to level the approaches up to the bridge surface (approximately 14.5 ft NAVD88). This approach eliminates potential exposure of the structural elements of the bridge span to storm surge and maintains accessibility up to and including a 2070 0.5% chance event. Side slope treatments along the approaches to the bridge would be designed to transition to existing grade on developed parcels, and provide coastal bank living shoreline side slopes for undeveloped areas. Representative cross sections for the approach and bridge are presented in Figures 4-10 and 4-11, respectively, and further detail is provided in Appendix E.

A preliminary opinion of probable cost indicates that the Marshall Street Bridge adaptation project could cost approximately \$4.5M to \$8.7M (detailed cost estimate breakdown is provided in Appendix E).

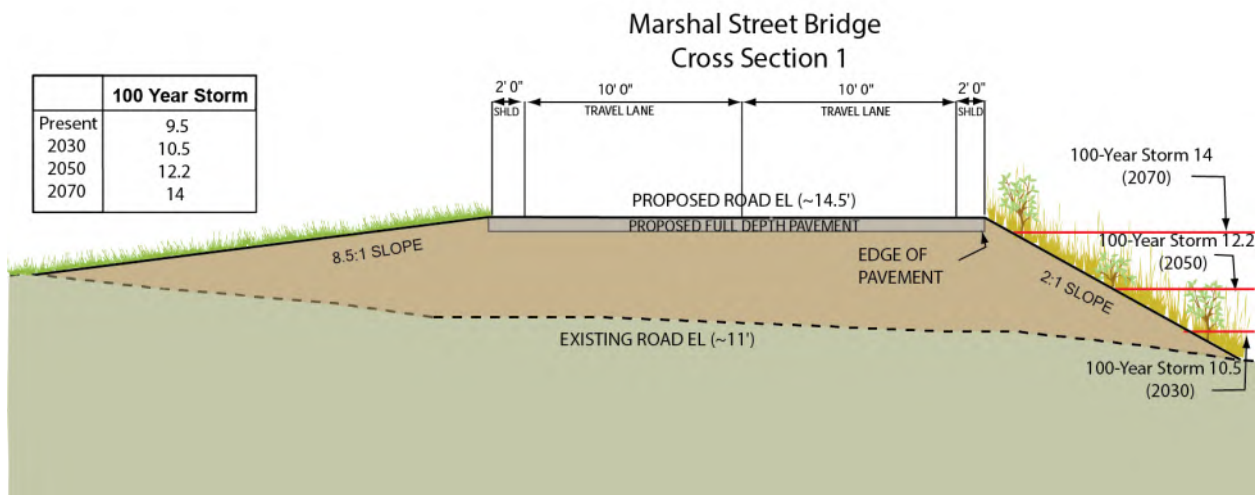


Figure 4-10. Marshall Street adaptation plan at Cross Section 1



	100 Year Storm	MHHW
Present	9.5	5.2
2030	10.5	6.5
2050	12.2	7.8
2070	14	9.7

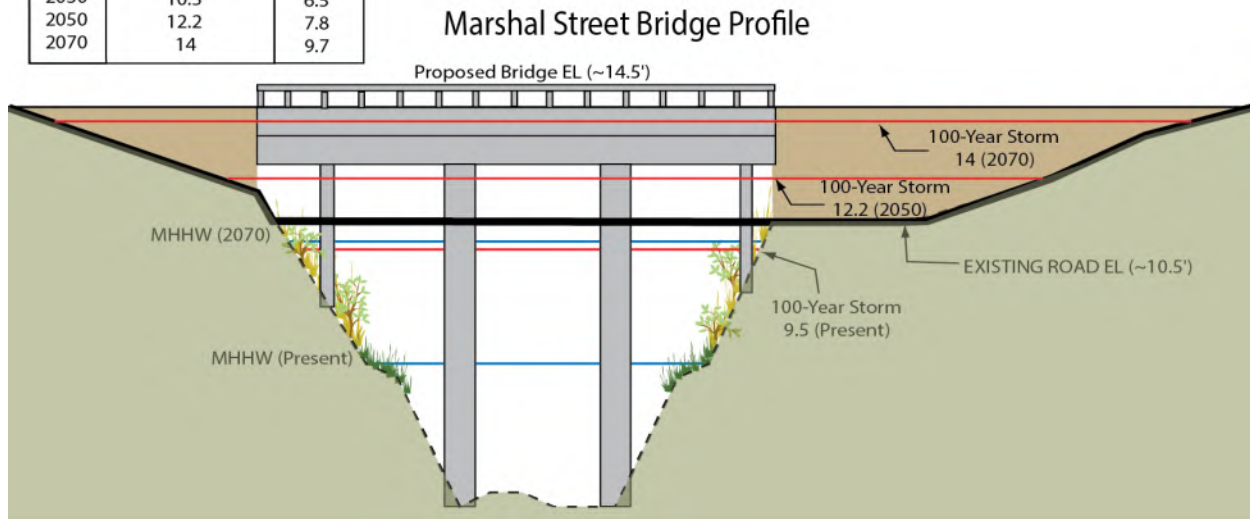


Figure 4-11. Marshal Street Bridge adaptation plan

4.3.1.3 Powder Point Avenue

Powder Point Avenue is a low-lying roadway (critical elevations of segments between 7.0 and 7.4 feet NAVD88) along the edge of the Bluefish River from the Washington Street bridge to (just past) the intersection with King Caesar Road (Figure 4-12). It is a critical linkage for the Powder Point neighborhood as well as for vehicles accessing Duxbury Beach via the Powder Point Bridge. Annual chance of storm surge inundation is ~10-100% under current conditions, ~50-100% by 2030, and ~80-100% by 2070. The roadway could be exposed to nuisance flooding as early as 2050 in the lowest segments.



Figure 4-12. Powder Point Avenue adaptation area (with transect locations)



Elevating Powder Point Avenue to ~10.0 feet across the 1,660 ft span would require approximately 1.5 to 3.0 feet of fill and paving, depending on existing conditions at each area. Side slope treatments would be designed to transition to existing grade on developed parcels, and provide coastal bank living shoreline side slopes along the Bluefish River with potential for wetlands migration over the lifespan of the roadway. A representative cross section is presented in Figure 4-13, and further detail is provided in Appendix E.

A preliminary opinion of probable cost indicates that the Powder Point Avenue adaptation project could cost approximately \$1.0M (detailed cost estimate breakdown is provided in Appendix E).

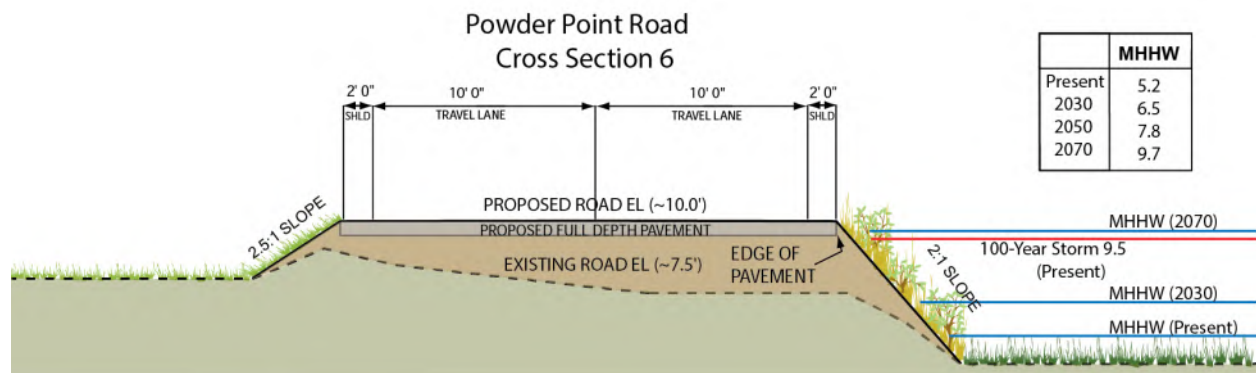


Figure 4-13. Powder Point Road adaptation plan at Cross Section 6



4.3.2.2 Duxbury Harbormaster

- Consider building a modular wall along the eastern edge of the Mattakeeset parking lot, at least as high as the retaining wall on the boat ramp to provide some flood protection for the parking lot. Over time this wall could be further elevated and prepared to integrate a rising gate on the boat ramp and a deployable flood barrier at the Town Pier.
- Consider elevating low-lying portions of the Mattakeeset parking lot next to the boat ramp to prevent nuisance flooding in the mid-term.
- Consider elevating or floodproofing the Harbormaster Office in the near to mid term. The facility should be prepared immediately to accommodate inundation in the interim – all equipment, records and other items should be stored at least two feet above the floor of the office.
- Consider elevating or reconfiguring the fulcrum point of the ramp serving the Harbormaster Float. Since this float stays in the water year-round it is vulnerable to coastal storm damage. In the current configuration, storm surge can push the ramp above this critical elevation and potentially cause damage. Extending the pilings on the ramp guide would also reduce the chance of damage to this infrastructure.
- Seal and floodproof the Snug Harbor Shared Septic Pump. Although this asset's critical elevation is above current stillwater elevations and all but the most extreme 2030 storms, it is potentially exposed to waves during a large coastal storm.
- In conjunction with other municipal departments, develop a Coastal Flood Operations Plan (CFOP) to prepare for and minimize flood damage due to coastal flooding as a result of extreme weather events at Harbormaster facilities and throughout Snug Harbor. The plan will help to institutionalize flood prevention actions that need to be performed before, during and after a major storm. See Section 4.4.5 recommendations for a Town CFOP for additional detail.



4.4 Policy and Regulatory Strategies

Recent planning by the Town of Duxbury, including the 2019 Comprehensive Master Plan *Envision Duxbury*, the *Snug Harbor Resiliency* initiative, 2018 Climate Resiliency Assessment and Action Plan, 2018 Hazard Mitigation Plan, and 2017 Open Space and Recreation Plan recognize the threat that climate change poses to public safety, health, and the environment. Each includes relevant goals, strategies, and actions to promote adaptation and build resiliency to the effects of climate change, including sea level rise and coastal flooding. A common thread amongst these plans is an identified need to update policies, bylaws, and regulations.

Building on these existing planning documents, a thorough review of the Town’s by-laws and regulations relevant to climate change and resiliency, especially coastal flooding and related hazards, was conducted to gain an understanding of the purpose and scope of these laws and potential limitations with respect to the implementation of climate resilience measures. These include:

- Town of Duxbury Zoning Bylaws (amended through March ATM 2019);
- Town of Duxbury Planning Board Rules and Regulations Governing the Subdivision of Land (March 2005); and
- Town of Duxbury Conservation Commission Wetlands Protection Bylaw, Chapter 9, Wetlands Regulations (adopted February 28, 2017)

Bylaws and regulations are the foundations upon which the Town of Duxbury builds its governing principles, land uses, and protection of the environment and public health and safety. These bylaws and regulations are either the conduit for, or hinderance of, short and long-term adaptation and resiliency of the community from climate change impacts. Studies show that investments in flood hazard mitigation and other resiliency measures can be highly cost-effective. The 2017 report by the National Institute of Building Sciences (NIBS, 2017) estimated that, on average, every \$1 invested in mitigation saves \$6 in damage. Addressing regulatory barriers and constraints to adaptation and fully exploiting opportunities that may exist to achieve effective adaptation will help to make the built environment and essential infrastructure more resilient and less vulnerable to the effects of climate change.

Recommended modifications were developed for each of the above in cases where existing bylaws and regulations were restrictive to the allowance of public or private property owners to employ climate change resilience and adaptation measures, or were not restrictive enough for the Town to protect the public interest in the environment, public health and safety considering long-term climate change impacts. For the purpose of this analysis, climate change resilience and adaptation measures are those that:

- Protect natural resources and land uses from the impacts of climate change;



- Accommodate existing land uses by making required adjustments and adaptations to the impacts of climate changes; and/or
- Manage Retreat from extremely vulnerable areas using laws, policies, and procedures that account for the impacts of climate changes.

These measures reflect no adverse impacts to public or private property owners because they are actions that should be considered under any conditions, as they include the best practices for environmental protection, ensuring public health and safety, and economically feasible and sustainable growth in appropriate locations.

The recommended modifications are included in tracked changes as Appendix F of this report. Summaries of the most significant modifications and other typical modifications recommended in each document are included in the sections that follow. In addition, high-level recommendations were developed for the Town to incorporate climate adaptation and resiliency in acquisition activities and public projects.

4.4.1 Zoning Bylaws

The following recommendations summarize the more detailed “red line” modifications to the Zoning Bylaws provided in Appendix F-1:

1. Fully integrate references to present and future flood hazards in the text of the Bylaws and raise the issue of flooding and resilience to future climate change impacts as a required consideration in the design and approval of development proposals, including Zoning Board of Appeals and Planning Board decisions.
2. Update and modify the Flood Hazard Areas Overlay District to account for future coastal flood risk and promote adaptation and resiliency in future floodplain development:
 - a. Expand the boundary of the Flood Hazard Areas Overlay District (FHAOD) to include future coastal flood hazard areas and Sea Level Rise Base Flood Elevation (SLR-BFE) based on a Best Available Future Coastal Flood Hazard Areas Map (i.e., Massachusetts Coast Flood Risk Model).
 - b. Update the FHAOD for compliance with the 2020 Model Floodplain Bylaw guidance published by the Commonwealth of Massachusetts based on FEMA National Flood Insurance Program (NFIP) regulatory requirements.
 - c. Include a list of Prohibited Uses and Structures, building on the existing list, to restrict certain high risk uses and structures, including residential use of areas below the SLR-BFE plus Freeboard.
 - d. Include a list of Uses and Structures Permitted by Special Permit, harmonizing with conditionally permissible uses and structures in other environmentally focused overlays (i.e., Wetlands, Dunes, and Aquifer Protection), and including non-residential use of areas below the SLR-BFE plus Freeboard.



- e. Include a Development Standard requiring that new access ways created as part of future development be elevated to the SLR-BFE, except under certain conditions.
 - f. Include specific Plot Plan Requirements to assist Town staff and board members in their review of development proposals for compliance with flood resistant design standards of the State Building Code and proposed requirements of the FHAOD.
 - g. Include Definitions in the FHAOD for the purposes of determining compliance with provisions of the Overlay, including Best Available Future Coastal Flood Hazard Areas Map, Flood Design Class, Freeboard, Sea Level Rise Base Flood Elevation, Substantial Damage, Substantial Improvement, Target Year, and others to align with the Massachusetts 2020 Model Floodplain Bylaw.
 - h. Measure building height within the FHAOD from the SLR-BFE.
3. Update and modify the Wetlands Protection Overlay District to account for long-term sea level rise and promote ecological adaptation and resiliency, including protecting areas of future wetland transition and migration.
 - a. Expand the boundary of the Wetlands Protection Overlay District to include areas within 100 feet of the future estimated mean high tide, considering long-term sea level rise.
 - b. Add ecological restoration, enhancement, and climate change adaptation to Permitted Uses and Structures.
 - c. Add coastal flood and erosion control uses and structures to Uses and Structures Permitted by Special Permit.
 - d. Add protection of coastal wetlands and their ability to migrate in response to long-term sea level rise to Special Permit Goals.
 4. Harmonize references to elevation vertical datum to consistently reference North American Vertical Datum (NAVD) of 1988.

4.4.2 Subdivision Rules and Regulations

The following recommendations summarize the more detailed “red line” modifications to the Subdivision Rules and Regulations provided in Appendix F-2:

1. Fully integrate references to present and future flood hazards in the text of the Rules and Regulations and raise the issue of flooding and resilience to future climate change impacts as a required consideration in the design and approval of subdivision proposals.
2. Reiterate, by referencing the FHAOD and/or repeating its requirements in relevant sections of the Subdivision Rules and Regulations, that development, including buildings, utilities, and roads, in the FHAOD must comply with FHAOD requirements.
3. Include specific Approval Not Required, Preliminary, Definitive, and As-Built Plan requirements, as well as Hydrogeologic and Traffic Study requirements, to assist Town



staff and board members in their review of subdivision proposals for compliance with flood resistant design standards of the State Building Code and proposed requirements of the FHAOD.

4. Modify drainage culvert and outfall design standards to prevent backflow and ensure safe performance under future tidal and coastal storm flooding conditions.
5. Modify references to tidal wetland and vegetation protection buffer areas to include areas of potential wetland transition or migration accounting for estimated long-term sea level rise.
6. Harmonize references to elevation vertical datum to consistently reference North American Vertical Datum (NAVD) of 1988.

4.4.3 Wetlands Regulations

The following recommendations summarize the more detailed “red line” modifications to the Wetlands Regulations provided in Appendix F-3:

1. Add new definitions that incorporate climate resiliency including the following: Adaptation, Cumulative Effect, Extreme Weather Event, Flood Control, Impacts of Climate Change, Resilience, Resource Area Enhancement, Sea Level Rise, and Storm Damage Prevention.
2. Include coastal resiliency as a wetland value for Coastal Beach, Coastal Dune, Salt Marsh, and Land Subject to Coastal Storm Flowage
3. Modify definitions for Land Subject to Coastal Storm Flowage to distinguish Coastal A Zones.
4. Add performance standards to Vegetated Wetlands, Salt Marsh, and Land Subject Coastal Storm Flowage to consider the impacts of climate change on projects.
5. Create a subsection of Buffer Zone called Special Transitional Areas that calls for additional considerations for areas in the Buffer Zone adjacent coastal resource areas.
6. Create an additional section for protections against hardened surfaces in Land Subject to Coastal Storm Flowage.

4.4.4. Acquisition

The Town should consider acquiring land adjacent to coastal resource areas to accommodate changing conditions of natural resource areas such as salt marsh, especially those areas identified in this study as areas of potential resource transition and/or migration. This would be complimentary to the existing strategy in the Open Space and Recreation Plan of acquiring ecologically valuable existing habitat and natural resource areas and the high priority measure in the Hazard Mitigation Plan of acquiring land in flood areas along the coast. Specific actions that the Town and its non-profit partners should complete include (but are not limited to):



- Use the natural resource information provided in the Climate Change Vulnerability Assessment and Adaptation Plan to identify priority areas for acquisition through easements, fee interest or purchase of development rights to accommodate projected effects of sea level rise;
- Integrate the identified priorities into specific actions in the next update to the Town’s Open Space and Recreation Plan;
- Investigate the possibility of implementing a Rolling Easement program, which includes:
 - Commitment to implementation of a retreat policy in areas subject to severe and repeated flooding;
 - Purchasing easements from landowners in exchange for a promise to surrender the property to the Town once it is substantially damaged by a flood event;
 - Offering of funds to a homeowner under an agreement that when the home is substantially damaged, it will not be rebuilt and will be turned over to the town;
 - Utilizing the Town’s existing Hazard Mitigation Plan, and the Climate Change Vulnerability Assessment and Adaptation Plan, to identify single or multi-family homes that are defined by the Community Rating System (CRS) as repetitive loss properties as candidates for Rolling Easements.

4.4.5. Public Projects

It is important for the Town to also develop policies for public projects that incorporate the anticipated effects of climate change and sea level rise and promote more sustainable practices throughout the community, such as:

- Require that all Town-funded projects take into account predicted impacts of climate change and sea level rise. This could be made more consistent by applying the Commonwealth’s Climate Resilience Design Standards and Guidelines.
- Evaluate and amend the Town’s Hazard Mitigation Plan in the context of this study, including the flood-related hazards and climate change impacts narrative, critical infrastructure exposure assessment, HAZUS-MH damage estimates, specific recommended mitigation measures, and prioritization.
- Develop a regular (perhaps bi-annual) inventory/report of actions taken by the community to improve resilience to climate change and sea level rise.
- Consider installing an automated tide gauge in Snug Harbor to help monitor actual sea level rise locally. The nearest tide gauge is in Boston. Although it is very reliable, it does not provide localized data for Duxbury. Having a local tide gauge will not only support



daily harbor operations with hyperlocal tide predictions and situational awareness, but will also provide important data for the design and implementation of future adaptation projects. Approximate cost is \$3,800 per year for sensor, data telemetry and online dashboard access (plus additional labor and direct costs for installation, survey, and maintenance, if desired). Since there is mutual benefit to such an installation, Snug Harbor stakeholders may be willing to share these modest costs with the Town as access to the data and projections would also benefit stakeholder operations.

- Consider developing a Coastal Flood Operations Plan to prepare for and minimize flood damage due to coastal flooding as a result of extreme weather events. The plan will help to institutionalize flood prevention actions that need to be performed before, during and after a major storm. Specific elements of this Plan should include:
 - Utilization of actual maximum predicted water elevations for a storm;
 - Clearly define what the sources of data are and who makes the decision to implement the plan;
 - Clearly define actions to be taken based on the maximum predicted water elevations, parties responsible to perform the actions and timelines required to implement the actions;
 - Include actions relating to pre-storm mobilization, monitoring during the storm, and post-storm recovery;
 - Identify training, storage, and maintenance needs for any specific equipment such as temporary flood barriers or pumps;
 - Facility-specific instructions located on-site for easy access during pre-storm mobilization; and
 - Incorporation into the Town’s overall emergency response planning documents.

4.5 Summary

The adaptation recommendation in this section are a menu of strategies, some general and some specific, that the Town of Duxbury and Snug Harbor stakeholders may consider for future implementation to build coastal resilience to future sea level rise and storm surge hazards. In many cases, these strategies are preliminary in nature and would need further refinement in the design phase. Monitoring for implementation thresholds as well as adjusting risk and vulnerability assessments over time given evolving projections will be important elements in the Town’s coastal resilience program. Additionally, these coastal resilience initiatives would benefit from a cross-departmental discussion of risk tolerance and cumulative risk. This vulnerability assessment and adaptation plan defaults to the 1% and 0.5% chance inundation events (i.e. the



100-year and 200-year return period events), but certain assets may be better designed to higher or lower risk thresholds.

Future planning and design for infrastructure should take service life and exposure to coastal flooding into account. To support forward-facing design, the Commonwealth’s ResilientMA Action Team (RMAT) has developed “Climate Resilience Design Standards and Guidelines” which may be a useful reference for public and private infrastructure planning.

The analyses conducted for this project and described in this document are also a resource for conducting Town-wide vulnerability assessments (for non-municipal assets outside of Snug Harbor) and other planning efforts. The supporting MC-FRM, SLAMM, and asset data accompanies this report in a digital deliverable.

Based on the recommendations provided in Section 4, the following immediate actions are recommended to continue building coastal resilience in Duxbury:

- Develop a public outreach and communications plan to disseminate information on future coastal flood risk to residents and local businesses and organizations.
- Install a tide gage in Snug Harbor, and potentially link it to a Harbormaster operational plan and communications system.
- Support Duxbury Beach Reservation’s efforts to maintain and restore coastal beach, dune, and bank habitats that provide natural protection to landward areas in Duxbury.
- Continue to seal/elevate/floodproof controls and manholes for sewer and fuel tank infrastructure vulnerable to storm inundation.
- Review and consider adopting regulatory recommendations proposed in this report.
- Explore funding sources to replace the failing culvert under Bay Road just west of Wirt Way (Tidal Restriction Site DUJR4) and restore the tidally restricted wetland.
- Form a Coastal Resilience Committee (including municipal staff, residents and business owners) to continue implementing recommendations from this report, especially:
 - selecting the highest priority low-lying roadways and developing plans to preserve critical connections;
 - considering the long-term future of the Snug Harbor waterfront area.

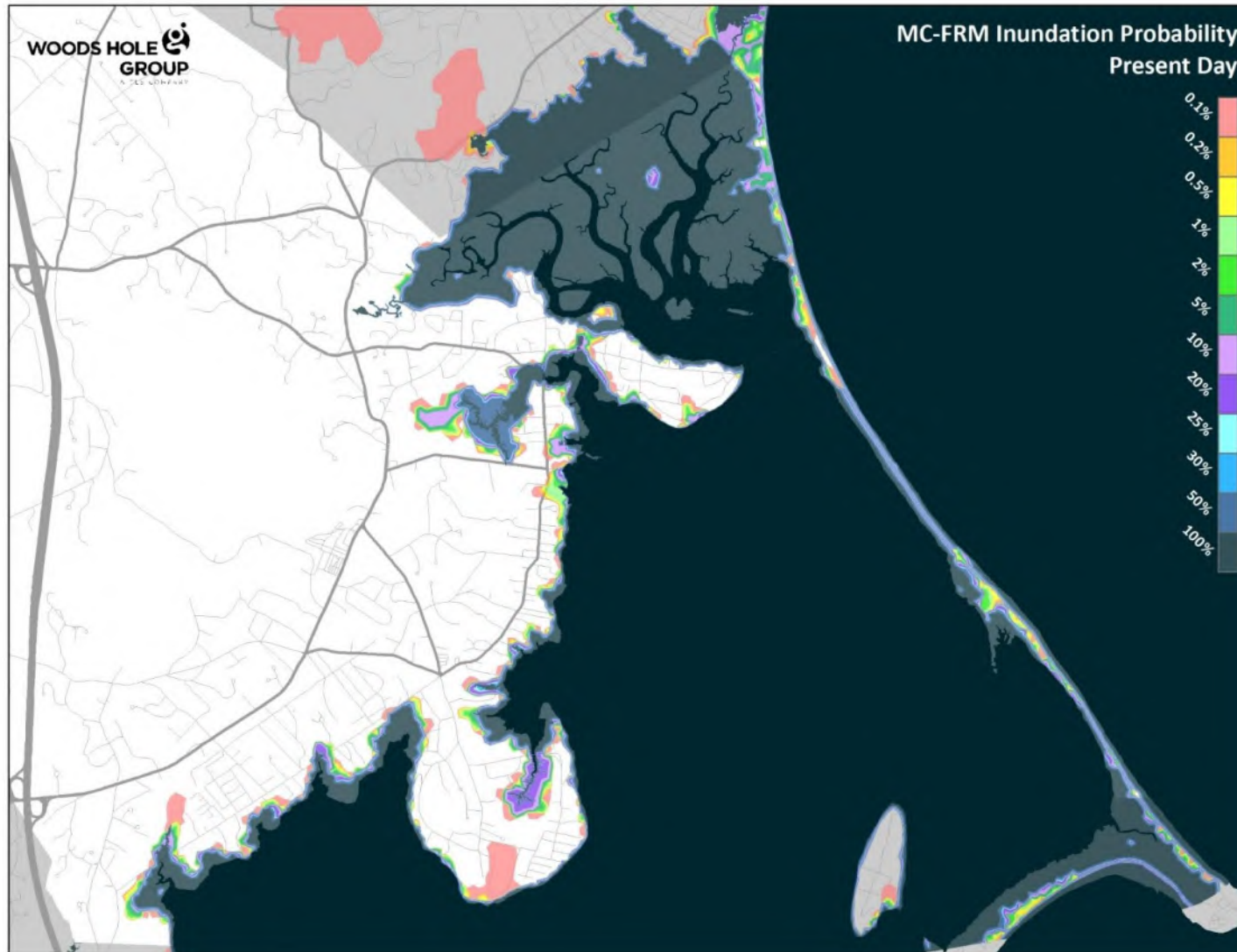


5.0 REFERENCES

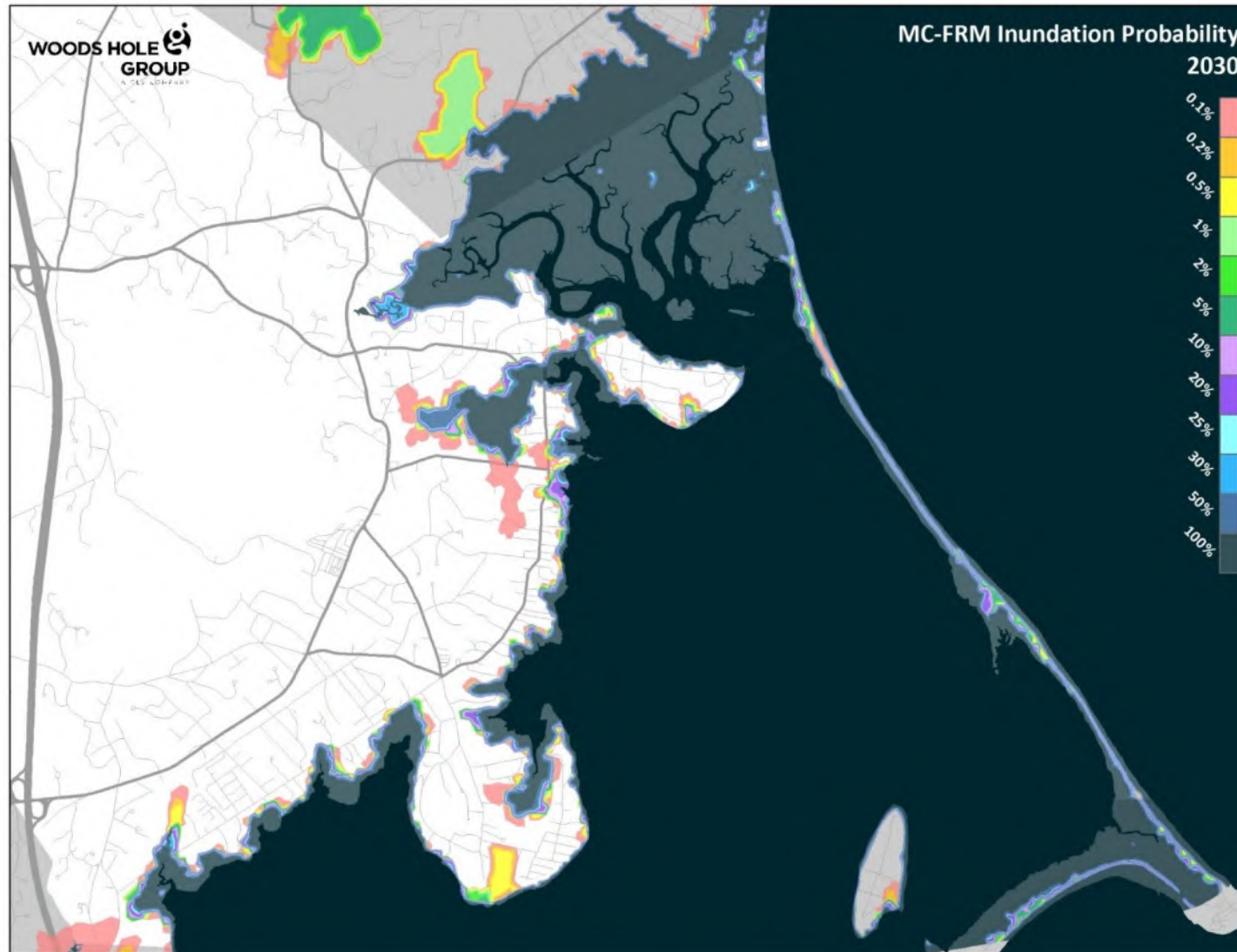
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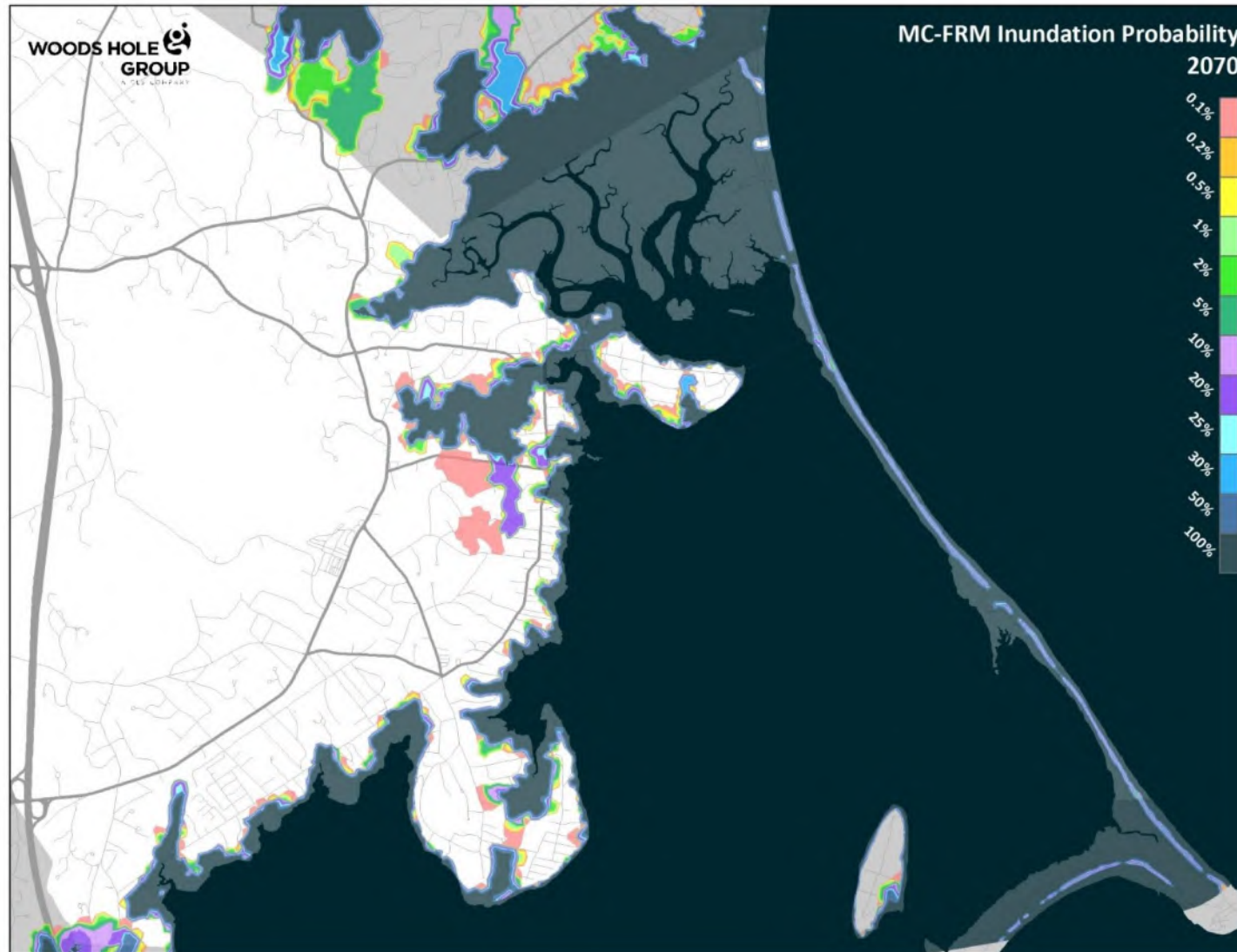
APPENDIX A – MASSACHUSETTS COAST FLOOD RISK MODEL (MC-FRM) INUNDATION MAPS



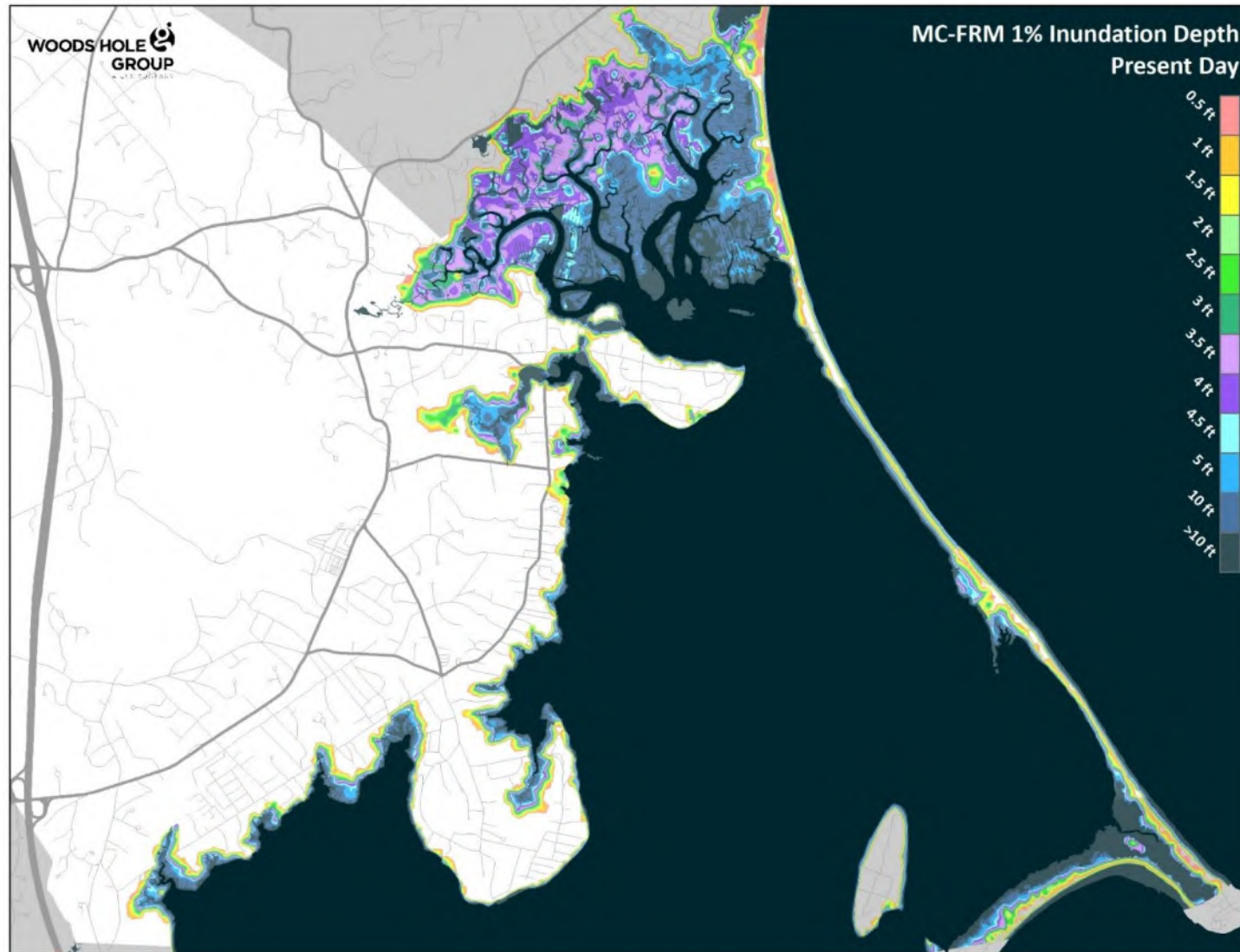
A-1 MC-FRM Coastal Flood Exceedance Probability – Present Day.



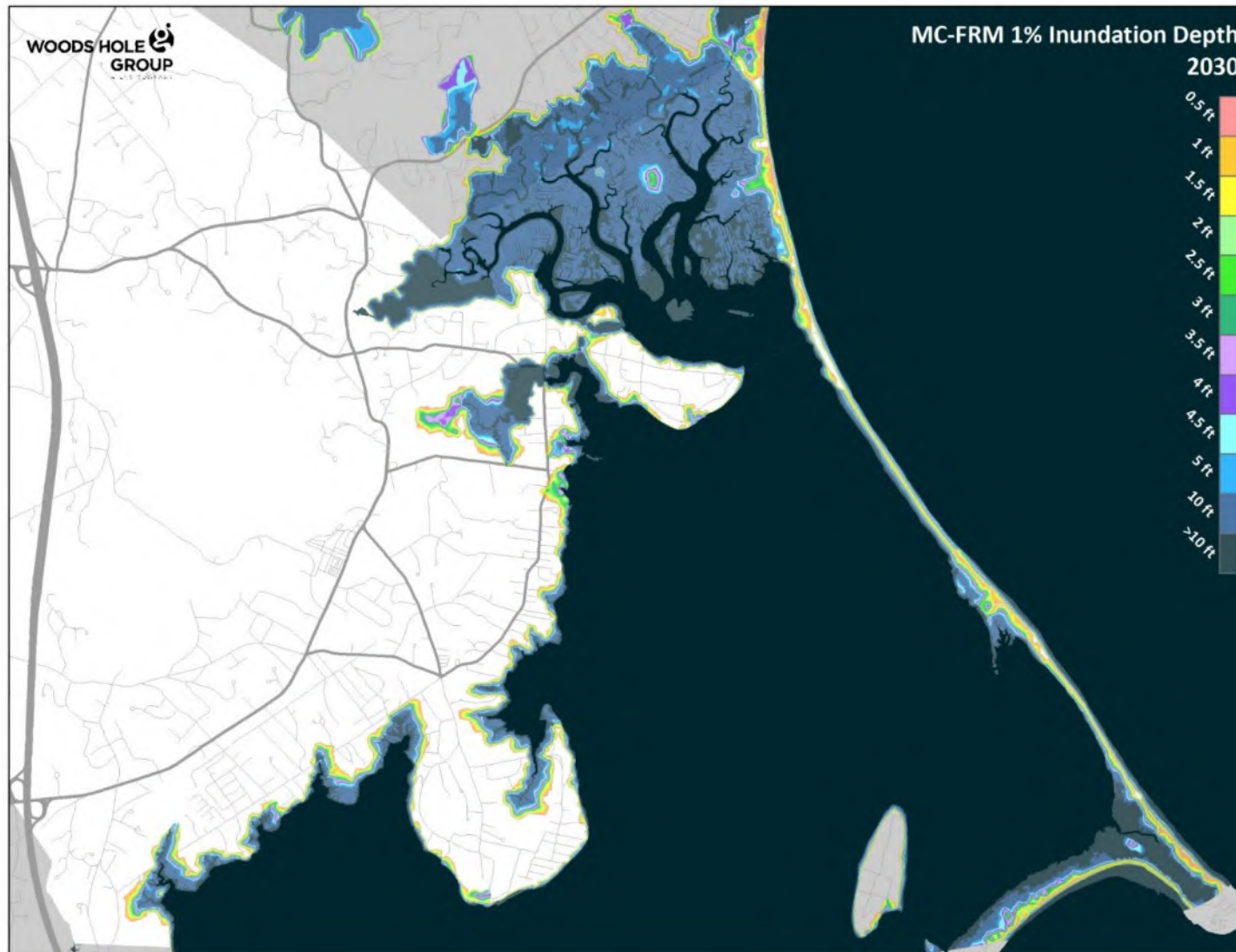
A-2 MC-FRM Coastal Flood Exceedance Probability – 2030.



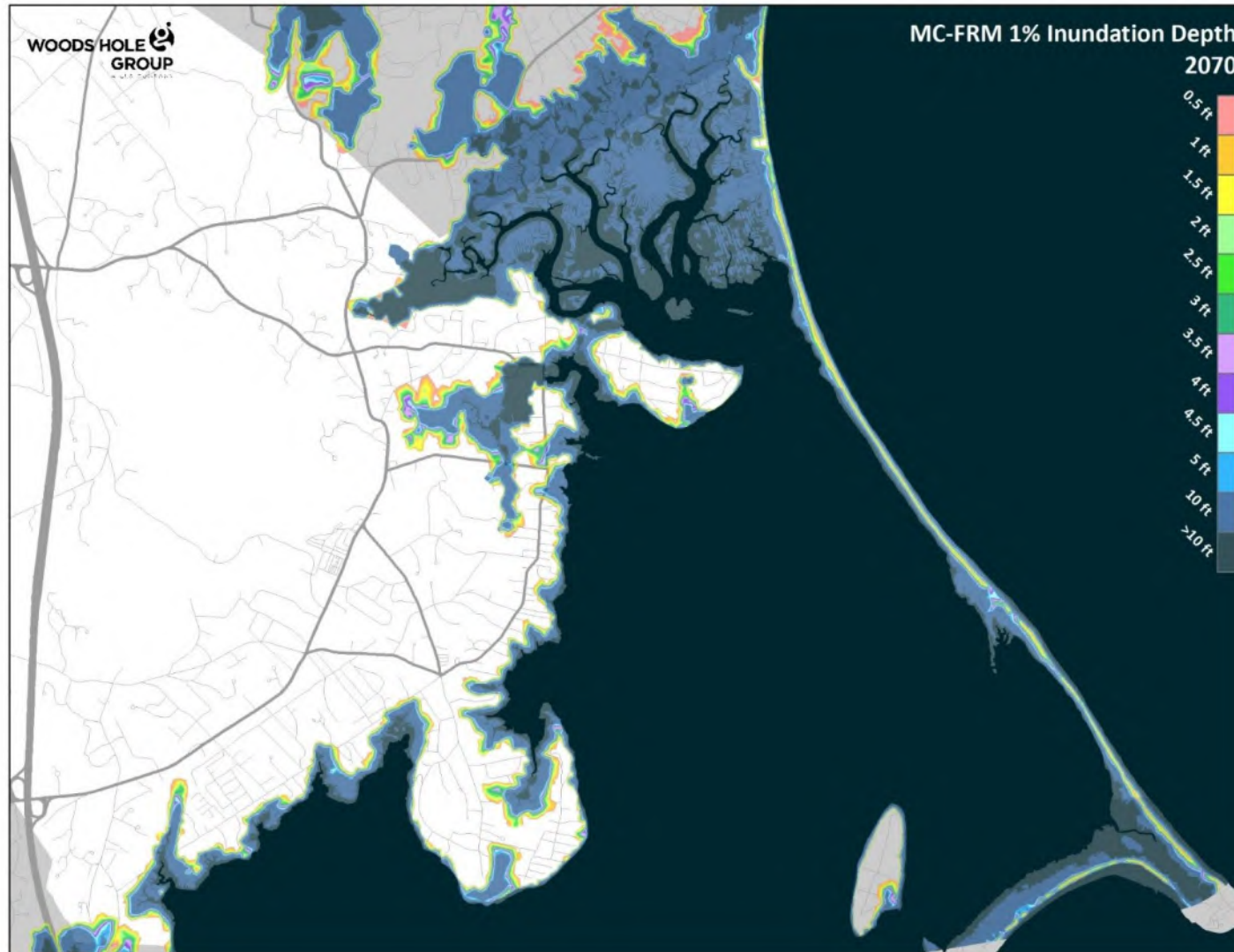
A-3 MC-FRM Coastal Flood Exceedance Probability – 2070.



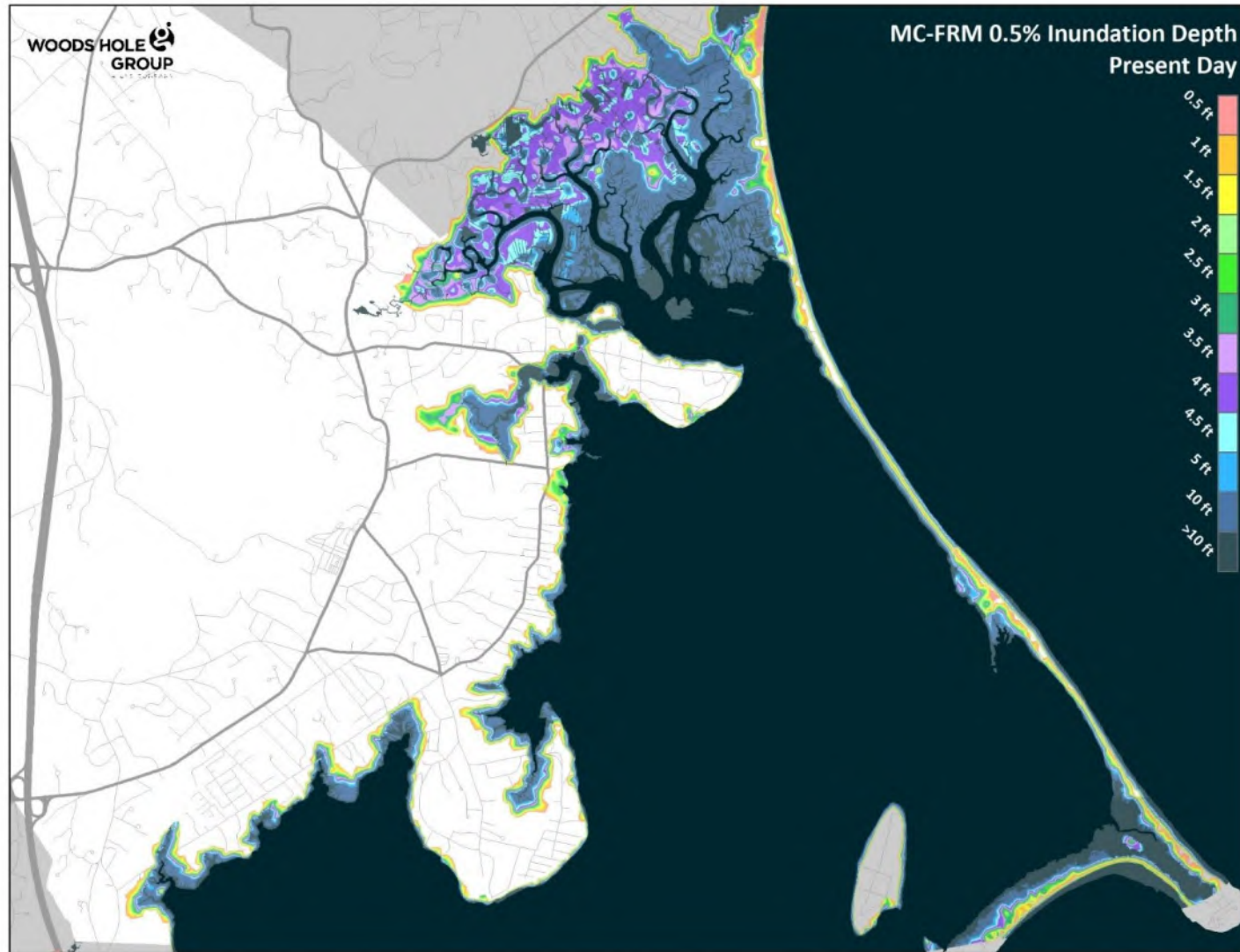
A-4 MC-FRM 1% CFEP Inundation Depth – Present Day.



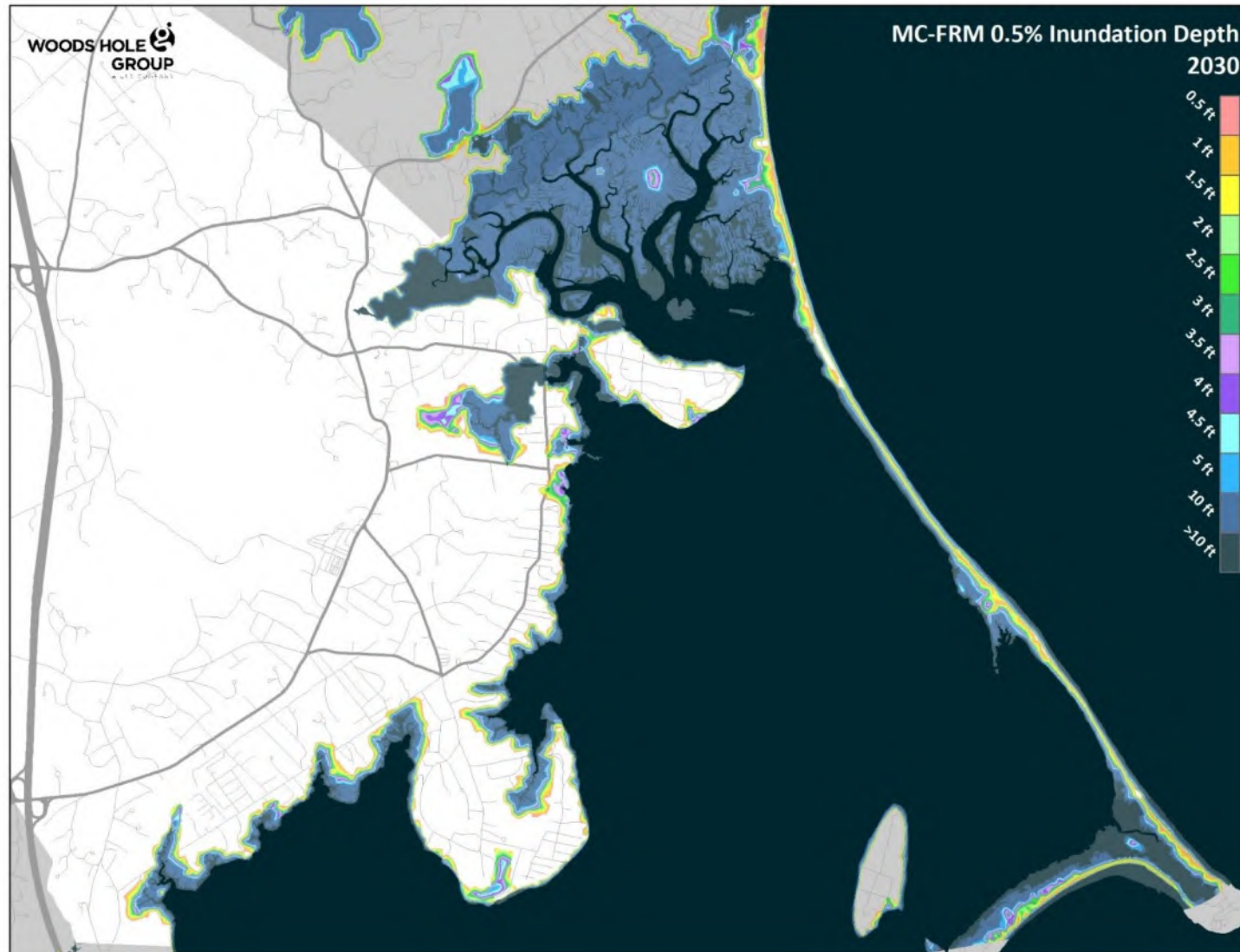
A-5 MC-FRM 1% CFEP Inundation Depth – 2030.



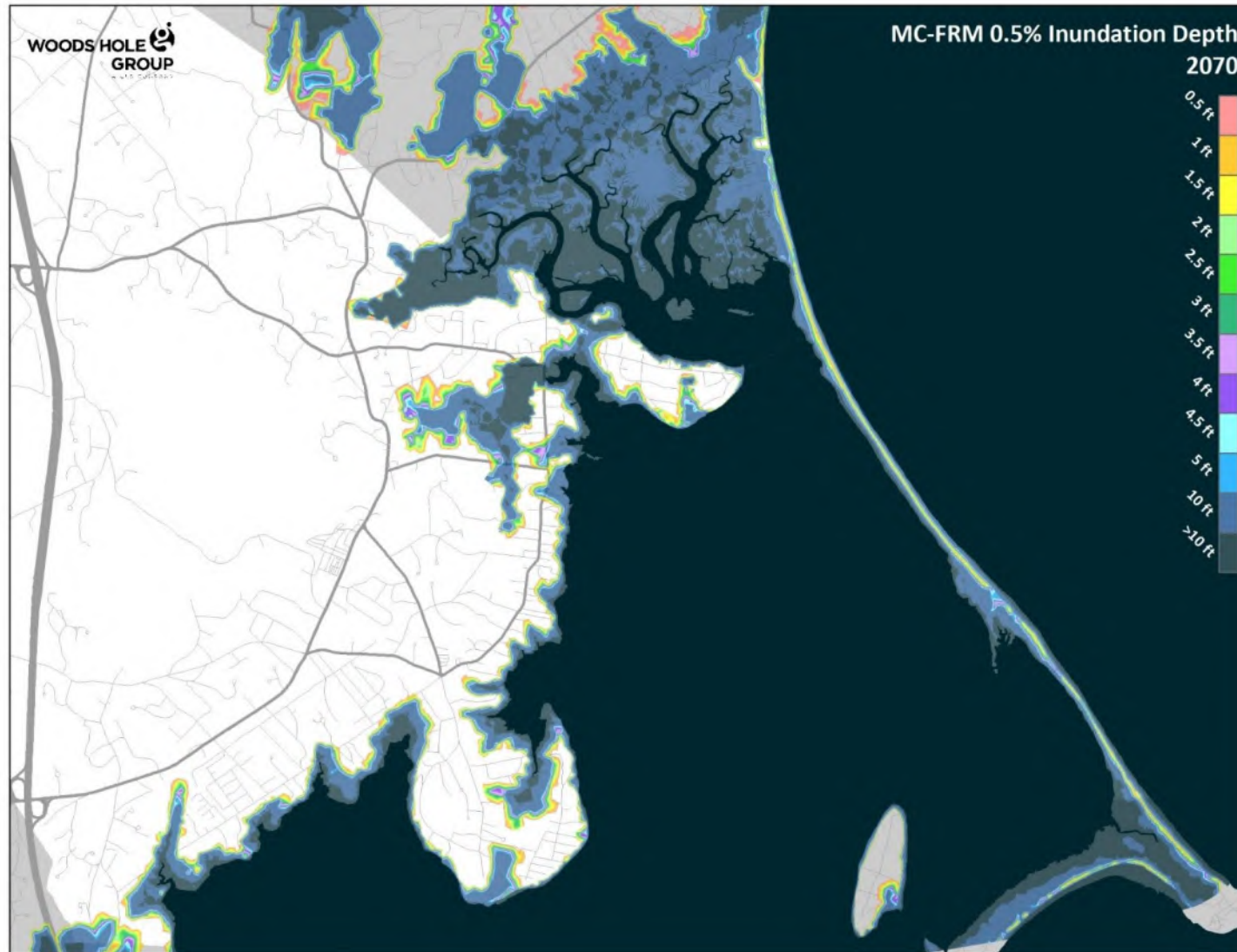
A-6 MC-FRM 1% CFEP Inundation Depth – 2070.



A-7 MC-FRM 0.5% CFEP Inundation Depth – Present Day.



A-8 MC-FRM 0.5% CFEP Inundation Depth – 2030.



A-9 MC-FRM 0.5% CFEP Inundation Depth – 2070.



APPENDIX B – COASTAL WETLAND MODELING (SLAMM) TOWN PROFILE



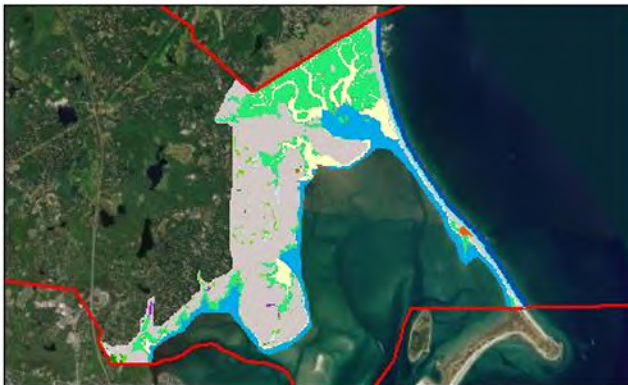
Present Day (Aerial)



Present Day (SLAMM Categories)



2030 SLAMM Results



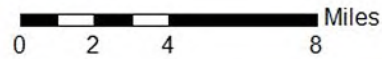
2070 SLAMM Results



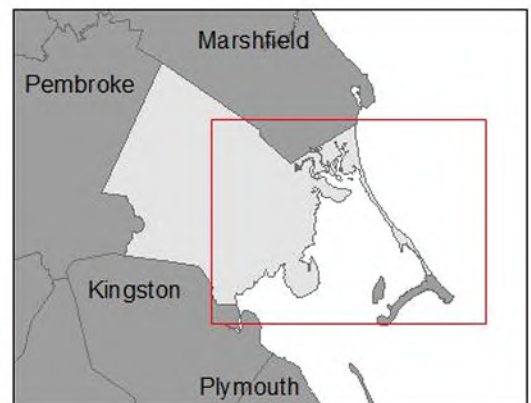
Duxbury

SLAMM Wetland Categories

- Upland
- Nontidal Swamp
- Inland Fresh Marsh
- Transitional Marsh/Scrub-Shrub
- Regularly Flooded Marsh
- Estuarine Beach
- Tidal Flat
- Ocean Beach
- Inland Open Water
- Estuarine Open Water
- Open Ocean
- Irregularly Flooded Marsh
- Tidal Swamp



	Area (acres)		
	2011	2030	2070
Upland	2234.1	2235.3	2071.4
Nontidal Swamp	52.8	53.1	45.4
Inland Fresh Marsh	12.1	11.2	10.2
Transitional Marsh/Scrub-Shrub	9.0	11.6	56.6
Regularly Flooded Marsh	41.2	49.9	792.2
Estuarine Beach	441.8	443.4	166.3
Tidal Flat	15.5	25.7	72.0
Ocean Beach	53.2	47.6	88.8
Inland Open Water	20.8	21.1	13.0
Estuarine Open Water	681.8	680.3	976.3
Open Ocean	202.7	201.8	209.1
Irregularly Flooded Marsh	990.2	974.3	256.6
Tidal Swamp	9.7	9.6	6.9





APPENDIX C – ASSET SPECIFIC RISK ASSESSMENT TABLES



C-1 Town of Duxbury Asset Risk Tables



C-1.1 Duxbury Municipal Asset Level Risk Assessment

Type	Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE_ftNAVD88	CE_Desc	Prob_P day	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
Bridges	Harrison St Bridge	3	4	2	3	4	3	19	79	5.53	CE=5.53 ft NAVD88 Low Chord Elevation; Road surface 9.36 ft NAVD88	100	100	100	7900	7900	7900
Bridges	Washington St Bridge	3	4	2	3	4	3	19	79	7.48	CE= 7.48 ft NAVD88 Low Chord Elevation; road surface 11.50 ft NAVD88	30	50	100	2370	3950	7900
Bridges	Island Creek Bridge	3	4	2	3	3	3	18	75	7.01	CE= 7.01 ft NAVD88 Low Chord Elevation; Road Surface 9.26 ft NAVD88	30	50	100	2250	3750	7500
Bridges	Marshall St Bridge	3	4	2	3	2	3	17	71	6.83	CE= 6.83 ft NAVD88 Low Chord Elevation; Road surface 10.51 ft NAVD88	30	100	100	2130	7100	7100
Coastal	Harbormaster Float	4	3	1	3	3	2	16	67	6.88	Fulcrum point of ramp below deck	30	100	100	2000	6667	6667
Parking	Mattakeeset	4	2	2	4	4	3	19	79	8.02	average elevation in footprint (LIDAR)	10	50	100	792	3958	7917
Parking	Blue Fish Fire Station	1	2	1	1	2	1	8	33	8.53	average elevation in footprint (LIDAR)	5	30	100	167	1000	3333
Coastal	Town Pier	4	4	3	3	3	2	19	79	8.62	Top of decking	2	25	100	158	1979	7917
Coastal	Town Float	4	3	1	3	3	2	16	67	8.62	Same as Town Pier	2	25	100	133	1667	6667
Parking	447-449 Washington Street	4	2	1	2	3	1	13	54	8.54	average elevation in footprint (LIDAR)	2	25	100	108	1354	5417
Bridges	Canal St Bridge (MSH)	3	4	0	4	3	2	16	67	9.84	road surface (LiDAR)	1	2	100	67	134	6700
Parking	Duxbury Beach 1	4	2	1	2	3	2	14	58	9.70	average elevation in footprint (LIDAR)	0.5	5	100	29	292	5833
Buildings	Harbormaster Office	4	3	1	3	3	3	17	71	10.21	First Floor - survey	0.2	1	50	14	71	3550
Assets	Blue Fish Shared Septic Pump	1	2	1	0	1	4	9	38	10.34	hatch cover - 3" to electrical box pad	0.2	1	50	8	37	1875
Bridges	Beach St Bridge (MSH)	3	4	0	4	3	2	16	67	9.76	from plans: west road surface; low chord (West) = 7.64	0	1	50	0	67	3350
Parking	Duxbury Beach 2	4	2	1	2	2	1	12	50	10.82	average elevation in footprint (LIDAR)	0	1	50	0	25	2500
Bridges	Powder Point Bridge	3	4	2	4	3	3	19	79	11.14	9.72=east abutment; 10.89=west, 15.58=crest, +1.42 for top of deck (per SGH)	0	0.2	50	0	16	3950
Assets	Snug Harbor Shared Septic Pump	2	2	1	0	3	4	12	50	11.37	Pad at base of electrical box	0	0.2	30	0	10	1500
Buildings	Blue Fish River Fire Station	1	2	1	1	2	1	8	33	11.78	First floor	0	0.1	30	0	3	990
Parking	Alden Elementary School 2	1	2	0	1	0	0	4	17	11.01	average elevation in footprint (LIDAR)	0	0.2	50	0	3	833
Parking	Duxbury Middle/High School 1	1	2	0	1	0	0	4	17	11.58	average elevation in footprint (LIDAR)	0	0.1	30	0	2	500
Parking	Alden Elementary School 3	1	2	0	1	0	0	4	17	11.92	average elevation in footprint (LIDAR)	0	0	20	0	0	333
Parking	479 Washington Street	4	2	1	2	3	1	13	54	12.67	average elevation in footprint (LIDAR)	0	0	5	0	0	271
Coastal	Duxbury Beach Walkover	1	4	2	2	1	2	12	50	12.88	Top of decking	0	0	2	0	0	100
Buildings	Alden Elementary School	4	4	3	3	4	0	18	75	14.03	Southern Door - leads to first floor boiler room	0	0	1	0	0	75
Buildings	Performing Arts Center	4	4	3	2	2	1	16	67	14.03	Ground from Lidar - southern door	0	0	1	0	0	67
Parking	Alden Elementary School 1	1	2	0	1	0	0	4	17	13.16	average elevation in footprint (LIDAR)	0	0	2	0	0	33
Parking	Alden Elementary School 5	1	2	0	1	0	0	4	17	13.65	average elevation in footprint (LIDAR)	0	0	2	0	0	33
Buildings	Snug Harbor Public Restrooms	4	3	1	2	2	3	15	62	12.31	Electrical Panel	0	0	0.5	0	0	31
Parking	Shipyards Lane	3	2	1	2	1	2	11	46	14.25	average elevation in footprint (LIDAR)	0	0	0.5	0	0	23
Recreation	Alden Field 2	4	1	0	1	0	1	7	29	14.40	average elevation in footprint (LIDAR)	0	0	0.5	0	0	14
Assets	Duxbury High School Generator	1	3	1	3	1	2	11	46	14.67	Top of slab	0	0	0.2	0	0	9



Type	Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE_ftrNAVD88	CE_Desc	Prob_P day	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
Assets	Duxbury High School Lift 1	2	2	1	0	2	4	11	46	14.70	Ground - manhole cover	0	0	0.2	0	0	9
Parking	Alden Elementary School 4	1	2	0	1	0	0	4	17	14.26	average elevation in footprint (LIDAR)	0	0	0.5	0	0	8
Parking	Powder Point/King Caesar	4	2	1	2	0	2	11	46	15.11	average elevation in footprint (LIDAR)	0	0	0.1	0	0	5
Bridges	Wirt Bridge	3	4	2	3	3	3	18	75	9.5	road surface = 9.5 (LIDAR)	1	5	100	0	0	0
Assets	Blue Fish Shared Septic Dose	1	2	1	0	1	4	9	38	18.05	Base of electrical switch box	0	0	0	0	0	0
Assets	Wright Building - Homework Room AC	1	3	1	1	0	1	7	29	24.51	Homework room step	0	0	0	0	0	0
Assets	Duxbury Library AC	1	3	1	1	1	1	8	33	22.91	Slab	0	0	0	0	0	0
Assets	Duxbury High School Lift 2	2	2	1	0	2	4	11	46	20.59	To electric panel	0	0	0	0	0	0
Assets	Duxbury High School Lift 3	2	2	1	0	2	4	11	46	24.10	Ground power	0	0	0	0	0	0
Assets	Duxbury High School Science Tight Tank	1	2	0	2	0	3	8	33	16.81	Ground	0	0	0	0	0	0
Assets	Snug Harbor Shared Septic Dose	2	2	1	0	3	4	12	50	18.72	Base of electrical switch box	0	0	0	0	0	0
Assets	Wright Building Condenser	1	3	1	1	0	1	7	29	24.71	Slab	0	0	0	0	0	0
Assets	Mill Brook Drinking Water Pump Station	3	3	2	0	2	4	14	58	20.98	Ground from Lidar	0	0	0	0	0	0
Assets	Mill Brook Propane Tank	3	2	0	1	2	4	12	50	21.48	Ground from Lidar + 6"	0	0	0	0	0	0
Buildings	Timothy J. Steele Athletic Building	2	4	2	2	2	1	13	54	27.77	Slab	0	0	0	0	0	0
Buildings	Duxbury Public Library	4	4	3	2	2	0	15	62	22.91	Slab - backdoor leads to boiler room	0	0	0	0	0	0
Buildings	Percy Walker Pool	1	4	3	0	2	2	12	50	25.01	Grating for pit	0	0	0	0	0	0
Buildings	Duxbury High School	4	4	3	4	4	3	22	92	17.09	Western backdoor - top of slab	0	0	0	0	0	0
Buildings	Wright Building	1	4	2	0	1	2	10	42	24.35	Basement walkout	0	0	0	0	0	0
Buildings	Wright Building - Homework Room	1	4	1	0	1	2	9	38	25.17	Homework room step + 8"	0	0	0	0	0	0
Parking	Steele 1	1	2	1	1	0	0	5	21	22.57	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Steele 2	1	2	1	1	0	0	5	21	25.33	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Steele 3	1	2	1	1	0	0	5	21	25.56	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Steele 4	1	2	0	1	0	0	4	17	24.78	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Steele 5	1	2	0	1	0	0	4	17	24.85	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Steele 6	1	2	0	1	0	0	4	17	25.12	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Duxbury Free Library	1	2	1	1	1	0	6	25	21.32	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Alden Elementary School 6	1	2	1	1	0	0	5	21	18.72	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Duxbury Middle/High School 2	1	2	1	0	0	0	4	17	17.78	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Pool/Wright 1	1	2	0	1	0	0	4	17	22.69	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Pool/Wright 2	1	2	1	1	1	0	6	25	22.67	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Parking	Duxbury Middle/High School 3	1	2	1	0	0	0	4	17	18.27	average elevation in footprint (LIDAR)	0	0	0	0	0	0



Type	Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE_ftNAVD88	CE_Desc	Prob_P day	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
Recreation	Steele Tennis Courts	4	2	1	1	0	0	8	33	26.90	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Recreation	Steele Basketball Court	4	2	1	1	0	0	8	33	24.96	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Recreation	Steele Field 1	4	1	1	1	0	1	8	33	25.17	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Recreation	Steele Field 2	4	1	1	1	0	1	8	33	25.99	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Recreation	Alden Tennis Courts	4	2	1	1	0	0	8	33	18.87	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Recreation	Alden Field 1	4	1	0	1	0	1	7	29	20.89	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Recreation	Alden Playground 1	4	2	0	1	0	0	7	29	16.80	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Recreation	Alden Playground 2	4	2	0	1	0	0	7	29	22.58	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Open Space	F_880007_2846612	0	0	0	0	0	0	0	0	5.31	average elevation in footprint (LIDAR)	78	93	97	0	0	0
Open Space	F_878672_2845851	0	0	0	0	0	0	0	0	5.36	average elevation in footprint (LIDAR)	75	90	95	0	0	0
Open Space	F_885815_2850237	0	0	0	0	0	0	0	0	5.03	average elevation in footprint (LIDAR)	79	98	99	0	0	0
Open Space	F_886483_2850294	0	0	0	0	0	0	0	0	5.22	average elevation in footprint (LIDAR)	79	95	98	0	0	0
Open Space	F_879762_2846119	0	0	0	0	0	0	0	0	5.52	average elevation in footprint (LIDAR)	73	81	90	0	0	0
Open Space	F_886969_2846012	0	0	0	0	0	0	0	0	4.19	average elevation in footprint (LIDAR)	91	96	98	0	0	0
Open Space	F_886951_2850185	0	0	0	0	0	0	0	0	5.19	average elevation in footprint (LIDAR)	75	92	98	0	0	0
Open Space	F_886347_2850048	0	0	0	0	0	0	0	0	5.28	average elevation in footprint (LIDAR)	79	83	86	0	0	0
Open Space	F_886516_2848759	0	0	0	0	0	0	0	0	5.03	average elevation in footprint (LIDAR)	76	93	97	0	0	0
Open Space	F_886681_2848973	0	0	0	0	0	0	0	0	5.02	average elevation in footprint (LIDAR)	82	96	98	0	0	0
Open Space	F_886365_2848982	0	0	0	0	0	0	0	0	4.68	average elevation in footprint (LIDAR)	83	96	98	0	0	0
Open Space	F_879610_2847571	0	0	0	0	0	0	0	0	5.08	average elevation in footprint (LIDAR)	81	98	100	0	0	0
Open Space	F_879064_2847344	0	0	0	0	0	0	0	0	5.22	average elevation in footprint (LIDAR)	85	98	99	0	0	0
Open Space	F_880486_2846623	0	0	0	0	0	0	0	0	5.07	average elevation in footprint (LIDAR)	81	96	97	0	0	0
Open Space	F_870411_2832116	0	0	0	0	2	1	3	13	26.59	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Open Space	F_886374_2851965	0	0	0	0	0	0	0	0	6.03	average elevation in footprint (LIDAR)	57	57	78	0	0	0
Open Space	F_886195_2851833	0	0	0	0	0	0	0	0	5.71	average elevation in footprint (LIDAR)	77	77	77	0	0	0
Open Space	F_886474_2851515	0	0	0	0	0	0	0	0	5.42	average elevation in footprint (LIDAR)	77	93	97	0	0	0
Open Space	F_886722_2851550	0	0	0	0	0	0	0	0	5.54	average elevation in footprint (LIDAR)	71	84	91	0	0	0
Open Space	F_886471_2851308	0	0	0	0	0	0	0	0	5.61	average elevation in footprint (LIDAR)	76	95	98	0	0	0
Open Space	F_886497_2851265	0	0	0	0	0	0	0	0	5.22	average elevation in footprint (LIDAR)	82	95	97	0	0	0
Open Space	F_886533_2849671	0	0	0	0	0	0	0	0	4.99	average elevation in footprint (LIDAR)	82	93	97	0	0	0
Open Space	F_886814_2849623	0	0	0	0	0	0	0	0	5.18	average elevation in footprint (LIDAR)	66	92	98	0	0	0
Open Space	F_886990_2849212	0	0	0	0	0	0	0	0	5.19	average elevation in footprint (LIDAR)	80	99	100	0	0	0



Type	Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE_frnAVD88	CE_Desc	Prob_P day	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
Open Space	F_886662_2849197	0	0	0	0	0	0	0	0	5.00	average elevation in footprint (LIDAR)	80	96	98	0	0	0
Open Space	F_869594_2833203	0	0	0	0	0	1	1	4	23.06	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Open Space	F_885952_2847144	0	0	0	0	0	0	0	0	4.81	average elevation in footprint (LIDAR)	86	94	97	0	0	0
Open Space	F_880361_2847159	0	0	0	0	0	0	0	0	5.54	average elevation in footprint (LIDAR)	76	92	96	0	0	0
Open Space	F_870186_2829823	0	0	0	0	0	0	0	0	6.67	average elevation in footprint (LIDAR)	28	38	59	0	0	0
Open Space	F_886412_2848394	0	0	0	0	0	0	0	0	7.44	average elevation in footprint (LIDAR)	42	65	75	0	0	0
Open Space	F_886274_2848323	0	0	0	0	0	0	0	0	6.67	average elevation in footprint (LIDAR)	58	75	75	0	0	0
Open Space	F_886683_2847682	0	0	0	0	0	0	0	0	4.89	average elevation in footprint (LIDAR)	82	100	100	0	0	0
Open Space	F_880975_2847228	0	0	0	0	0	0	0	0	5.16	average elevation in footprint (LIDAR)	80	86	89	0	0	0
Open Space	F_880654_2847249	0	0	0	0	0	0	0	0	5.33	average elevation in footprint (LIDAR)	77	87	92	0	0	0
Open Space	F_880522_2847210	0	0	0	0	0	0	0	0	5.47	average elevation in footprint (LIDAR)	76	91	94	0	0	0
Open Space	F_885768_2846882	0	0	0	0	0	0	0	0	4.71	average elevation in footprint (LIDAR)	92	96	98	0	0	0
Open Space	F_880250_2847093	0	0	0	0	0	0	0	0	5.55	average elevation in footprint (LIDAR)	76	92	95	0	0	0
Open Space	F_880125_2847060	0	0	0	0	0	0	0	0	5.51	average elevation in footprint (LIDAR)	80	90	93	0	0	0
Open Space	F_876947_2846478	0	0	0	0	0	0	0	0	5.57	average elevation in footprint (LIDAR)	0	7	14	0	0	0
Open Space	F_885139_2846283	0	0	0	0	0	0	0	0	4.02	average elevation in footprint (LIDAR)	96	100	100	0	0	0
Open Space	F_872958_2845873	0	0	0	0	0	1	1	4	30.59	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Open Space	F_877473_2845860	0	0	0	0	0	0	0	0	5.58	average elevation in footprint (LIDAR)	67	92	99	0	0	0
Open Space	F_877302_2845905	0	0	0	0	0	0	0	0	8.08	average elevation in footprint (LIDAR)	26	60	88	0	0	0
Open Space	F_881534_2845760	0	0	0	0	0	0	0	0	4.78	average elevation in footprint (LIDAR)	88	95	98	0	0	0
Open Space	F_878180_2845594	0	0	0	0	0	0	0	0	5.62	average elevation in footprint (LIDAR)	78	94	97	0	0	0
Open Space	F_877038_2845502	0	0	0	0	0	0	0	0	6.38	average elevation in footprint (LIDAR)	19	39	61	0	0	0
Open Space	F_877788_2845670	0	0	0	0	0	0	0	0	5.28	average elevation in footprint (LIDAR)	79	97	99	0	0	0
Open Space	F_877295_2845574	0	0	0	0	0	0	0	0	5.57	average elevation in footprint (LIDAR)	74	90	97	0	0	0
Open Space	F_877320_2845409	0	0	0	0	0	0	0	0	5.42	average elevation in footprint (LIDAR)	76	98	100	0	0	0
Open Space	F_878247_2845263	0	0	0	0	0	0	0	0	5.68	average elevation in footprint (LIDAR)	59	76	83	0	0	0
Open Space	F_886640_2844932	0	0	0	0	0	0	0	0	1.46	average elevation in footprint (LIDAR)	100	100	100	0	0	0
Open Space	F_880005_2840464	0	0	0	0	0	0	0	0	5.46	average elevation in footprint (LIDAR)	0	2	19	0	0	0
Open Space	F_878985_2832302	0	0	0	0	0	1	1	4	24.72	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Open Space	F_870669_2832095	0	0	0	0	2	1	3	13	18.57	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Open Space	F_870330_2829279	0	0	0	0	0	0	0	0	4.61	average elevation in footprint (LIDAR)	74	81	84	0	0	0
Open Space	F_872815_2845370	0	0	0	0	1	1	2	8	31.06	average elevation in footprint (LIDAR)	0	0	0	0	0	0



Type	Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE_fRNA_VD88	CE_Desc	Prob_Pday	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
Open Space	F_884933_2848526	0	0	0	0	0	0	0	0	4.97	average elevation in footprint (LIDAR)	79	97	99	0	0	0
Open Space	F_884780_2849849	0	0	0	0	0	0	0	0	5.06	average elevation in footprint (LIDAR)	80	98	99	0	0	0
Open Space	F_869120_2833894	0	0	0	0	0	1	1	4	41.83	average elevation in footprint (LIDAR)	0	0	0	0	0	0
Open Space	F_877486_2845672	0	0	0	0	0	0	0	0	5.38	average elevation in footprint (LIDAR)	76	100	100	0	0	0
Open Space	F_877575_2845511	0	0	0	0	0	0	0	0	4.58	average elevation in footprint (LIDAR)	81	100	100	0	0	0
Open Space	F_879821_2845481	0	0	0	0	0	0	0	0	5.41	average elevation in footprint (LIDAR)	72	94	97	0	0	0
Open Space	F_886705_2851201	0	0	0	0	0	0	0	0	5.08	average elevation in footprint (LIDAR)	79	94	96	0	0	0
Open Space	F_878481_2846385	0	0	0	0	0	0	0	0	5.12	average elevation in footprint (LIDAR)	78	87	91	0	0	0
Open Space	F_877793_2846511	0	0	0	0	0	0	0	0	5.54	average elevation in footprint (LIDAR)	71	82	89	0	0	0
Open Space	F_886682_2851099	0	0	0	0	0	0	0	0	5.31	average elevation in footprint (LIDAR)	79	92	95	0	0	0
Open Space	F_886657_2851249	0	0	0	0	0	0	0	0	5.12	average elevation in footprint (LIDAR)	75	92	95	0	0	0
Open Space	F_886135_2848123	0	0	0	0	0	0	0	0	5.76	average elevation in footprint (LIDAR)	73	78	79	0	0	0
Open Space	F_883878_2848544	0	0	0	0	0	0	0	0	5.08	average elevation in footprint (LIDAR)	79	90	92	0	0	0
Open Space	F_881246_2846975	0	0	0	0	0	0	0	0	4.95	average elevation in footprint (LIDAR)	85	88	90	0	0	0
Open Space	F_881412_2848878	0	0	0	0	0	0	0	0	4.81	average elevation in footprint (LIDAR)	83	90	92	0	0	0



C-1.2 Municipal Roadways Risk Assessment

Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAVD88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
WASHINGTON STREET	4	3	1	4	2	2	16	67	6.88	97	98	99	6475	6581	6610
POWDER POINT AVENUE	4	3	2	3	1	2	15	62	7.02	100	100	100	6200	6200	6200
HARRISON STREET	4	3	2	4	2	0	15	62	4.40	100	100	100	6200	6200	6200
BAY ROAD	4	3	2	4	0	2	15	62	8.84	91	92	92	5642	5674	5727
KING ARTHUR ROAD	4	2	2	4	2	2	16	67	6.61	77	96	100	5156	6406	6700
CANAL STREET	4	3	1	4	0	2	14	58	8.15	83	84	95	4818	4853	5536
BAY ROAD	4	3	1	4	0	2	14	58	8.49	80	85	87	4639	4945	5067
GURNET ROAD	3	3	2	3	2	2	15	62	5.98	71	75	89	4386	4676	5518
MATTAKEESET COURT	4	3	1	1	4	2	15	62	6.62	70	82	90	4359	5103	5608
GURNET ROAD	3	3	2	3	0	2	13	54	6.53	76	95	100	4118	5108	5400
GURNET ROAD	3	3	2	3	0	2	13	54	6.61	69	91	100	3702	4922	5400
KING ARTHUR ROAD	2	2	1	4	0	2	11	46	6.33	79	91	100	3642	4200	4600
KING CAESAR ROAD	3	3	2	1	0	2	11	46	6.38	61	88	100	2807	4046	4600
SAINT GEORGE STREET	4	3	1	3	1	2	14	58	7.55	44	53	77	2524	3076	4481
PINE POINT ROAD	2	3	1	1	0	2	9	38	6.68	63	75	75	2404	2854	2866
POWDER POINT BRIDGE	4	3	1	3	2	2	15	62	10.65	39	42	78	2404	2621	4820
MARGINAL ROAD	2	3	1	1	0	2	9	38	6.82	62	93	100	2360	3549	3800
BAY POND ROAD	2	3	1	0	0	0	6	25	6.58	81	84	88	2024	2088	2194
DUCK HILL ROAD	2	3	1	0	0	2	8	33	7.42	61	61	61	2003	2005	2005
	2	3	1	0	0	0	6	25	5.64	66	83	88	1650	2071	2199
LANDING ROAD	2	3	1	0	0	0	6	25	5.75	61	72	90	1535	1793	2243
ANCHORAGE LANE	2	3	1	0	0	0	6	25	7.01	55	75	85	1380	1863	2121
	2	3	1	0	0	0	6	25	7.83	55	58	61	1371	1442	1535
LONG VIEW ROAD	2	3	1	0	0	0	6	25	8.17	54	72	83	1357	1794	2077
DUCK HILL ROAD	0	3	1	0	0	2	6	25	5.61	50	51	51	1262	1264	1264
HICKS POINT ROAD	0	3	1	0	0	0	4	17	6.46	74	75	75	1258	1282	1282
ELDERBERRY LANE	2	3	1	0	0	0	6	25	7.35	50	62	70	1242	1550	1755
HICKS POINT ROAD	0	3	1	0	0	0	4	17	5.90	73	75	85	1241	1282	1447
HARDEN HILL ROAD	2	3	1	0	0	0	6	25	10.93	47	52	53	1176	1304	1331
	2	3	1	0	0	0	6	25	7.41	44	59	85	1091	1483	2136
CANAL STREET	4	3	1	4	0	2	14	58	7.21	19	22	76	1081	1259	4392
PINE POINT PLACE	2	3	1	1	0	2	9	38	7.93	28	41	75	1078	1574	2866



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAVD88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
WASHINGTON STREET	4	3	1	4	2	2	16	67	6.88	97	98	99	6475	6581	6610
POWDER POINT AVENUE	4	3	2	3	1	2	15	62	7.02	100	100	100	6200	6200	6200
HARRISON STREET	4	3	2	4	2	0	15	62	4.40	100	100	100	6200	6200	6200
BAY ROAD	4	3	2	4	0	2	15	62	8.84	91	92	92	5642	5674	5727
KING ARTHUR ROAD	4	2	2	4	2	2	16	67	6.61	77	96	100	5156	6406	6700
CANAL STREET	4	3	1	4	0	2	14	58	8.15	83	84	95	4818	4853	5536
BAY ROAD	4	3	1	4	0	2	14	58	8.49	80	85	87	4639	4945	5067
GURNET ROAD	3	3	2	3	2	2	15	62	5.98	71	75	89	4386	4676	5518
MATTAKEESET COURT	4	3	1	1	4	2	15	62	6.62	70	82	90	4359	5103	5608
GURNET ROAD	3	3	2	3	0	2	13	54	6.53	76	95	100	4118	5108	5400
GURNET ROAD	3	3	2	3	0	2	13	54	6.61	69	91	100	3702	4922	5400
KING ARTHUR ROAD	2	2	1	4	0	2	11	46	6.33	79	91	100	3642	4200	4600
KING CAESAR ROAD	3	3	2	1	0	2	11	46	6.38	61	88	100	2807	4046	4600
SAINT GEORGE STREET	4	3	1	3	1	2	14	58	7.55	44	53	77	2524	3076	4481
PINE POINT ROAD	2	3	1	1	0	2	9	38	6.68	63	75	75	2404	2854	2866
POWDER POINT BRIDGE	4	3	1	3	2	2	15	62	10.65	39	42	78	2404	2621	4820
MARGINAL ROAD	2	3	1	1	0	2	9	38	6.82	62	93	100	2360	3549	3800
BAY POND ROAD	2	3	1	0	0	0	6	25	6.58	81	84	88	2024	2088	2194
DUCK HILL ROAD	2	3	1	0	0	2	8	33	7.42	61	61	61	2003	2005	2005
	2	3	1	0	0	0	6	25	5.64	66	83	88	1650	2071	2199
LANDING ROAD	2	3	1	0	0	0	6	25	5.75	61	72	90	1535	1793	2243
ANCHORAGE LANE	2	3	1	0	0	0	6	25	7.01	55	75	85	1380	1863	2121
	2	3	1	0	0	0	6	25	7.83	55	58	61	1371	1442	1535
LONG VIEW ROAD	2	3	1	0	0	0	6	25	8.17	54	72	83	1357	1794	2077
DUCK HILL ROAD	0	3	1	0	0	2	6	25	5.61	50	51	51	1262	1264	1264
HICKS POINT ROAD	0	3	1	0	0	0	4	17	6.46	74	75	75	1258	1282	1282
ELDERBERRY LANE	2	3	1	0	0	0	6	25	7.35	50	62	70	1242	1550	1755
HICKS POINT ROAD	0	3	1	0	0	0	4	17	5.90	73	75	85	1241	1282	1447
HARDEN HILL ROAD	2	3	1	0	0	0	6	25	10.93	47	52	53	1176	1304	1331
	2	3	1	0	0	0	6	25	7.41	44	59	85	1091	1483	2136
CANAL STREET	4	3	1	4	0	2	14	58	7.21	19	22	76	1081	1259	4392
PINE POINT PLACE	2	3	1	1	0	2	9	38	7.93	28	41	75	1078	1574	2866



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAVD88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
CARESWELL STREET	4	3	1	4	0	2	14	58	13.24	5	5	11	271	271	614
CARESWELL STREET	4	3	1	4	0	2	14	58	14.25	5	5	6	269	269	377
WASHINGTON STREET	4	3	0	4	1	2	14	58	8.41	5	24	73	267	1368	4209
WIRT WAY	2	3	1	0	0	0	6	25	7.80	10	32	77	258	793	1924
	2	3	1	0	0	0	6	25	7.31	10	54	76	253	1354	1892
BAY ROAD	4	3	1	4	0	0	12	50	11.90	5	5	8	246	254	414
KING CAESAR ROAD	3	3	2	1	0	0	9	38	7.94	6	39	75	243	1468	2866
EAST MARGINAL ROAD	2	3	1	1	0	2	9	38	8.24	6	62	76	231	2370	2892
OCEAN ROAD SOUTH	2	3	1	1	0	2	9	38	10.21	6	75	75	215	2866	2866
OCEAN ROAD NORTH	2	3	1	1	0	2	9	38	10.63	6	75	75	215	2855	2866
GURNET ROAD	2	3	0	3	0	2	10	42	8.47	5	75	75	211	3137	3167
LONG POINT LANE	2	3	1	0	0	0	6	25	7.93	8	42	71	195	1050	1777
	2	3	1	0	3	2	11	46	7.76	4	28	75	192	1287	3469
EAST PINE ROAD	2	3	1	1	0	2	9	38	8.49	5	75	75	190	2866	2866
FRIENDSHIP LANE	0	3	1	0	0	0	4	17	8.88	10	15	75	173	250	1279
	2	3	1	1	0	0	7	29	4.30	6	75	75	169	2187	2187
BAY AVENUE	2	3	1	1	0	0	7	29	10.14	6	74	75	169	2146	2175
PLYMOUTH AVENUE	2	3	1	1	0	0	7	29	5.49	6	75	75	168	2165	2187
LEWIS COURT	2	3	0	1	0	2	8	33	9.27	5	59	75	163	1952	2489
QUAIL RUN	1	3	1	0	0	0	5	21	9.25	8	34	72	163	715	1502
SAINT GEORGE STREET	4	3	1	3	1	0	12	50	10.34	3	25	52	160	1261	2613
BAY ROAD	4	3	1	4	0	0	12	50	10.49	3	4	65	150	217	3229
JOSSELYN AVENUE	2	3	1	0	0	0	6	25	12.97	6	29	43	147	714	1071
BAY AVENUE	2	3	1	1	0	0	7	29	10.00	5	71	75	145	2057	2187
HICKS POINT ROAD	2	3	1	0	0	0	6	25	10.58	6	20	48	144	489	1210
KENTUCKY STREET	2	3	1	1	0	0	7	29	5.86	5	66	75	131	1904	2187
COVE STREET	3	3	1	1	0	0	8	33	8.29	4	21	59	130	700	1948
POWDER POINT AVENUE	4	3	1	3	1	0	12	50	14.82	2	4	16	88	187	801
CARESWELL STREET	4	3	2	4	0	2	15	62	8.84	1	52	76	85	3232	4694
	0	3	1	0	0	0	4	17	11.87	5	5	7	84	85	121
	1	3	1	0	0	0	5	21	12.03	4	11	25	78	226	520
WASHINGTON STREET	4	3	1	4	4	0	16	67	8.68	1	9	75	54	636	5053



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAVD88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
POWDER POINT AVENUE	4	3	2	3	1	0	13	54	17.47	1	2	3	54	102	174
FREEMAN PLACE	2	3	1	0	0	0	6	25	11.04	2	10	27	42	249	668
	2	3	1	0	0	0	6	25	8.32	2	12	41	41	305	1026
MARSHALL STREET	3	3	2	2	0	0	10	42	15.59	1	4	6	40	171	248
LINDEN LANE	2	3	1	0	0	0	6	25	8.83	2	10	45	39	249	1126
	1	3	1	0	4	2	11	46	7.88	1	10	75	37	475	3469
BAY ROAD	4	3	1	4	0	0	12	50	13.17	1	3	47	30	155	2348
UPLAND ROAD	2	3	2	0	0	0	7	29	9.80	1	8	75	27	218	2187
WASHINGTON STREET	4	3	1	4	2	0	14	58	14.80	0	2	4	25	98	212
	1	3	1	0	0	0	5	21	29.47	1	5	8	24	109	171
WASHINGTON STREET	4	3	1	4	4	0	16	67	9.12	0	4	70	22	290	4660
CANAL STREET	4	3	1	4	0	0	12	50	9.10	0	51	75	20	2569	3771
LANDING ROAD	2	3	1	0	0	0	6	25	11.79	1	5	42	20	122	1039
WASHINGTON STREET	4	3	1	4	4	0	16	67	9.59	0	2	75	19	162	5052
MARSHALL STREET	2	3	1	0	0	0	6	25	15.90	1	3	5	19	79	127
BRADFORD ROAD	2	3	1	0	0	0	6	25	18.88	1	5	24	17	124	599
	0	3	1	0	0	0	4	17	10.86	1	8	34	13	132	575
	1	3	1	0	4	0	9	38	10.51	0	3	39	11	124	1474
	2	3	1	0	0	0	6	25	14.71	0	2	34	10	47	856
	1	3	1	0	0	0	5	21	12.67	0	1	38	10	12	801
	2	3	1	0	0	0	6	25	14.29	0	3	10	9	87	257
PLUMFIELD LANE	2	3	1	0	0	0	6	25	12.77	0	3	23	9	73	582
OCEAN WOODS DRIVE	2	3	1	0	0	0	6	25	16.06	0	1	11	8	28	268
BEAVERBROOK LANE	2	3	1	0	0	0	6	25	9.00	0	4	32	7	90	791
WASHINGTON STREET	4	3	1	4	2	0	14	58	9.88	0	1	60	5	57	3506
PLUMFIELD LANE	2	3	1	0	0	0	6	25	12.70	0	2	26	5	43	658
BAY VIEW ROAD	2	3	1	0	0	0	6	25	10.26	0	1	59	5	15	1469
MIDWAY ROAD	2	3	1	0	0	0	6	25	15.07	0	1	13	4	17	322
BAY ROAD	4	3	1	4	0	0	12	50	13.72	0	0	6	3	14	280
BEECHWOOD LANE	2	3	1	0	0	0	6	25	9.55	0	0	32	3	11	794
PATTEN LANE	2	3	2	0	0	0	7	29	6.99	0	1	62	2	21	1793
WASHINGTON STREET	4	3	1	4	4	0	16	67	10.26	0	0	36	2	18	2426



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAVD88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
NEWPORT AVENUE	2	3	1	0	0	0	6	25	15.76	0	1	24	2	16	603
GOOSE POINT LANE	2	3	2	0	0	0	7	29	9.12	0	0	50	2	7	1446
	2	3	1	0	0	0	6	25	6.81	0	0	52	1	7	1296
SEABURY POINT ROAD	2	3	2	0	0	0	7	29	10.95	0	0	29	1	5	833
SUNSET ROAD	2	3	1	0	0	0	6	25	11.16	0	30	65	0	762	1637
SALT MEADOW LANE	2	3	1	0	0	0	6	25	14.90	0	17	46	0	433	1146
ANCHORAGE LANE	2	3	1	0	0	0	6	25	11.57	0	9	15	0	237	382
	2	3	1	0	0	0	6	25	13.40	0	8	11	0	191	265
	2	3	1	0	0	0	6	25	16.23	0	1	4	0	35	92
THE MARSHES	2	3	1	0	0	0	6	25	15.93	0	1	2	0	16	55
CEDAR STREET	3	3	2	1	0	0	9	38	10.38	0	0	23	0	3	856
COVE STREET	3	3	1	1	0	0	8	33	10.84	0	0	26	0	3	851
	1	3	0	0	0	0	4	17	12.77	0	0	17	0	2	294
CANAL STREET	4	3	1	4	0	0	12	50	11.49	0	0	36	0	1	1799
LANDING ROAD	4	3	1	4	0	0	12	50	12.17	0	0	20	0	1	1025
PARKS STREET	3	3	1	2	0	0	9	38	11.04	0	0	19	0	1	714
PETERSON ROAD	2	3	2	0	0	0	7	29	12.58	0	0	19	0	1	551
WASHINGTON STREET	4	3	1	4	2	0	14	58	12.62	0	0	8	0	1	452
FAIRWAY LANE	1	3	1	0	1	0	6	25	7.64	0	0	17	0	1	429
STETSON PLACE	2	3	1	0	0	0	6	25	13.69	0	0	17	0	1	422
WESTON ROAD	2	3	1	0	0	0	6	25	13.45	0	0	15	0	1	365
KING CAESAR ROAD	3	3	1	1	0	0	8	33	14.67	0	0	10	0	1	332
	0	3	1	0	0	0	4	17	11.98	0	0	18	0	1	303
	0	3	1	0	0	0	4	17	11.98	0	0	18	0	1	303
PARKS STREET	3	3	1	2	0	0	9	38	10.64	0	0	7	0	1	256
GRANDVIEW AVENUE	2	3	1	0	0	0	6	25	15.28	0	0	10	0	1	251
BAY ROAD	4	3	1	4	0	0	12	50	23.79	0	0	3	0	1	159
	2	3	1	0	0	0	6	25	18.32	0	0	6	0	1	140
ALLENS LANE	2	3	2	0	0	0	7	29	15.06	0	0	4	0	1	127
BAY ROAD	4	3	2	4	0	0	13	54	13.97	0	0	19	0	0	1013
ELDER BREWSTER ROAD	2	3	1	0	0	0	6	25	11.49	0	0	16	0	0	393
ALDEN STREET	4	3	2	4	1	0	14	58	16.02	0	0	5	0	0	263



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAV D88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
HOLMES PLACE	2	3	1	0	0	0	6	25	12.22	0	0	9	0	0	218
CARESWELL STREET	4	3	1	4	0	0	12	50	16.51	0	0	4	0	0	215
CARESWELL STREET	4	3	1	4	0	0	12	50	15.97	0	0	4	0	0	214
	1	3	1	0	4	0	9	38	20.06	0	0	5	0	0	203
BAY ROAD	4	3	1	4	0	0	12	50	17.05	0	0	4	0	0	185
WASHINGTON STREET	4	3	1	4	4	0	16	67	16.31	0	0	3	0	0	173
	1	3	1	0	0	0	5	21	17.02	0	0	6	0	0	120
WESTERN WAY	2	3	1	0	0	0	6	25	16.84	0	0	4	0	0	106
MAYFLOWER LANE	2	3	1	0	0	0	6	25	17.05	0	0	3	0	0	85
	2	3	1	0	0	0	6	25	17.08	0	0	3	0	0	76
CARESWELL STREET	4	3	1	4	0	0	12	50	15.51	0	0	1	0	0	59
PILL HILL LANE	0	3	1	0	0	0	4	17	17.21	0	0	3	0	0	57
CANAL STREET	4	3	1	4	0	0	12	50	14.26	0	0	1	0	0	52
WASHINGTON STREET	4	3	0	4	2	0	13	54	15.82	0	0	1	0	0	48
SHIPYARD LANE	2	3	1	0	0	0	6	25	18.22	0	0	2	0	0	42
FORT HILL LANE	2	3	1	0	0	0	6	25	24.61	0	0	1	0	0	34
	2	3	1	0	0	0	6	25	21.60	0	0	1	0	0	26
	1	3	1	0	0	0	5	21	13.56	0	0	1	0	0	17
HARRISON STREET	4	3	2	4	1	0	14	58	13.85	0	0	0	0	0	13
TREMONT STREET	4	3	2	4	0	0	13	54	20.08	0	0	0	0	0	11
SAINT GEORGE STREET	4	3	1	3	1	0	12	50	15.23	0	0	0	0	0	6
CANAL STREET	4	3	1	4	0	0	12	50	18.65	0	0	0	0	0	5
	1	3	1	0	0	0	5	21	14.08	0	0	0	0	0	2
	2	3	1	1	1	0	8	33	15.96	0	0	0	0	0	2
CHRISTMAS TREE WAY	2	3	1	0	0	0	6	25	15.86	0	0	0	0	0	2
CHRISTMAS TREE WAY	2	3	1	0	0	0	6	25	15.91	0	0	0	0	0	2
HARRISON STREET	4	3	1	4	1	0	13	54	16.38	0	0	0	0	0	2
CARESWELL STREET	4	3	0	4	0	0	11	46	19.49	0	0	0	0	0	2
CARESWELL STREET	4	3	1	4	0	0	12	50	17.86	0	0	0	0	0	2
	2	3	1	0	0	0	6	25	17.72	0	0	0	0	0	1
ELDER BREWSTER ROAD	2	3	1	0	0	0	6	25	14.35	0	0	0	0	0	1
RAILROAD AVENUE	2	3	1	1	3	0	10	42	17.36	0	0	0	0	0	1



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAVD88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
BAY ROAD	4	3	1	4	0	0	12	50	25.54	0	0	0	0	0	1
CARESWELL STREET	4	3	1	4	0	0	12	50	19.99	0	0	0	0	0	1
	2	3	1	0	0	0	6	25	22.03	0	0	0	0	0	0
SOUTH PASTURE LANE	2	3	2	0	0	0	7	29	23.83	0	0	0	0	0	0
	2	3	1	1	3	0	10	42	19.37	0	0	0	0	0	0
	1	3	2	0	0	0	6	25	16.10	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	23.54	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	20.44	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	17.37	0	0	0	0	0	0
CROOKED LANE	2	3	1	0	0	0	6	25	24.66	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	22.69	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	22.07	0	0	0	0	0	0
CHAPEL STREET	2	3	1	0	0	0	6	25	22.38	0	0	0	0	0	0
	0	3	1	0	0	0	4	17	22.62	0	0	0	0	0	0
	0	3	1	0	0	0	4	17	19.36	0	0	0	0	0	0
SHORT LANE	2	3	1	0	0	0	6	25	22.87	0	0	0	0	0	0
	0	3	1	0	0	0	4	17	16.27	0	0	0	0	0	0
	2	3	2	0	0	0	7	29	16.56	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	19.62	0	0	0	0	0	0
SAMOSSET ROAD	2	3	1	0	0	0	6	25	19.13	0	0	0	0	0	0
	0	3	0	0	0	0	3	12	19.15	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	21.67	0	0	0	0	0	0
KING CAESAR LANE	2	3	1	0	0	0	6	25	16.52	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	25.61	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	24.67	0	0	0	0	0	0
HERON WAY	1	3	1	0	0	0	5	21	16.52	0	0	0	0	0	0
	0	3	1	0	0	0	4	17	26.30	0	0	0	0	0	0
SPRING STREET	2	3	1	0	0	0	6	25	22.83	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	23.08	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	19.66	0	0	0	0	0	0
CHRISTMAS TREE WAY	2	3	1	0	0	0	6	25	18.31	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	24.25	0	0	0	0	0	0



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAVD88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
TIDE ACRES LANE	2	3	0	0	0	0	5	21	17.86	0	0	0	0	0	0
TIDE ACRES LANE	1	3	1	0	0	0	5	21	23.82	0	0	0	0	0	0
BACK RIVER WAY	2	3	2	0	0	0	7	29	15.55	0	0	0	0	0	0
SOUTH STATION STREET	3	3	2	0	0	0	8	33	17.23	0	0	0	0	0	0
SURPLUS STREET	3	3	2	1	0	0	9	38	18.69	0	0	0	0	0	0
CRANBERRY LANE	0	3	1	0	0	0	4	17	23.52	0	0	0	0	0	0
CROOKED LANE	2	3	1	0	0	0	6	25	24.96	0	0	0	0	0	0
ELDER BREWSTER ROAD	2	3	1	0	0	0	6	25	25.35	0	0	0	0	0	0
HARRISON STREET	4	3	1	4	0	0	12	50	19.49	0	0	0	0	0	0
HARRISON STREET	4	3	1	4	0	0	12	50	22.77	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	1	0	12	50	18.28	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	1	0	12	50	21.97	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	1	0	12	50	20.97	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	1	0	12	50	20.20	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	2	3	1	0	13	54	25.24	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	3	0	14	58	21.23	0	0	0	0	0	0
MARSHALL STREET	3	3	2	2	0	0	10	42	21.67	0	0	0	0	0	0
BEECHWOOD LANE	0	3	1	0	0	0	4	17	21.37	0	0	0	0	0	0
SPRING STREET	2	3	1	0	0	0	6	25	25.32	0	0	0	0	0	0
BAY VIEW ROAD	2	3	1	0	0	0	6	25	20.02	0	0	0	0	0	0
SAMOSSET ROAD	2	3	1	0	0	0	6	25	21.49	0	0	0	0	0	0
SAMOSSET ROAD	2	3	1	0	0	0	6	25	24.74	0	0	0	0	0	0
MOULTON ROAD	2	3	2	0	0	0	7	29	13.12	0	0	0	0	0	0
LOVERS LANE	3	3	2	1	0	0	9	38	20.23	0	0	0	0	0	0
CAPTAINS HILL ROAD	2	3	1	0	0	0	6	25	22.91	0	0	0	0	0	0
CAPTAINS HILL ROAD	2	3	1	0	0	0	6	25	23.21	0	0	0	0	0	0
PARTRIDGE ROAD	3	3	1	0	0	0	7	29	16.46	0	0	0	0	0	0
PARTRIDGE ROAD	3	3	1	0	0	0	7	29	17.37	0	0	0	0	0	0
PINE HILL AVENUE	2	3	1	0	0	0	6	25	26.55	0	0	0	0	0	0
THE MARSHES	2	3	1	0	0	0	6	25	16.00	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	21.12	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	19.90	0	0	0	0	0	0



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAV D88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
HOUNDS DITCH LANE	2	3	2	0	0	0	7	29	23.06	0	0	0	0	0	0
POWDER POINT AVENUE	4	3	0	3	1	0	11	46	17.35	0	0	0	0	0	0
EAGLES NEST ROAD	2	3	2	0	0	0	7	29	21.54	0	0	0	0	0	0
WEBSTER STREET	1	3	1	0	0	0	5	21	18.74	0	0	0	0	0	0
BREWER LANE	2	3	1	0	0	0	6	25	22.32	0	0	0	0	0	0
BREWER LANE	2	3	0	0	0	0	5	21	24.66	0	0	0	0	0	0
BREWER LANE	2	3	1	0	0	0	6	25	22.65	0	0	0	0	0	0
CHAPEL STREET	2	3	1	0	0	0	6	25	18.46	0	0	0	0	0	0
BAYRIDGE LANE	2	3	1	0	0	0	6	25	24.29	0	0	0	0	0	0
STANDISH STREET	3	3	2	2	0	0	10	42	20.17	0	0	0	0	0	0
WICKED HILL	1	3	1	0	0	0	5	21	18.20	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	23.57	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	21.56	0	0	0	0	0	0
ALPHEUS WAY	0	3	0	0	0	0	3	12	21.63	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	1	0	12	50	23.15	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	1	0	12	50	24.14	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	3	0	14	58	19.48	0	0	0	0	0	0
BAY ROAD	4	3	1	4	0	0	12	50	27.47	0	0	0	0	0	0
BAY ROAD	4	3	1	4	0	0	12	50	26.69	0	0	0	0	0	0
BAY ROAD	4	3	1	4	0	0	12	50	24.37	0	0	0	0	0	0
CANAL STREET	4	3	1	4	0	0	12	50	16.88	0	0	0	0	0	0
CANAL STREET	4	3	1	4	0	0	12	50	17.35	0	0	0	0	0	0
CANAL STREET	4	3	1	4	0	0	12	50	22.10	0	0	0	0	0	0
CANAL STREET	4	3	0	4	0	0	11	46	17.10	0	0	0	0	0	0
CANAL STREET	4	3	1	4	0	0	12	50	17.19	0	0	0	0	0	0
CANAL STREET	4	3	1	4	0	0	12	50	18.25	0	0	0	0	0	0
CANAL STREET	4	3	0	4	0	0	11	46	16.89	0	0	0	0	0	0
CANAL STREET	4	3	1	4	0	0	12	50	17.25	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	19.97	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	30.08	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	23.16	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	17.62	0	0	0	0	0	0



Street Name	Service Loss	Loss Duration	Damage Cost	Public Safety	Economic	Health & Env	Sum	Consequence	CE (ftNAVD88)	Prob_PDAY	Prob_2030	Prob_2070	Risk_PDAY	Risk_2030	Risk_2070
CARESWELL STREET	4	3	1	4	0	0	12	50	18.01	0	0	0	0	0	0
CARESWELL STREET	4	3	0	4	0	0	11	46	18.86	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	19.43	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	20.15	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	28.41	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	38.40	0	0	0	0	0	0
CARESWELL STREET	4	3	0	4	0	0	11	46	29.04	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	18.62	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	18.15	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	20.93	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	25.75	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	3	0	15	62	42.42	0	0	0	0	0	0
TREMONT STREET	4	3	2	4	3	0	16	67	38.31	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	3	0	15	62	41.77	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	23.88	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	33.07	0	0	0	0	0	0
TREMONT STREET	4	3	0	4	3	0	14	58	35.79	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	25.73	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	24.14	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	25.50	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	45.10	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	35.21	0	0	0	0	0	0
	1	3	1	0	0	0	5	21	20.82	0	0	0	0	0	0
WASHINGTON STREET	4	3	1	4	2	0	14	58	19.58	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	19.62	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	3	0	15	62	36.38	0	0	0	0	0	0
	2	3	1	0	0	0	6	25	17.28	0	0	0	0	0	0
CARESWELL STREET	4	3	1	4	0	0	12	50	18.83	0	0	0	0	0	0
CANAL STREET EXTENSION	4	3	1	4	0	0	12	50	17.29	0	0	0	0	0	0
TREMONT STREET	4	3	1	4	0	0	12	50	65.04	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	0	0	11	46	44.04	0	0	0	0	0	0
SAINT GEORGE STREET	4	3	1	3	0	0	11	46	34.02	0	0	0	0	0	0



APPENDIX D – ASSET RISK PROFILES



D-1 Town of Duxbury Asset Profiles



Harrison Bridge

Asset Type: Bridge

Critical Elevation (CE): **5.53 FT. NAVD88**

Threshold Description:

Low chord elevation; Road surface 9.36 FT. NAVD88

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	5.37	11.9	6.37	15.5	9.97
0.2	10.5	4.97	11.5	5.97	15.1	9.57
0.5	10	4.47	11	5.47	14.5	8.97
1	9.6	4.07	10.6	5.07	14.1	8.57
2	9.2	3.67	10.3	4.77	13.7	8.17
5	8.7	3.17	9.8	4.27	13.1	7.57
10	8.3	2.77	9.4	3.87	12.6	7.07
20	7.8	2.27	8.9	3.37	12.1	6.57
25	7.6	2.07	8.8	3.27	11.9	6.37
30	7.5	1.97	8.7	3.17	11.8	6.27
50	7	1.47	8.2	2.67	11.3	5.77
100	5.9	0.37	7.2	1.67	10.1	4.57

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	3	4	2	3	4	3	19	79

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	100	79	7900	1/35
2030	100	79	7900	1/35
2070	100	79	7900	3/35



Washington Street Bridge

Asset Type: Bridges

Critical Elevation (CE): **7.48 FT. NAVD88**

Threshold Description:

Low Chord Elevation; road surface 11.50 ft NAVD88

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	11	3.52	11.9	4.42	15.6	8.12
0.2	10.6	3.12	11.5	4.02	15.2	7.72
0.5	10.1	2.62	11	3.52	14.6	7.12
1	9.7	2.22	10.6	3.12	14.2	6.72
2	9.3	1.82	10.3	2.82	13.7	6.22
5	8.7	1.22	9.8	2.32	13.1	5.62
10	8.3	0.82	9.4	1.92	12.6	5.12
20	7.8	0.32	8.9	1.42	12.1	4.62
25	7.6	0.12	8.8	1.32	12	4.52
30	7.5	0.02	8.7	1.22	11.8	4.32
50	7	-	8.2	0.72	11.3	3.82
100	5.9	-	7.2	-	10.1	2.62

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	3	4	2	3	4	3	19	79

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	30	79	2370	2/35
2030	50	79	3950	5/35
2070	100	79	7900	3/35



Island Creek Bridge

Asset Type: Bridge

Critical Elevation (CE): **7.01 FT. NAVD88**

Threshold Description:

Low chord elevation; Road surface 9.26 FT. NAVD88

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	11.3	4.29	12	4.99	15.7	8.69
0.2	10.8	3.79	11.6	4.59	15.2	8.19
0.5	10.2	3.19	11	3.99	14.6	7.59
1	9.8	2.79	10.6	3.59	14.1	7.09
2	9.3	2.29	10.2	3.19	13.6	6.59
5	8.7	1.69	9.7	2.69	13	5.99
10	8.2	1.19	9.2	2.19	12.5	5.49
20	7.7	0.69	8.8	1.79	12	4.99
25	7.5	0.49	8.6	1.59	11.8	4.79
30	7.3	0.29	8.5	1.49	11.6	4.59
50	6.8	-	8	0.99	11.1	4.09
100	5.5	-	6.9	-	9.8	2.79

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	3	4	2	3	3	3	18	75

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	30	75	2250	3/35
2030	50	75	3750	6/35
2070	100	75	7500	5/35



Marshall Street Bridge

Asset Type: Bridge

Critical Elevation (CE): **6.83 FT. NAVD88**

Threshold Description:

Low chord elevation; road surface 10.51 NAVD88

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	4.07	11.8	4.97	15.4	8.57
0.2	10.5	3.67	11.4	4.57	15	8.17
0.5	9.9	3.07	10.9	4.07	14.4	7.57
1	9.5	2.67	10.5	3.67	14	7.17
2	9.1	2.27	10.1	3.27	13.5	6.67
5	8.5	1.67	9.6	2.77	12.9	6.07
10	8.1	1.27	9.2	2.37	12.4	5.57
20	7.6	0.77	8.8	1.97	11.9	5.07
25	7.5	0.67	8.6	1.77	11.8	4.97
30	7.3	0.47	8.5	1.67	11.6	4.77
50	6.8	-	8	1.17	11.1	4.27
100	5.7	-	7	0.17	9.9	3.07

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
	3	4	2	3	2	3	17	71

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	30	71	2130	4/35
2030	100	71	7100	2/35
2070	100	71	7100	6/35



Harbormaster Float

Asset Type: Coastal

Critical Elevation (CE): **6.88 FT. NAVD88**

Threshold Description:

Fulcrum point of ramp below deck



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	3.92	11.7	4.82	15.4	8.52
0.2	10.4	3.52	11.4	4.52	15	8.12
0.5	9.9	3.02	10.9	4.02	14.4	7.52
1	9.5	2.62	10.5	3.62	14	7.12
2	9.1	2.22	10.1	3.22	13.5	6.62
5	8.5	1.62	9.6	2.72	12.9	6.02
10	8.1	1.22	9.2	2.32	12.5	5.62
20	7.6	0.72	8.8	1.92	12	5.12
25	7.5	0.62	8.6	1.72	11.8	4.92
30	7.3	0.42	8.5	1.62	11.6	4.72
50	6.8	-	8.1	1.22	11.1	4.22
100	5.8	-	7.1	0.22	9.9	3.02

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	3	1	3	3	2	16	67

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	30	67	2000	5/35
2030	100	67	6667	3/35
2070	100	67	6667	8/35



Mattakeeset

Asset Type: Parking

Critical Elevation (CE): **8.02 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	2.78	11.7	3.68	15.4	7.38
0.2	10.4	2.38	11.4	3.38	15	6.98
0.5	9.9	1.88	10.9	2.88	14.4	6.38
1	9.5	1.48	10.5	2.48	14	5.98
2	9.1	1.08	10.1	2.08	13.5	5.48
5	8.5	0.48	9.6	1.58	12.9	4.88
10	8.1	0.08	9.2	1.18	12.5	4.48
20	7.6	-	8.8	0.78	12	3.98
25	7.5	-	8.6	0.58	11.8	3.78
30	7.3	-	8.5	0.48	11.6	3.58
50	6.8	-	8.1	0.08	11.1	3.08
100	5.8	-	7.1	-	9.9	1.88

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	2	2	4	4	3	19	79

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	10	79	792	6/35
2030	50	79	3598	4/35
2070	100	79	7917	1/35



Blue Fish Fire Station

Asset Type: Parking

Critical Elevation (CE): **8.53 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	11	2.47	11.9	3.37	15.6	7.07
0.2	10.6	2.07	11.5	2.97	15.2	6.67
0.5	10.1	1.57	11	2.47	14.6	6.07
1	9.7	1.17	10.6	2.07	14.2	5.67
2	9.3	0.77	10.3	1.77	13.7	5.17
5	8.7	0.17	9.8	1.27	13.1	4.57
10	8.3	-	9.4	0.87	12.6	4.07
20	7.8	-	8.9	0.37	12.1	3.57
25	7.6	-	8.8	0.27	12	3.47
30	7.5	-	8.7	0.17	11.8	3.27
50	7	-	8.2	-	11.3	2.77
100	5.9	-	7.2	-	10.1	1.57

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	1	2	1	1	2	1	8	33

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	5	33	167	7/35
2030	30	33	1000	10/35
2070	100	33	3333	15/35



Town Pier

Asset Type: Coastal

Critical Elevation (CE): **8.62 FT. NAVD88**

Threshold Description:

Top of decking



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	2.18	11.7	3.08	15.4	6.78
0.2	10.4	1.78	11.4	2.78	15	6.38
0.5	9.9	1.28	10.9	2.28	14.4	5.78
1	9.5	0.88	10.5	1.88	14	5.38
2	9.1	0.48	10.1	1.48	13.5	4.88
5	8.5	-	9.6	0.98	12.9	4.28
10	8.1	-	9.2	0.58	12.5	3.88
20	7.6	-	8.8	0.18	12	3.38
25	7.5	-	8.6	-	11.8	3.18
30	7.3	-	8.5	-	11.6	2.98
50	6.8	-	8.1	-	11.1	2.48
100	5.8	-	7.1	-	9.9	1.28

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	4	3	3	3	2	19	79

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	2	79	158	8/35
2030	25	79	1979	7/35
2070	100	79	7917	1/35



Town Float

Asset Type: Coastal

Critical Elevation (CE): 8.62 FT. NAVD88

Threshold Description:

Top of decking



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	2.18	11.7	3.08	15.4	6.78
0.2	10.4	1.78	11.4	2.78	15	6.38
0.5	9.9	1.28	10.9	2.28	14.4	5.78
1	9.5	0.88	10.5	1.88	14	5.38
2	9.1	0.48	10.1	1.48	13.5	4.88
5	8.5	-	9.6	0.98	12.9	4.28
10	8.1	-	9.2	0.58	12.5	3.88
20	7.6	-	8.8	0.18	12	3.38
25	7.5	-	8.6	-	11.8	3.18
30	7.3	-	8.5	-	11.6	2.98
50	6.8	-	8.1	-	11.1	2.48
100	5.8	-	7.1	-	9.9	1.28

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	3	1	3	3	2	16	67

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	2	67	133	9/35
2030	25	67	1667	8/35
2070	100	67	6667	8/35



447-449 Washington Street

Asset Type: Parking

Critical Elevation (CE): **8.54 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	2.26	11.7	3.16	15.4	6.86
0.2	10.4	1.86	11.4	2.86	15	6.46
0.5	9.9	1.36	10.9	2.36	14.4	5.86
1	9.5	0.96	10.5	1.96	14	5.46
2	9.1	0.56	10.1	1.56	13.5	4.96
5	8.5	-	9.6	1.06	12.9	4.36
10	8.1	-	9.2	0.66	12.5	3.96
20	7.6	-	8.8	0.26	12	3.46
25	7.5	-	8.6	0.06	11.8	3.26
30	7.3	-	8.5	-	11.6	3.06
50	6.8	-	8.1	-	11.1	2.56
100	5.8	-	7.1	-	9.9	1.36

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	2	1	2	3	1	13	54

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	2	54	108	10/35
2030	25	54	1354	9/35
2070	100	54	5417	11/35



Canal Street Bridge

Asset Type: Bridges

Critical Elevation (CE): **9.84 FT. NAVD88**

Threshold Description:

Road surface (LiDAR)

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	11.5	1.66	11.7	1.86	15.4	5.56
0.2	11.1	1.26	11.3	1.46	15	5.16
0.5	10.4	0.56	10.8	0.96	14.4	4.56
1	10	0.16	10.5	0.66	14	4.16
2	9.5	-	10.1	0.26	13.6	3.76
5	8.9	-	9.6	-	13	3.16
10	8.4	-	9.3	-	12.5	2.66
20	7.9	-	8.9	-	12.1	2.26
25	7.7	-	8.7	-	11.9	2.06
30	7.5	-	8.6	-	11.7	1.86
50	7	-	8.2	-	11.2	1.36
100	5.7	-	7.2	-	10.1	0.26

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	3	4	0	4	3	2	16	67

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	1	67	67	11/35
2030	2	67	134	12/35
2070	100	67	6700	7/35



Duxbury Beach 1

Asset Type: Parking

Critical Elevation (CE): **9.70 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.7	1	11.7	2	15.4	5.7
0.2	10.3	0.6	11.4	1.7	14.9	5.2
0.5	9.8	0.1	10.9	1.2	14.4	4.7
1	9.4	-	10.5	0.8	14	4.3
2	9	-	10.2	0.5	13.5	3.8
5	8.5	-	9.7	0	13	3.3
10	8.1	-	9.3	-	12.5	2.8
20	7.7	-	8.9	-	12	2.3
25	7.5	-	8.7	-	11.9	2.2
30	7.4	-	8.6	-	11.7	2
50	6.9	-	8.2	-	11.2	1.5
100	5.9	-	7.2	-	10.1	0.4

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
4	2	1	2	3	2	14	58	

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0.5	58	29	12/35
2030	5	58	292	11/35
2070	100	58	5883	10/35



Harbormaster Office

Asset Type: Buildings

Critical Elevation (CE): 10.21 FT. NAVD88

Threshold Description:

First-floor survey

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	0.59	11.7	1.49	15.4	5.19
0.2	10.4	0.19	11.4	1.19	15	4.79
0.5	9.9	-	10.9	0.69	14.4	4.19
1	9.5	-	10.5	0.29	14	3.79
2	9.1	-	10.1	-	13.5	3.29
5	8.5	-	9.6	-	12.9	2.69
10	8.1	-	9.2	-	12.5	2.29
20	7.6	-	8.8	-	12	1.79
25	7.5	-	8.6	-	11.8	1.59
30	7.3	-	8.5	-	11.6	1.39
50	6.8	-	8.1	-	11.1	0.89
100	5.8	-	7.1	-	9.9	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	3	1	3	3	3	17	71

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0.2	71	14	13/35
2030	1	71	71	13/35
2070	50	71	3550	13/35



Blue Fish Shared Septic Pump

Asset Type: Assets

Critical Elevation (CE): 10.34 FT. NAVD88

Threshold Description:

Hatch cover – 3” to electrical box pad

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	11	0.66	11.9	1.56	15.6	5.26
0.2	10.6	0.26	11.5	1.16	15.2	4.86
0.5	10.1	-	11	0.66	14.6	4.26
1	9.7	-	10.6	0.26	14.2	3.86
2	9.3	-	10.3	-	13.7	3.36
5	8.7	-	9.8	-	13.1	2.76
10	8.3	-	9.4	-	12.6	2.26
20	7.8	-	8.9	-	12.1	1.76
25	7.6	-	8.8	-	12	1.66
30	7.5	-	8.7	-	11.8	1.46
50	7	-	8.2	-	11.3	0.96
100	5.9	-	7.2	-	10.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	1	2	1	0	1	4	9	37.5

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0.2	37.5	8	14/35
2030	1	37.5	37	15/35
2070	50	37.5	1875	17/35



Powder Point Bridge

Asset Type: Bridge

Critical Elevation (CE): **11.14 FT. NAVD88**

Threshold Description:

9.72 = east abutment; 10.89 = west, 15.58=crest,
+1.42 for top of deck (per SGH)

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.7	-	11.7	0.56	15.4	4.26
0.2	10.3	-	11.4	0.26	14.9	3.76
0.5	9.8	-	10.9	-	14.4	3.26
1	9.4	-	10.5	-	14	2.86
2	9	-	10.2	-	13.5	2.36
5	8.5	-	9.7	-	13	1.86
10	8.1	-	9.3	-	12.5	1.36
20	7.7	-	8.9	-	12	0.86
25	7.5	-	8.7	-	11.9	0.76
30	7.4	-	8.6	-	11.7	0.56
50	6.9	-	8.2	-	11.2	0.06
100	5.9	-	7.2	-	10.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	3	4	2	4	3	3	19	79

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	79	0	15/35
2030	0.2	79	16	17/35
2070	50	79	3950	12/35



Beach Street Bridge

Asset Type: Bridges

Critical Elevation (CE): **9.76 FT. NAVD88**

Threshold Description:

From plans: west road surface; low chord (West) = 7.64

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	9.6	-	11	1.24	15.3	5.54
0.2	9.3	-	10.6	0.84	14.8	5.04
0.5	8.8	-	10.1	0.34	14.2	4.44
1	8.5	-	9.8	0.04	13.7	3.94
2	8.1	-	9.4	-	13.2	3.44
5	7.6	-	8.9	-	12.5	2.74
10	7.3	-	8.5	-	12	2.24
20	6.9	-	8.1	-	11.4	1.64
25	6.7	-	7.9	-	11.2	1.44
30	6.6	-	7.8	-	11.1	1.34
50	6.2	-	7.4	-	10.5	0.74
100	5.2	-	6.4	-	9.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	3	4	0	4	3	2	16	67

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	67	0	15/35
2030	1	67	67	14/35
2070	50	67	3350	14/35



Duxbury Beach 2

Asset Type: Parking

Critical Elevation (CE): **10.82 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.7	-	11.7	0.88	15.4	4.58
0.2	10.3	-	11.4	0.58	14.9	4.08
0.5	9.8	-	10.9	0.08	14.4	3.58
1	9.4	-	10.5	-	14	3.18
2	9	-	10.2	-	13.5	2.68
5	8.5	-	9.7	-	13	2.18
10	8.1	-	9.3	-	12.5	1.68
20	7.7	-	8.9	-	12	1.18
25	7.5	-	8.7	-	11.9	1.08
30	7.4	-	8.6	-	11.7	0.88
50	6.9	-	8.2	-	11.2	0.38
100	5.9	-	7.2	-	10.1	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
4	2	1	2	2	1	12	50	

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	50	0	15/35
2030	0.5	50	25	16/35
2070	50	50	2500	16/35



Snug Harbor Shared Septic Pump

Asset Type: Assets

Critical Elevation (CE): **11.37 FT. NAVD88**

Threshold Description:

Pad at base of electrical box

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	-	11.7	0.33	15.4	4.03
0.2	10.4	-	11.4	0.03	15	3.63
0.5	9.9	-	10.9	-	14.4	3.03
1	9.5	-	10.5	-	14	2.63
2	9.1	-	10.1	-	13.5	2.13
5	8.5	-	9.6	-	12.9	1.53
10	8.1	-	9.2	-	12.5	1.13
20	7.6	-	8.8	-	12	0.63
25	7.5	-	8.6	-	11.8	0.43
30	7.3	-	8.5	-	11.6	0.23
50	6.8	-	8.1	-	11.1	-
100	5.8	-	7.1	-	9.9	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	2	2	1	0	3	4	12	50

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	50	0	15/35
2030	0.2	50	10	18/35
2070	30	50	1500	18/35



Blue Fish River Fire Station

Asset Type: Buildings

Critical Elevation (CE): **11.78 FT. NAVD88**

Threshold Description:

First floor



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	11	-	11.9	0.12	15.6	3.82
0.2	10.6	-	11.5	-	15.2	3.42
0.5	10.1	-	11	-	14.6	2.82
1	9.7	-	10.6	-	14.2	2.42
2	9.3	-	10.3	-	13.7	1.92
5	8.7	-	9.8	-	13.1	1.32
10	8.3	-	9.4	-	12.6	0.82
20	7.8	-	8.9	-	12.1	0.32
25	7.6	-	8.8	-	12	0.22
30	7.5	-	8.7	-	11.8	0.02
50	7	-	8.2	-	11.3	-
100	5.9	-	7.2	-	10.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	1	2	1	1	2	1	8	33

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	33	0	15/35
2030	0.1	33	3	19/35
2070	30	33	990	19/35



Alden Elementary School 2

Asset Type: Parking

Critical Elevation (CE): **11.01 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	0.89	15.5	4.49
0.2	10.5	-	11.5	0.49	15.1	4.09
0.5	10	-	11	-	14.5	3.49
1	9.6	-	10.6	-	14.1	3.09
2	9.2	-	10.3	-	13.7	2.69
5	8.7	-	9.8	-	13.1	2.09
10	8.3	-	9.4	-	12.6	1.59
20	7.8	-	8.9	-	12.1	1.09
25	7.6	-	8.8	-	11.9	0.89
30	7.5	-	8.7	-	11.8	0.79
50			8.2	-	11.3	0.29
100			7.2	-	10.1	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
	1	2	0	1	0	0	4	17

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	17	0	15/35
2030	0.2	17	3	19/35
2070	50	17	833	20/35



Duxbury Middle/High School 1

Asset Type: Parking

Critical Elevation (CE): **11.58 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	0.32	15.5	3.92
0.2	10.5	-	11.5	-	15.1	3.52
0.5	10	-	11	-	14.5	2.92
1	9.6	-	10.6	-	14.1	2.52
2	9.2	-	10.3	-	13.7	2.12
5	8.7	-	9.8	-	13.1	1.52
10	8.3	-	9.4	-	12.6	1.02
20	7.8	-	8.9	-	12.1	0.52
25	7.6	-	8.8	-	11.9	0.32
30	7.5	-	8.7	-	11.8	0.22
50		-	8.2	-	11.3	-
100		-	7.2	-	10.1	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
1	2	0	1	0	0	4	17	

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	17	0	15/35
2030	0.1	17	2	21/35
2070	30	17	500	21/35



Alden Elementary School 3

Asset Type: Parking

Critical Elevation (CE): **11.92 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	3.58
0.2	10.5	-	11.5	-	15.1	3.18
0.5	10	-	11	-	14.5	2.58
1	9.6	-	10.6	-	14.1	2.18
2	9.2	-	10.3	-	13.7	1.78
5	8.7	-	9.8	-	13.1	1.18
10	8.3	-	9.4	-	12.6	0.68
20	7.8	-	8.9	-	12.1	0.18
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50		-	8.2	-	11.3	-
100		-	7.2	-	10.1	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
1	2	0	1	0	0	4	17	

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	17	0	15/35
2030	0	17	0	22/35
2070	20	17	333	22/35



479 Washington Street

Asset Type: Parking

Critical Elevation (CE): **12.67FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	-	11.7	-	15.4	2.73
0.2	10.4	-	11.4	-	15	2.33
0.5	9.9	-	10.9	-	14.4	1.73
1	9.5	-	10.5	-	14	1.33
2	9.1	-	10.1	-	13.5	0.83
5	8.5	-	9.6	-	12.9	0.23
10	8.1	-	9.2	-	12.5	-
20	7.6	-	8.8	-	12	-
25	7.5	-	8.6	-	11.8	-
30	7.3	-	8.5	-	11.6	-
50	6.8	-	8.1	-	11.1	-
100	5.8	-	7.1	-	9.9	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
4	2	1	2	3	1	13	54	

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	54	0	15/35
2030	0	54	0	22/35
2070	5	54	271	23/35



Duxbury Beach Walkover

Asset Type: Coastal

Critical Elevation (CE): **12.88 FT. NAVD88**

Threshold Description:

Top of decking



Probability of Exceedance Summary Table

Probability	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.7	-	11.7	-	15	2.12
0.2	10.3	-	11.3	-	14.6	1.72
0.5	9.7	-	10.8	-	14.1	1.22
1	9.3	-	10.4	-	13.6	0.72
2	8.9	-	10	-	13.2	0.32
5	8.4	-	9.5	-	12.7	-
10	7.9	-	9.1	-	12.2	-
20	7.5	-	8.6	-	11.8	-
25	7.3	-	8.5	-	11.6	-
30	7.2	-	8.3	-	11.4	-
50	6.7	-	7.9	-	10.9	-
100	5.6	-	6.8	-	9.8	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
1	4	2	2	1	2	12	50	

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	50	0	15/35
2030	0	50	0	22/35
2070	2	50	100	24/35



Alden Elementary School

Asset Type: Building

Critical Elevation (CE): **14.03 FT. NAVD88**

Threshold Description:

Southern door that leads to first floor boiler room

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	1.47
0.2	10.5	-	11.5	-	15.1	1.07
0.5	10	-	11	-	14.5	0.47
1	9.6	-	10.6	-	14.1	0.07
2	9.2	-	10.3	-	13.7	-
5	8.7	-	9.8	-	13.1	-
10	8.3	-	9.4	-	12.6	-
20	7.8	-	8.9	-	12.1	-
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50			8.2	-	11.3	-
100			7.2	-	10.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	4	3	3	4	0	18	75

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	75	0	15/35
2030	0	75	0	22/35
2070	1	75	75	25/35



Performing Arts Center

Asset Type: Building

Critical Elevation (CE): **14.03 FT. NAVD88**

Threshold Description:

Ground from Lidar – southern door



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	1.47
0.2	10.5	-	11.5	-	15.1	1.07
0.5	10	-	11	-	14.5	0.47
1	9.6	-	10.6	-	14.1	0.07
2	9.2	-	10.3	-	13.7	-
5	8.7	-	9.8	-	13.1	-
10	8.3	-	9.4	-	12.6	-
20	7.8	-	8.9	-	12.1	-
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50			8.2	-	11.3	-
100			7.2	-	10.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	4	3	2	2	1	16	67

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	67	0	15/35
2030	0	67	0	22/35
2070	1	67	67	26/35



Alden Elementary School 1

Asset Type: Parking

Critical Elevation (CE): **13.16 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	2.34
0.2	10.5	-	11.5	-	15.1	1.94
0.5	10	-	11	-	14.5	1.34
1	9.6	-	10.6	-	14.1	0.94
2	9.2	-	10.3	-	13.7	0.54
5	8.7	-	9.8	-	13.1	-
10	8.3	-	9.4	-	12.6	-
20	7.8	-	8.9	-	12.1	-
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50			8.2	-	11.3	-
100			7.2	-	10.1	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
	1	2	0	1	0	0	4	17

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	17	0	15/35
2030	0	17	0	22/35
2070	2	17	33	27/35



Alden Elementary School 5

Asset Type: Parking

Critical Elevation (CE): **13.65 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	1.85
0.2	10.5	-	11.5	-	15.1	1.45
0.5	10	-	11	-	14.5	0.85
1	9.6	-	10.6	-	14.1	0.45
2	9.2	-	10.3	-	13.7	0.05
5	8.7	-	9.8	-	13.1	-
10	8.3	-	9.4	-	12.6	-
20	7.8	-	8.9	-	12.1	-
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50			8.2	-	11.3	-
100			7.2	-	10.1	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
	1	2	0	1	0	0	4	17

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	17	0	15/35
2030	0	17	0	22/35
2070	2	17	33	27/35



Snug Harbor Public Restrooms

Asset Type: Buildings

Critical Elevation (CE): **12.31 FT. NAVD88**

Threshold Description:

Electrical panel

Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.8	-	11.7	-	15.4	3.09
0.2	10.4	-	11.4	-	15	2.69
0.5	9.9	-	10.9	-	14.4	2.09
1	9.5	-	10.5	-	14	1.69
2	9.1	-	10.1	-	13.5	1.19
5	8.5	-	9.6	-	12.9	0.59
10	8.1	-	9.2	-	12.5	0.19
20	7.6	-	8.8	-	12	-
25	7.5	-	8.6	-	11.8	-
30	7.3	-	8.5	-	11.6	-
50	6.8	-	8.1	-	11.1	-
100	5.8	-	7.1	-	9.9	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	3	1	2	2	3	15	62

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	62	0	15/35
2030	0	62	0	22/35
2070	0.5	62	31	29/35



Shipyard Lane

Asset Type: Parking

Critical Elevation (CE): **14.25 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.7	-	11.7	-	15	0.75
0.2	10.3	-	11.3	-	14.6	0.35
0.5	9.7	-	10.8	-	14.1	-
1	9.3	-	10.4	-	13.6	-
2	8.9	-	10	-	13.2	-
5	8.4	-	9.5	-	12.7	-
10	7.9	-	9.1	-	12.2	-
20	7.5	-	8.6	-	11.8	-
25	7.3	-	8.5	-	11.6	-
30	7.2	-	8.3	-	11.4	-
50	6.7	-	7.9	-	10.9	-
100	5.6	-	6.8	-	9.8	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
	3	2	1	2	1	2	11	46

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	46	0	15/35
2030	0	46	0	22/35
2070	0.5	46	23	30/35



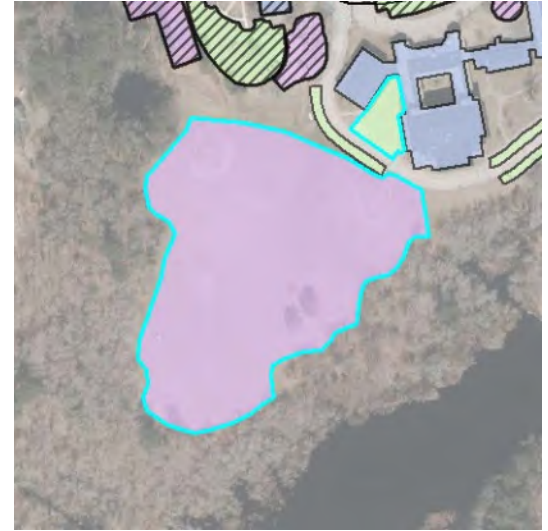
Alden Field 2

Asset Type: Recreation

Critical Elevation (CE): **14.40 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	1.1
0.2	10.5	-	11.5	-	15.1	0.7
0.5	10	-	11	-	14.5	0.1
1	9.6	-	10.6	-	14.1	-
2	9.2	-	10.3	-	13.7	-
5	8.7	-	9.8	-	13.1	-
10	8.3	-	9.4	-	12.6	-
20	7.8	-	8.9	-	12.1	-
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50			8.2	-	11.3	-
100			7.2	-	10.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	4	1	0	1	0	1	7	29

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	29	0	15/35
2030	0	29	0	22/35
2070	0.5	29	14	31/35



Duxbury High School Generator

Asset Type: Assets

Critical Elevation (CE): 14.67 FT. NAVD88

Threshold Description:

Top of slab



Probability of Exceedance Summary Table

Probability	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	0.83
0.2	10.5	-	11.5	-	15.1	0.43
0.5	10	-	11	-	14.5	-
1	9.6	-	10.6	-	14.1	-
2	9.2	-	10.3	-	13.7	-
5	8.7	-	9.8	-	13.1	-
10	8.3	-	9.4	-	12.6	-
20	7.8	-	8.9	-	12.1	-
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50			8.2	-	11.3	-
100			7.2	-	10.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	1	3	1	3	1	2	11	46

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	46	0	15/35
2030	0	46	0	22/35
2070	0.2	46	9	32/35



Duxbury High School Lift 1

Asset Type: Assets

Critical Elevation (CE): 14.70 FT. NAVD88

Threshold Description:

Ground – manhole cover

Probability of Exceedance Summary Table

Probability	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	0.8
0.2	10.5	-	11.5	-	15.1	0.4
0.5	10	-	11	-	14.5	-
1	9.6	-	10.6	-	14.1	-
2	9.2	-	10.3	-	13.7	-
5	8.7	-	9.8	-	13.1	-
10	8.3	-	9.4	-	12.6	-
20	7.8	-	8.9	-	12.1	-
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50			8.2	-	11.3	-
100			7.2	-	10.1	-

Consequence of Exceedance

	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
Scores	2	2	1	0	2	4	11	46

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	46	0	15/35
2030	0	46	0	22/35
2070	0.2	46	9	32/35



Alden Elementary School 4

Asset Type: Parking

Critical Elevation (CE): **14.26 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.9	-	11.9	-	15.5	1.24
0.2	10.5	-	11.5	-	15.1	0.84
0.5	10	-	11	-	14.5	0.24
1	9.6	-	10.6	-	14.1	-
2	9.2	-	10.3	-	13.7	-
5	8.7	-	9.8	-	13.1	-
10	8.3	-	9.4	-	12.6	-
20	7.8	-	8.9	-	12.1	-
25	7.6	-	8.8	-	11.9	-
30	7.5	-	8.7	-	11.8	-
50			8.2	-	11.3	-
100			7.2	-	10.1	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
	1	2	0	1	0	0	4	17

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	17	0	15/35
2030	0	17	0	22/35
2070	0.5	17	8	34/35



Powder Point/King Caesar

Asset Type: Parking

Critical Elevation (CE): **15.11 FT. NAVD88**

Threshold Description:

Average elevation from LIDAR



Probability of Exceedance Summary Table

Probability %	Present		2030		2070	
	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE	Flood Elevation	Depth Over CE
	FT. NAVD88	FT.	FT. NAVD88	FT.	FT. NAVD88	FT.
0.1	10.7	-	11.7	-	15.4	0.29
0.2	10.3	-	11.4	-	14.9	-
0.5	9.8	-	10.9	-	14.4	-
1	9.4	-	10.5	-	14	-
2	9	-	10.2	-	13.5	-
5	8.5	-	9.7	-	13	-
10	8.1	-	9.3	-	12.5	-
20	7.7	-	8.9	-	12	-
25	7.5	-	8.7	-	11.9	-
30	7.4	-	8.6	-	11.7	-
50	6.9	-	8.2	-	11.2	-
100	5.9	-	7.2	-	10.1	-

Consequence of Exceedance

Scores	Direct Impacts			Indirect Impacts			Sum	Consequence Score
	Service Loss Extent	Service Loss Duration	Cost of Damage	Safety & Emergency Services	Economic Activity	Public Health & Environment		
4	2	1	2	0	2	11	46	

Risk of Exceedance

Time horizon	Probability of Exceedance	Consequence Score	Risk Score	Risk Rank
Present	0	46	0	15/35
2030	0	46	0	22/35
2070	0.1	46	5	35/35



APPENDIX E – PRIORITY MUNICIPAL ASSET CONCEPTUAL ADAPTATION PLANS

MEMORANDUM

DATE June 3, 2021 **JOB NO.** 2019-0057

TO Valerie Massard, AICP, CFM
Planning Director
Town of Duxbury

FROM Joseph Famely
Senior Environmental Scientist
Woods Hole Group

CC Name, Title

Elevation of vulnerable Roadways in Duxbury MA.

The Massachusetts Coastal Flood Risk Model (MCFRM) identified areas that were vulnerable to flooding under present and future conditions. This memo focuses on the three priority high risk asset identified through the planning process and approved by the Steering Committee:

- Powder Point Road,
- Gurnet Road north of the Powder Point Bridge, and
- Marshal Street Bridge.

Each of these areas are subject to flooding under present day storm conditions and future tidal conditions. To alleviate these roadways which are critical for escape routes each area will be raised. This process is different for each roadway and will be described below.

A. Raising the Roadway

The first step to raising the road is to understand the elevation profile along the road, and to split it into representative cross sections. Figures 1-3 show the location of the cross sections and the elevation of the land around each roadway. Anything now red is under 10 feet which is vulnerable to present day flooding and future tidal flooding as shown in Table 1. Raising the road to 10 feet (NAVD88) will protect from the 0.5 percent chance storm today, and still remain effective against the 100 percent chance storm in 2070. Each of these cross sections were analyzed to determine the best way to elevate the roadway with as little impact to the surrounding area. This was done through several steps:

- Plot the elevation versus distance along the cross sections.
- Determine where the cross sections intersect the roadway.
- Elevate the roadway to the desired elevation.
- Determine how the elevation of the roadway interacts with the surrounding elevations to determine the appropriate side slopes.

The side slopes of the roadways were kept at a maximum steepness of 2 (h):1(v). This side slope is gradual enough that natural plantings and erosion control will provide adequate protection, and a harder solution will not be required. Some of the side slopes were much more gradual depending on the elevation of the land around sometimes even becoming flat



with the higher elevations on the side of the road. Appendix A-C shows the cross sections for each roadway and how the road will be raised.

Table 1: Flooding elevations for different percent chance storm events during present day and future conditions.

Percent Chance	Present WSE (ft NAVD88)	2030 WSE (ft NAVD88)	2050 WSE (ft NAVD88)	2070 WSE (ft NAVD88)
0.1	10.8	11.7	13.6	15.4
0.2	10.4	11.4	13.2	15.0
0.5	9.9	10.9	12.6	14.4
1	9.5	10.5	12.2	14.0
2	9.1	10.1	11.7	13.5
5	8.5	9.6	11.1	12.9
10	8.1	9.2	10.7	12.5
20	7.6	8.8	10.2	12.0
25	7.5	8.6	10.0	11.8
30	7.3	8.5	9.8	11.6
50	6.8	8.1	9.3	11.1
100	5.8	7.1	8.1	9.9

B. Preliminary Cost Estimates

Preliminary Opinions of Probable Costs (OPCs) are presented for each alternative. To give an estimate of what each part of the road will cost the following steps were used:

- Determine the length of the roadway that the cross section represents. This ranges from under 200 feet to over 1000.
- Determine the width of the roadway including the shoulder. This was assumed to be a consistent 24 feet for each cross section.
- The roadway cost was broken into several pieces including: Asphalt, surface paint, subbase, sub fill, shoulder fill and erosion control fabric. Each piece needed an estimate of material used.
- Each piece has a unit cost that was multiplied by the appropriate amount to accommodate the elevated roadway.
- The Asphalt and subbase were assumed to be 12 inches in depth.
- To raise the roadway more than 12 inches the volume of sub fill needed was determined.

Certain areas also required special consideration. The culvert under Powder Point road near Bay Pond Road was assumed to be replaced. The culvert replacement was estimated to be \$350,000 based on previous culvert replacements. The Marshal Street Bridge also needed to be constructed. Two different estimates are provided with different costs for the materials and labor to build the bridge. One based on \$27,500 per linear foot and the other on \$600 per square foot.

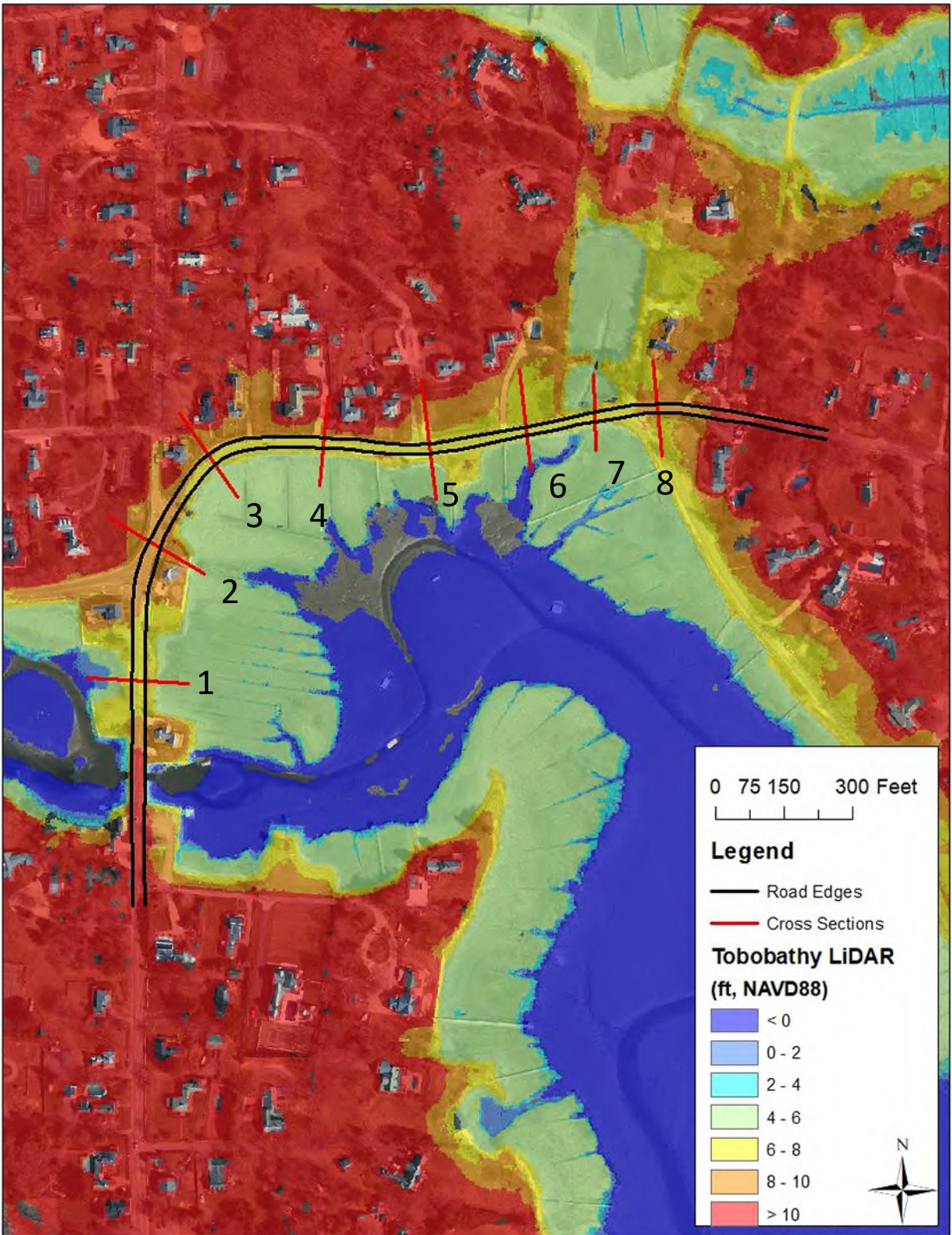


Figure 1: Powder Point Road cross section locations and numbers.



Table 2: Powder Point Road cross section cost estimates and totals. Cross section 7 includes the cost of replacing the culvert.

Powder Point Road		
	Length	cost
Cross Section 1	270	\$51,122.58
Cross Section 2	160	\$21,268.98
Cross Section 3	330	\$47,276.61
Cross Section 4	285	\$46,440.31
Cross Section 5	180	\$28,170.85
Cross Section 6	165	\$27,405.61
Cross Section 7	140	\$372,449.38
Cross Section 8	130	\$14,871.74
sum of cross sections	1660	\$609,006.05
General conditions	15%	\$ 91,351
Overhead and profit	10%	\$ 60,901
Insurance and bonds	2%	\$ 9,135
Engineering Costs	20%	\$ 121,801
Contingency	25%	\$ 152,252
Total Cost		\$ 1,044,445

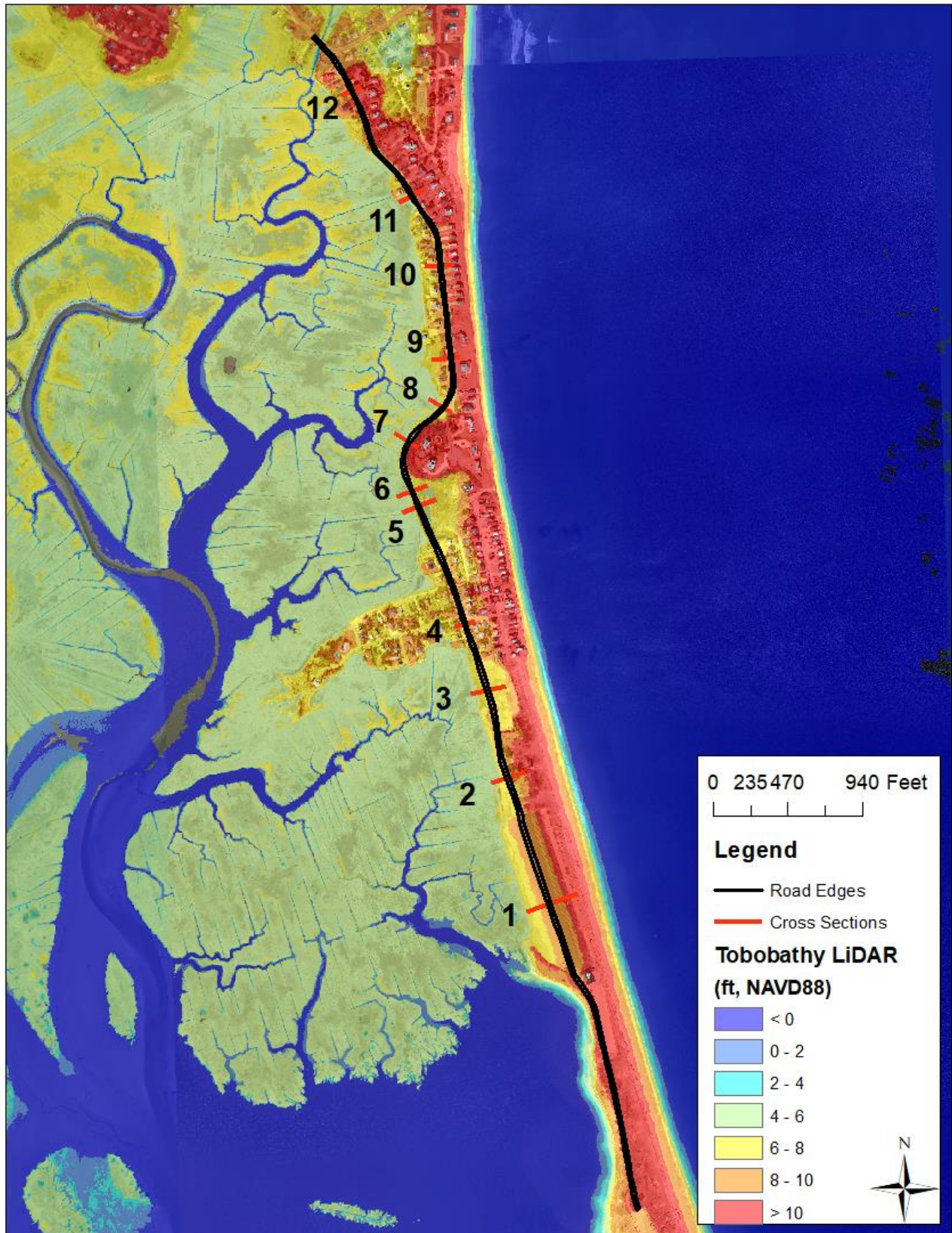


Figure 2: Gurnet Road cross section locations.



Table 3: Gurnet cross section cost estimates and totals.

Gurnet Road		
	Length	cost
Cross Section 1	1040	\$79,745.41
Cross Section 2	530	\$46,134.24
Cross Section 3	500	\$41,392.89
Cross Section 4	770	\$80,917.82
Cross Section 5	300	\$42,979.13
Cross Section 6	160	\$35,219.09
Cross Section 7	430	\$53,042.42
Cross Section 8	200	\$41,175.54
Cross Section 9	340	\$27,654.70
Cross Section 10	780	\$75,273.13
Cross Section 11	500	\$90,175.60
Cross Section 12	690	\$61,680.93
sum of cross sections	6240	\$675,390.91
General conditions	15%	\$ 101,309
Overhead and profit	10%	\$ 67,539
Insurance and bonds	2%	\$ 10,131
Engineering Costs	20%	\$ 135,078
Contingency	25%	\$ 168,848
Total Cost		\$ 1,158,295

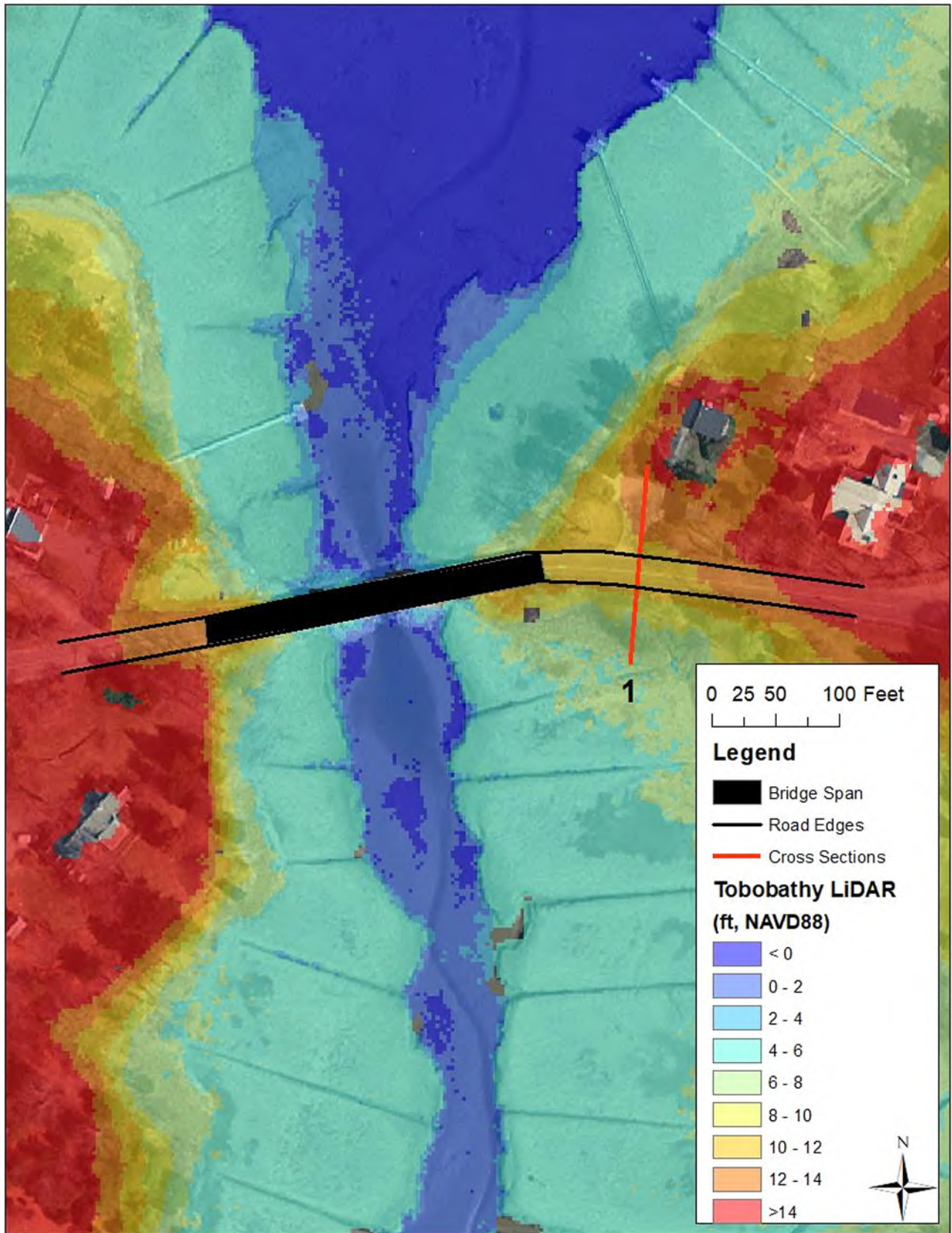


Figure 3: Marshal Street Bridge Cross section and Bridge Span.



Table 4: Marshal Street Bridge cross section cost estimates and totals.

Marshal Street Bridge		
	Length	cost
Cross Section 1	170	\$37,926.46
prefabricated bridge *	250	\$3,600,000.00
sum of cross sections	420	\$3,637,926.46
Contingency	25%	\$ 909,482
Total Cost		\$ 4,547,408

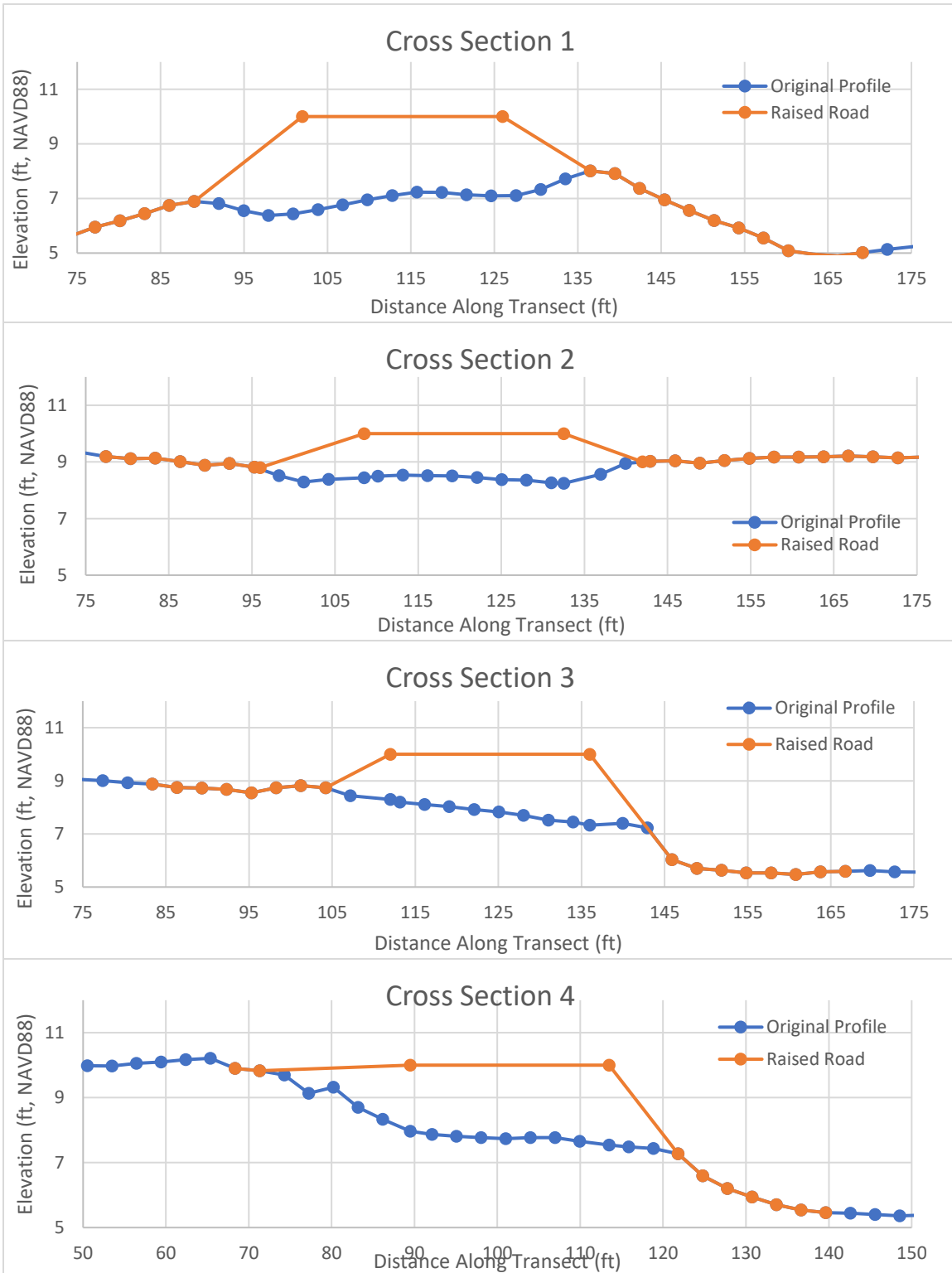
* Bridge Price is based on \$ 600 per square foot and a 24-foot wide roadway

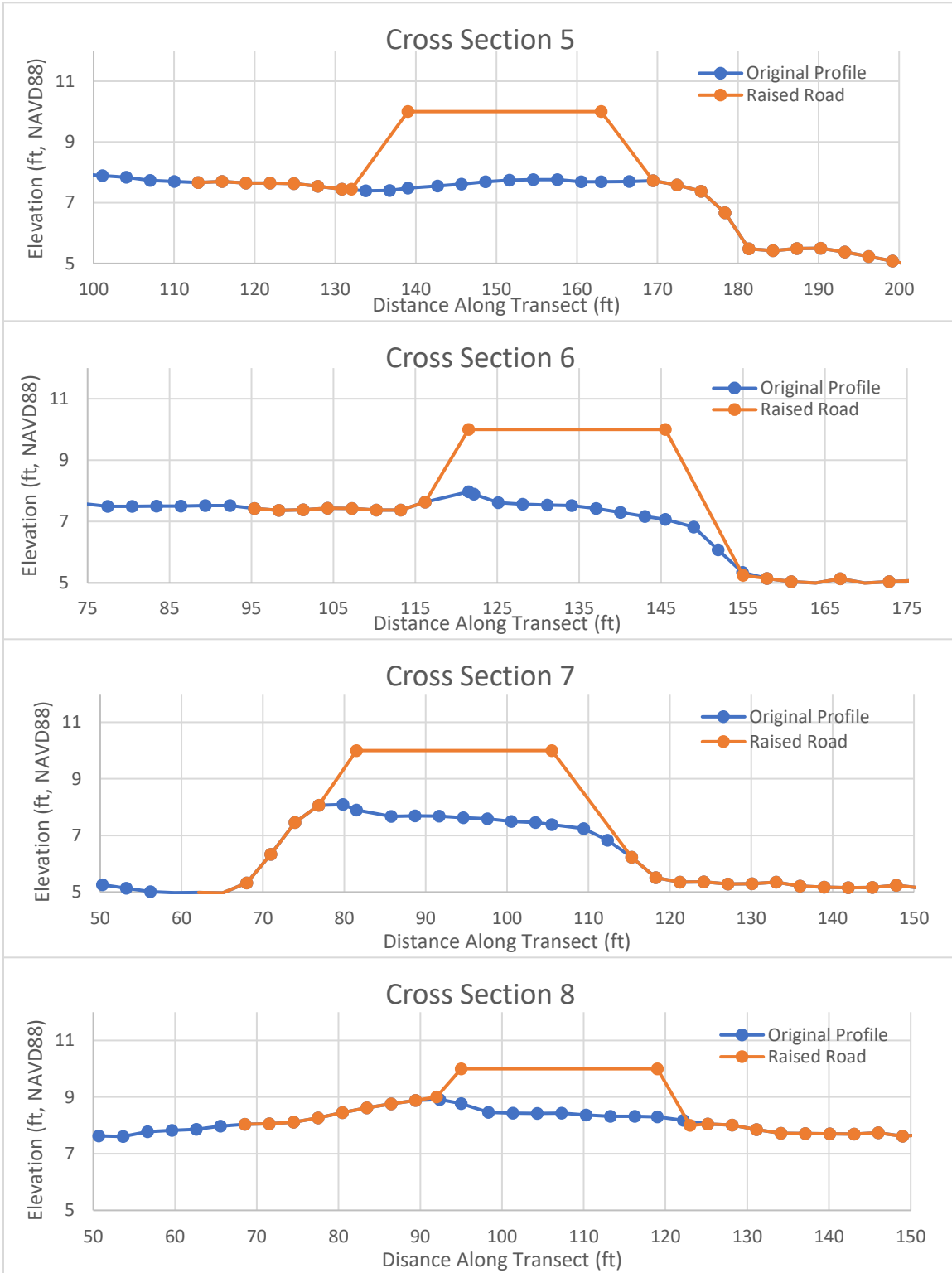
Marshal Street Bridge		
	Length	cost
Cross Section 1	170	\$37,926.46
prefabricated bridge **	250	\$6,500,000.00
Bridge Construction	250	\$450,000.00
sum of cross sections	670	\$6,987,926.46
Contingency	25%	\$ 1,746,982
Total Cost		\$ 8,734,908

** Bridge Price is based on \$ 26,000 per linear foot of roadway.



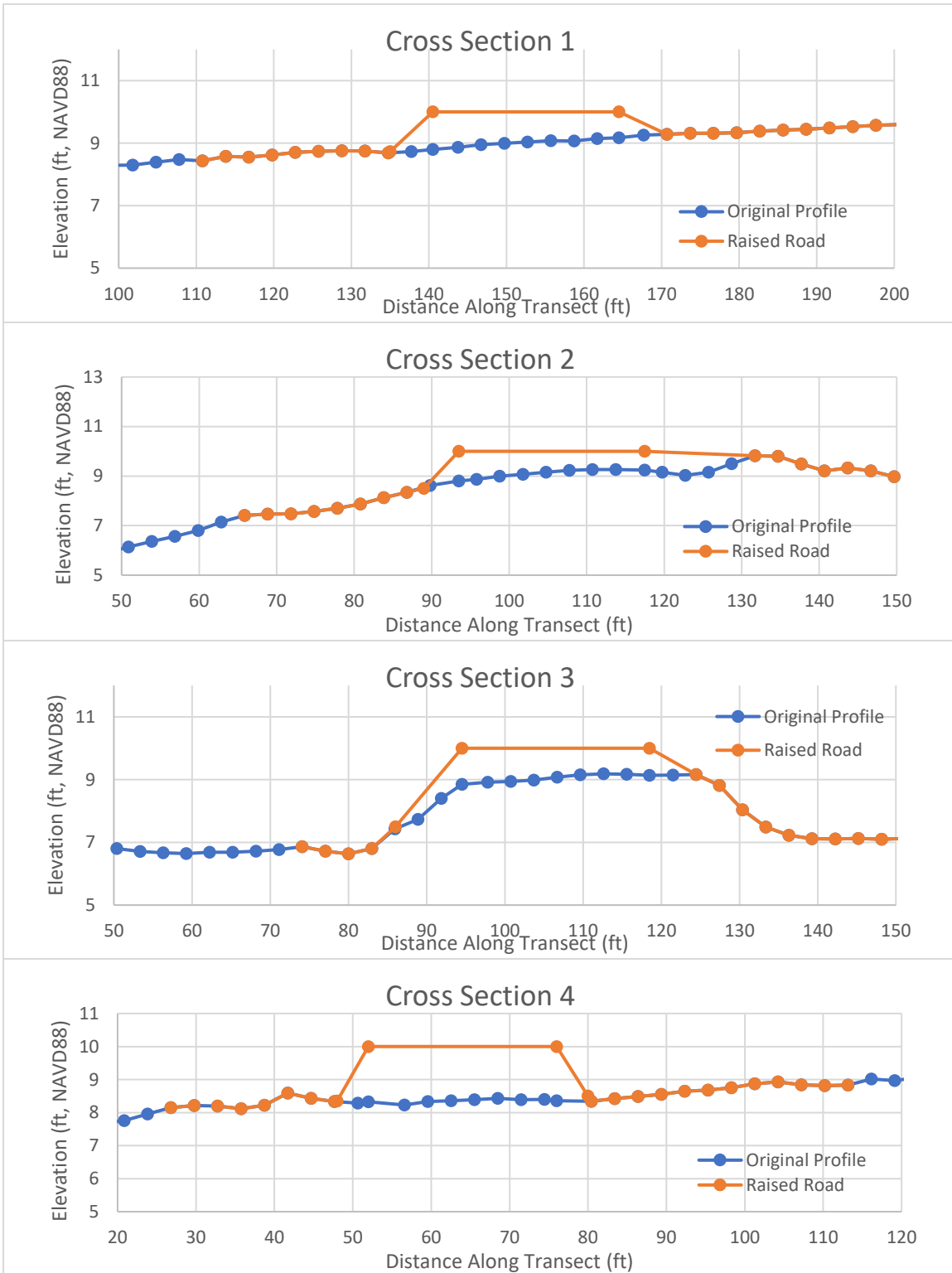
Appendix A – Powder Point Road Cross Sections

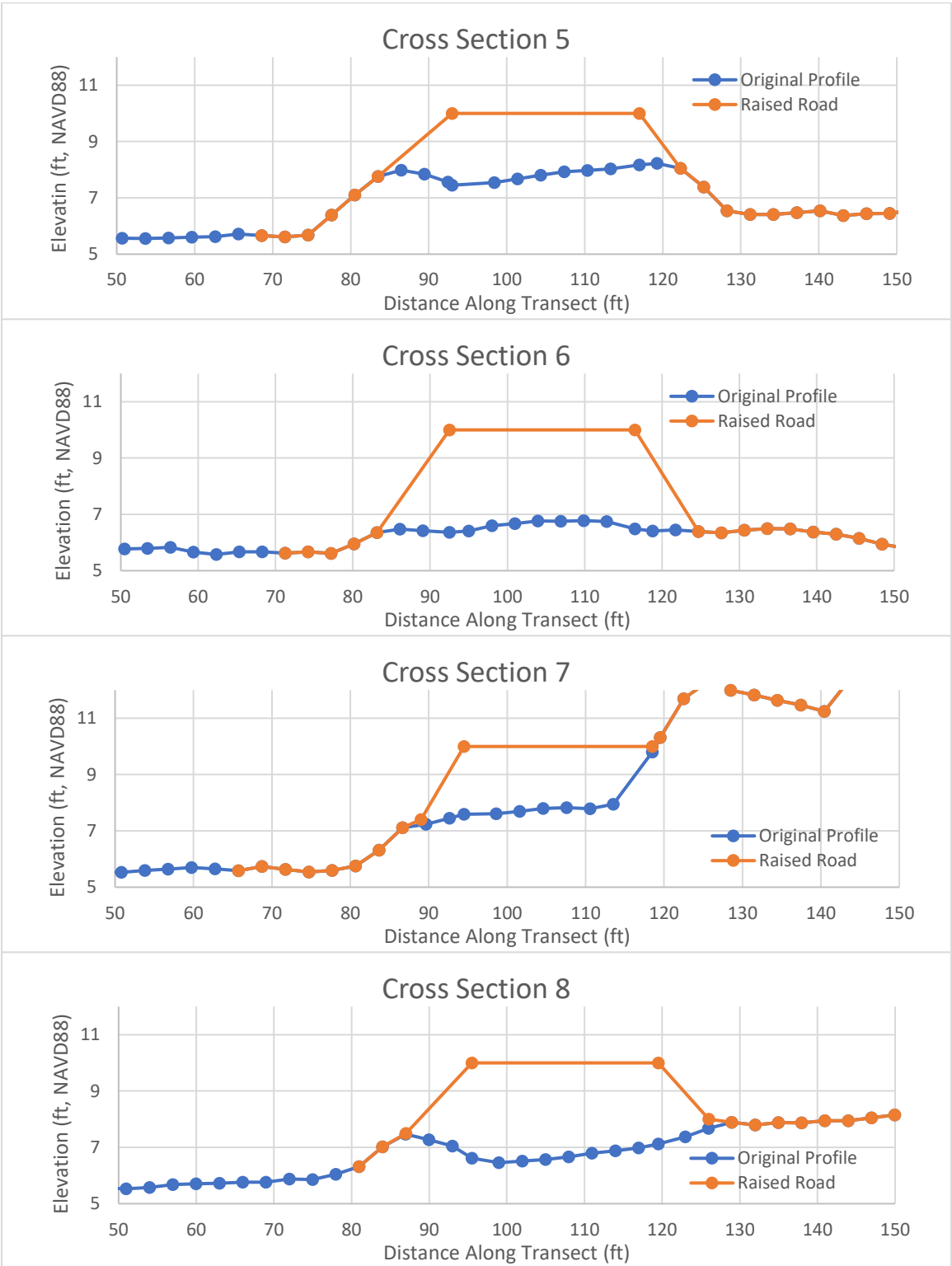


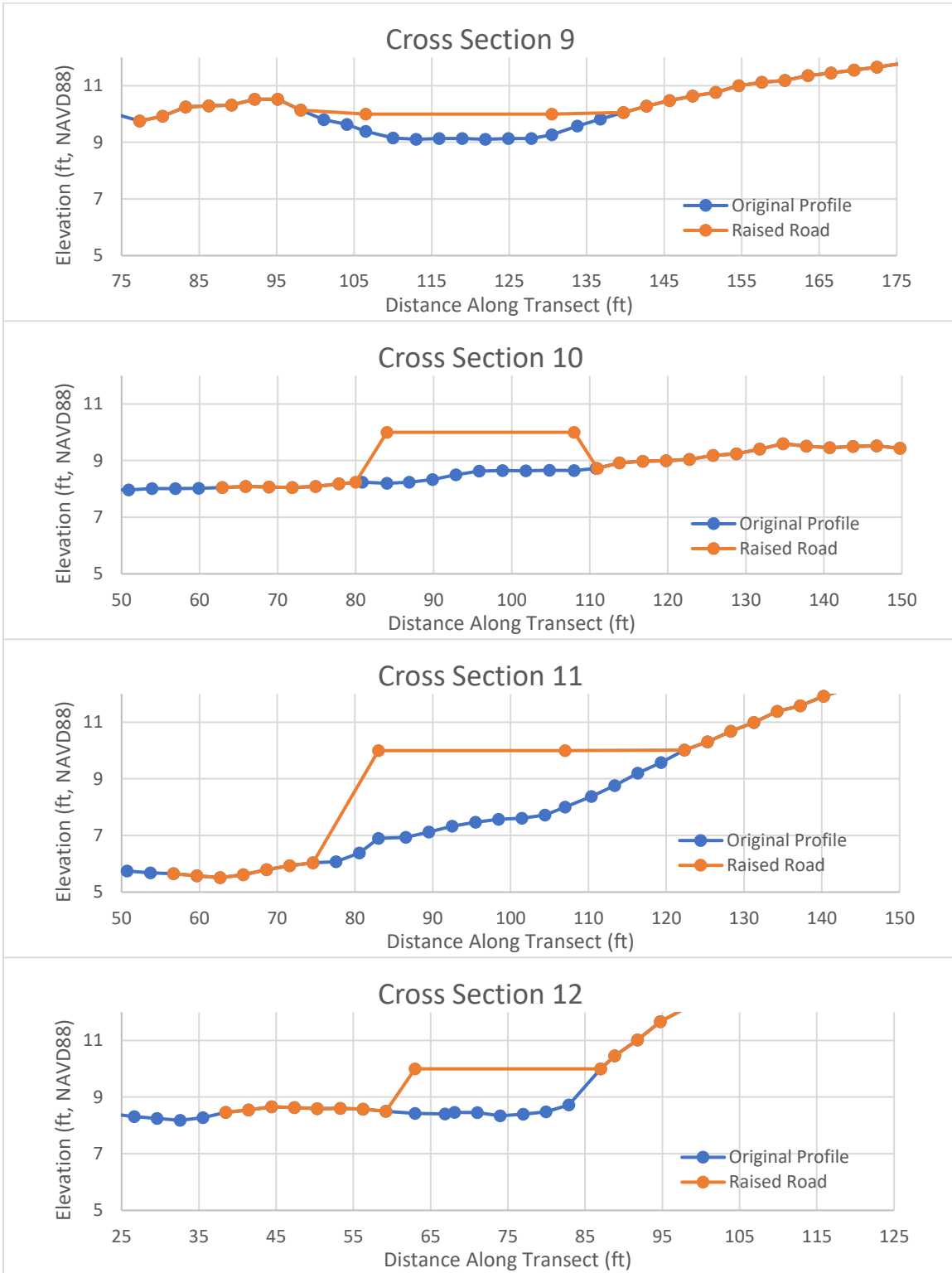




Appendix B – Gurnet Road Cross Sections

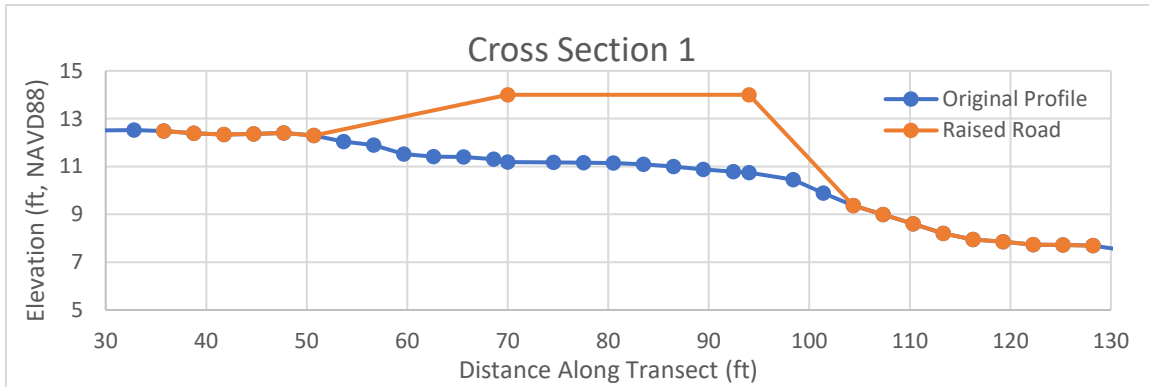








Appendix C – Marshal Street Bridge Cross Section





APPENDIX F – RECOMMENDED EDITS (REDLINE) TO MUNICIPAL BYLAWS AND REGULATIONS



F-1 Zoning Bylaws

ZONING BYLAWS

RED LINES BY WOODS HOLE GROUP
FOR THE DUXBURY CLIMATE CHANGE VULNERABILITY ASSESSMENT AND ADAPTATION PLAN



**Town of Duxbury
Massachusetts**

**AMENDED THROUGH
March ATM 2019**

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PROTECTIVE BYLAW OF THE TOWN OF DUXBURY

ARTICLE 100 – GENERAL

101 TITLE

This Bylaw shall be known and may be cited as the Protective Bylaw of the Town of Duxbury, Massachusetts and is referred to herein as "this Bylaw."

102 AUTHORITY

This Bylaw is adopted in accordance with and pursuant to the authority granted to the Town of Duxbury by General Laws, Chapter 40A as amended by Chapter 808 of the Acts of Massachusetts Legislature of 1975 as amended.

103 ESTABLISHMENT OF PRIOR RIGHTS

The provisions of this Bylaw shall not affect any one, any contract executed or liability incurred prior to its effective date, or any suit or prosecution pending or to be instituted to enforce any right, rule, regulation or Bylaw or to punish any offense under any prior Bylaw which may be modified or repealed by this Bylaw. All plans and permits legally approved and all applications and actions legally taken under the provisions of prior Zoning Bylaws and prior to the effective date of this Bylaw shall not be voided hereby and shall remain in full force and effect.

104 PURPOSE

This Bylaw is for the purpose of protecting the health, safety, convenience and general welfare of all inhabitants of the Town; to lessen the danger from fire, present and future flood hazards, congestion and confusion; to control the impact future land development will have on the quantity and quality of the drinking water resources of the Town; to encourage housing for persons of all income levels; to encourage the most appropriate use of land throughout the Town; to further the goals of the 1969 Comprehensive Plan, the 1973 Comprehensive Statement, the 1999 Comprehensive Plan, the 2019 Master Plan; and the Town Open Space Plan; and to improve and beautify the Town under and pursuant to the provisions of the Constitution and the General Laws. This Bylaw is further intended to reconcile man's basic need and desire for adequate shelter and support facilities associated with contemporary living with the preservation of natural resources and historic and natural features. It is also the purpose of this Bylaw to utilize, to the maximum extent possible, the powers granted to the Town so as to:

104.1 Protect the Town's significant environmental and historic features such as: salt marshes, wetlands, brooks, ponds, water resources, municipal facilities, historic areas, natural features, and to provide within this Bylaw methods to minimize the impact of developments;

104.2 Apply standards to measure and evaluate the capability of individual sites to support proposed developments;

104.3 Adopt standards to measure, evaluate and control the impact which future land development will have on the Town's natural resources, municipal facilities, historic areas, natural features, and to provide within this Bylaw methods to minimize the impact of developments;

104.4 Develop rational land development alternatives through an equitable and prescribed negotiation process to establish a balanced land use pattern responsive to individual site service capacities, planning standards and adjustable densities of land use and to provide reasonable community improvements consistent with the needs of the development of each site;

104.5 Establish within this Bylaw techniques to allow the Town to measure and evaluate economic impacts of future development on the Town's financial structure and to provide within this Bylaw methods to minimize adverse impacts by introducing varied land uses;

104.6 Further the conservation objectives of the Town as stated in the Comprehensive Statement and Plans;

104.7 Adopt regulations pursuant to these purposes that may include, but are not limited to, restricting, prohibiting, permitting or regulating the use, construction, alteration, height, area and location of buildings and structures and the use of land and premises in the Town.

ARTICLE 200 – ESTABLISHMENT OF DISTRICTS

201 CLASSES OF DISTRICTS

For the purpose of this Bylaw, the Town is hereby divided into the following classes of districts to be known as:

FHAOD	Flood Hazard Areas Overlay District
DP	Dunes Protection District
WP	Wetlands Protection Overlay District *
POL	Publicly-Owned Land Overlay District
APOD	Aquifer Protection Overlay District
RC	Residential Compatibility District
NB-L	Neighborhood Business Light District
NB-1	Neighborhood Business District 1
NB-2	Neighborhood Business District 2
PD-1	Planned Development District 1
PD-2	Planned Development District 2
PD-3	Planned Development District 3
WSA	Waterfront Scenic Overlay District
GMSP	Ground-Mounted Solar Photovoltaic Installations Overlay District
MOD	<i>Medical Marijuana Overlay District¹</i>

*The Wetlands Protection Overlay District as referred to in this Bylaw is the district identified on the "Wetlands and Watershed Protection District Map dated March 4, 1971."

202 LOCATION OF DISTRICTS

202.1 Zoning Map

Said districts are located and bounded as delineated on the "Town of Duxbury, Massachusetts Zoning Map" dated March 2009 as created by Greatwall GIS Services consisting of seven (7) sheets in total as revised and amended to date and on file in the office of the Town Clerk including the Wetland and Watershed Protection District Map dated March 4, 1971, as revised and amended to date and on file in the office of Town Clerk, and an Aquifer Protection District Map, dated January 15, 1986, as revised and amended March 24, 1993 and December 4, 2002 on file in the office of Town Clerk, and the Plymouth County Flood Insurance Rate Map dated November 4, 2016, and the

¹ This District was added at 2019 Annual Town Meeting Article 12, but was inadvertently omitted from Sections 201 and 202 – this will be corrected in 2020 town meeting as a Scrivener's error.

Ground-Mounted Solar Photovoltaic Installations Overlay District Map dated March 11, 2017, and on file in the office of the Town Clerk. The zoning map with boundaries of the districts and all explanatory matter thereon is hereby made a part of this Bylaw. Any conflict between the map and the description of any district in the written terms of this Bylaw shall be resolved according to the written terms.

202.2 District Boundary Line Descriptions

1. Where a district boundary line is shown as following a street, railroad or utility, the boundary shall be the centerline thereof as said line existed at the date of the zoning map unless otherwise indicated.
2. Where a boundary line is shown outside of a street, railroad or utility and approximately parallel thereto, the boundary shall be deemed parallel to the nearest line thereof, and the figure placed on the zoning map between the boundary and shall be the distance in feet between them, as measured at a right angle from such line unless otherwise indicated.
3. Where a boundary line is shown as following a watercourse, the boundary line shall coincide with the centerline thereof as said line existed at the date of the zoning map.
4. Where a boundary line shall include a numerical figure followed by the letter M.S.L., it is at that number of feet above Mean Sea Level. The basic source for determining such a line shall be the United States Geological Survey as interpreted by the Board of Selectmen or subsequent field surveys. *[Note that floodplain maps, digital LiDAR elevation maps, and many engineering and architectural drawings produced today reference a vertical datum in feet above North American Vertical Datum of 1988 (NAVD88). To avoid confusion, misinterpretation, and conversion errors between multiple datum, we suggest this reference and associated maps referenced herein be consistently referenced to NAVD88.]*
5. Where a boundary line is indicated as a property or lot line and the exact position of such line is not defined by measurements, the true location thereof shall be taken as the boundary line as said line existed at the date of the establishment of such boundary line.
6. Where the location of a boundary line is otherwise uncertain, the Zoning Enforcement Officer shall determine its position in accordance with the distance in feet from other lines or bounds as given or as measured on the zoning map and good engineering practice.
7. Where a boundary line other than a Wetlands Protection Overlay District boundary line divides a lot, a use permitted as a matter of right or by special permit in the less restricted district may be extended not more than thirty feet into the more

restricted portion of the lot.

8. All land within one hundred *[align with Wetlands Regulation buffer zone width]* feet, measured horizontally, of the high water line of all waterbodies, the estimated future mean high tide line accounting for long-term sea level rise, and the banks of all watercourses is within the Wetlands Protection District, unless specifically excluded. Where contours are used on the Wetlands and Watershed Protection Map as the boundaries of the district, their location on the ground shall be determined by their elevation based on the datum irrespective of their delineated location on the zoning map. *[This map should be updated to reference elevations in NAVD88]*

9. Boundaries of the Flood Hazard Areas Overlay District are shown and set forth in the Plymouth County Flood Insurance Rate Map (FIRM) and the Best Available Future Coastal Flood Hazard Areas Map, on file in the Office of Town Clerk and in the Planning Board Office. *[These maps reference elevations in NAVD88]*

10. Boundaries of the Waterfront Scenic Area Overlay District are shown on a map entitled "Waterfront Scenic View Resource Areas" dated 2004 prepared by the Urban Harbors Institute and on file in the Office of Town Clerk and Planning Board Office.

11. Boundaries of the Ground-Mounted Solar Photovoltaic Installations Overlay District Map on file in the Office of Town Clerk and in the Planning Board Office.

12. Neighborhood Business Light District may only be located where the district is adjoining an existing NB-1 or NB-2 District through a common district boundary line.

ARTICLE 300 – DEFINITIONS

301 GENERAL

In this Bylaw, the following terms shall have the following meanings unless a contrary meaning is required by the context or is specifically prescribed. Words used in the singular include the plural and words used in the plural include the singular. Words used in the present tense include the future.

302 DEFINITIONS

Accessory Building

A building devoted exclusively to an accessory use as herein defined.

Accessory Structure

A structure, such as, but not limited to, a detached garage, shed, swimming pool, tennis court, pier, greenhouse, or a structure with finished living space that is not a "dwelling unit," located on the same lot with and accommodating a use accessory to the principal structure or use of the lot, except a pier may be located on a lot adjacent to the principal structure.

Accessory Use

An activity customarily incidental to and located on the same lot as a principal use conducted by the same person or his agent. No use (other than parking) shall be considered "accessory" unless functionally dependent on and occupying less land area than the principal use to which it is related. (1987)

Applicant

The person submitting any application under the provisions of this Bylaw including a firm, association, organization, partnership, trust, company or corporation as well as an individual.

Bed and Breakfast

A structure originally built as a dwelling, in which the operator resides, and not more than four guest units are offered for overnight lodging with or without meals. (1987)

Board of Appeals

The Board of Appeals of the Town of Duxbury.

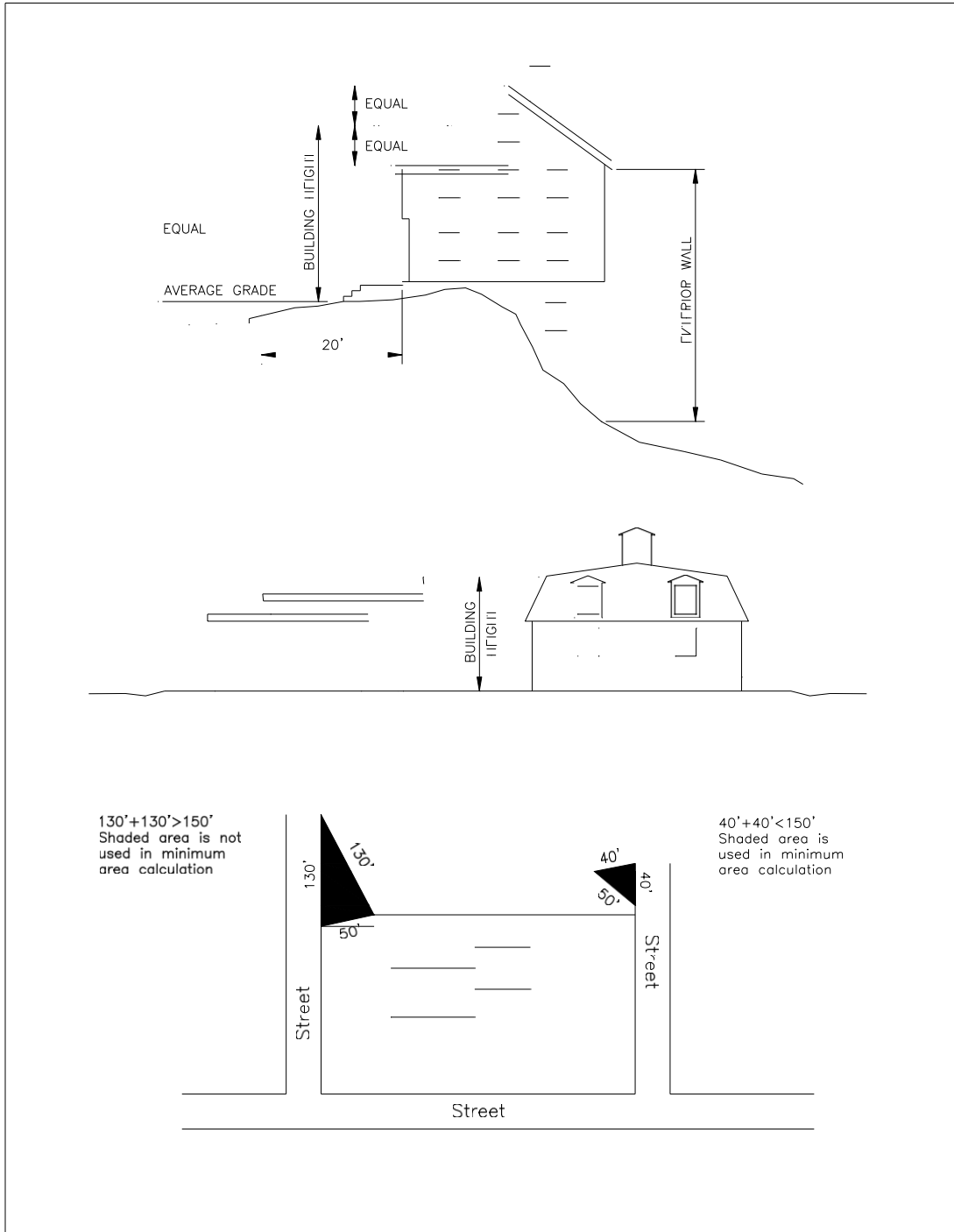
Building

A structure having a roof covering one hundred (100) square feet or more.

Building Height

Except for new construction or substantial improvements within the Flood Hazard Area Overlay District, the vertical distance from the average finished grade within twenty (20) feet of the structure on the street (frontage) side of a building to:

1. the highest point of the roof or parapet for flat or shed roofs, or
2. the midpoint between the lowest and highest points of the roof for gable, hip and gambrel roofs, or
3. the deck line for mansard roofs (with upper slope under four [4] inches per foot), and provided that at no point shall an exterior wall exceed the permitted heights by more than twelve (12) feet. **See Drawing in Section 300.**



Coverage

- 1. Building:** The maximum percentage of a lot in any district which is covered by buildings which constitute principal and accessory uses thereof. Garages, barns, storage sheds or additions and alterations to the principal residential building occupying the lot shall not be exempt from the definition of building coverage.

2. Site: The percentage of a lot in any district which is covered by impervious structures, including the principal building and accessory structures on the lot. For the purposes of this section, such impervious structures shall include, and not be limited to, paved driveways and parking areas, sidewalks constructed of impervious materials, principal and accessory structures and other on-site amenities that render any portion of a lot impervious.

Developer

The person, persons, corporation, trust, firm, or partnership or other legal entity who shall be responsible for the development of land and/or structures or is charged with the execution of a planned development.

Dwelling

A building, or portion thereof, designed exclusively for residential occupancy, including single-family, two-family, and multiple family dwellings, but not including hotels, motels, boarding houses, trailers, or structures solely for the use of transient or overnight occupants.

Dwelling Unit

A building or a portion of a building providing living quarters for a single-family having a single set of kitchen facilities (a stove plus either or both a refrigerator and sink) not shared with any other unit; or quarters for up to six persons in a lodging house, dormitory, congregate housing, or similar group dwelling. (1987)

Family

1. One (1) or more persons related by blood or marriage and including not more than four (4) additional unrelated persons, or
2. Not more than five (5) unrelated persons, occupying a dwelling unit and living as a single housekeeping unit.

Farm

Any tract of land used for the production of crops or the rearing of animals or livestock.

Findings

A written report of a decision reached by a reviewing agency as required by this Bylaw.

Float

A temporary floating structure attached to mooring gear or piles.

Frontage

The boundary of a lot coinciding with a street line if there are both rights of access and potential vehicular access across that boundary to a potential building site and the street has been determined by the Planning Board to provide adequate access to the premises under the provisions of the Subdivision Control Law and Duxbury Subdivision Regulations measured continuously along one street line between side lot lines or in the case of corner lots, between one side lot line and the midpoint of the corner.

Gangway

A structure attached at one end to a pier or other permanent object and the other end resting on a float.

Guest Unit

A room or suite of rooms suitable for separate rental or occupancy in a hotel, motel, or similar establishment. Any room or suite of rooms containing a stove plus either or both a refrigerator and a kitchen sink shall be considered a dwelling unit (1987).

Home Occupation

The use of portion of a dwelling as a principal location for the practice of their occupation by a person (such as an architect, counselor, consultant, dentist, doctor, engineer, insurance broker, investment counselor, lawyer or real estate broker) who is a resident therein.

Home Owners' or Residents' Association

A legal organization approved by this Bylaw composed of all resident owners in a Residential Conservation Cluster responsible for owning or maintaining common property, providing for compulsory membership for each resident, equitable voting rights and effective participation opportunities.

Impervious Coverage

Referring to the condition in which portions of a lot are rendered impervious by structures which cover previously natural or undeveloped land area, therefore, potentially altering natural drainage and ground water recharge characteristics.

Improvement Schedule

A program extending over the period of a proposed development during which certain improvements agreed upon by the developer or required by the Board of Appeals or any other special permit granting authority are to be installed by the developer.

Informal Hearing

Any scheduled meeting not advertised as a public hearing of the reviewing body at which time the applicant may submit material.

Interested Party

Any person who holds an interest in property within three hundred feet of a lot with respect to which a special permit or variance is sought, or who is entitled to receive notice of hearings under G.L. c. 40A.

Land Improvements

An improvement involving the allocation of certain lands and/or buildings for utilization by the public.

Lot

A parcel of land used or set aside and available for use as the site of one or more buildings and structures accessory thereto or for any other definite purpose, in one ownership and not divided by a street, not including any land within the

limits of a public or private way upon which such lot abuts, even if the fee to such way is in the owner of the lot.

Lot Area

The horizontal and contiguous area of the lot exclusive of any area in a public or private way open to public uses. Land under any waterbody, bog, swamp, wet meadow or marsh, as defined in G. L. c. 131 sec. 40, and as determined by the Conservation Commission, and/or land within the Wetlands Protection Overlay District, and/or land within any overhead easement, the purpose for which is the transmission of high voltage electricity, shall not be included in the horizontal and contiguous portion of the lot area required for zoning compliance. If the distance between any two (2) points on lot lines is less than fifty (50) feet, measured in a straight line, the smaller portion of the lot, as divided by that line, shall not be included in lot area nor shall any portion of its perimeter be counted toward meeting the frontage requirements unless the two points are separated by less than one hundred fifty (150) feet measured along the line. **See drawing Section 300.**

New Pier

A pier constructed on a lot where no pier currently exists or where a pre-existing pier is being replaced or reconstructed.

Pier

An elevated structure built over a wetland resource area to provide access from an upland land area to Duxbury Bay and its tributaries.

Planning Board

The Planning Board of the Town of Duxbury.

Pre-Existing Pier

An existing pier that at the time of application is structurally sound and functional to provide access to the water or was structurally sound and provided access to the water within two (2) years prior to the date of application to the Conservation Commission for reconstruction.

Projections

Cornices, eaves, gutters, outside chimneys, belted courses, steps, stoops, bay windows, terraces, and bulkheads.

Public Donation

A technique of preserving common open space by its donation either by a perpetual conservation or preservation restriction or in fee to the Town for conservation purposes or to a public agency or private charitable organization whose purposes include the acquisition and holding of land for open space purposes.

Research and Development

Administrative research, development, and testing facilities that do not involve the manufacture, fabrication, processing, or sale of products. Such uses shall not

violate any odor, dust, smoke, gas, noise, radiation, or similar pollution standards.

Setback

The distance from a property line to a building or other structure.

Shared Pier

A pier which is owned by two or more individuals or organizations that own contiguous waterfront property.

Sign

Any word, letter, symbol, drawing, picture, design, device, article or object which advertises, calls attention to or indicates the location of any premises, person or activity whatever its manner of composition or construction and however displayed.

Story

That part of a building above the basement or cellar and between the top of any tier of floor beams and the top of the tier of floor or roof beams next above.

Street

1. Feeder

A way which, in addition to providing access to abutting properties, intercepts local streets to provide a route serving fifty or more dwelling units, to give access to community facilities and/or other collectors and major streets.

2. Local

A way designated to be used primarily to provide access to abutting properties.

Structure

A combination of material assembled at a fixed location to give support or shelter, such as a building, tower framework, platform, or the like.

1. Accessory Structure

A structure, such as a detached garage, shed, swimming pool, tennis court, pier, or greenhouse, located on the same lot with and accommodating a use accessory to the principal structure or use of the lot, or a pier located on an adjacent lot to the principal structure.

2. Principal Structure

A structure in which the primary use of the lot is conducted; including porches, decks, utility building, and any other attached projections of the structure.

Town

The Town of Duxbury.

Town Landings

Designated areas to which the town has a right, which have been surveyed and recorded with the Plymouth County Registry of Deeds to the low water mark and including, in north to south orientation along the shoreline, Old Cove Landing, Drew Salt Works Landing, Simeon Soule's Landing, Peterson's Landing, Powder Point Bridge (at the west end on both north and south sides), Anchorage Lane Landing, Bluefish River Landing, Mattakeset Town Pier, Winsor Street Landing,

Water Street Landing, Josselyn Landing, Harden Hill Road Landing, Howland's Landing, Landing Road Landing, and Hicks Point Road Landing.

Use Restriction

A qualification placed upon any or all parts of a site which shall define the uses permitted on the land.

Waterfront Scenic Area Overlay District (WSA):

A WSA is the abutting waterfront land viewed from a public road, along which there is an open, unobstructed view of the ocean, harbor, bay or estuary. The WSA boundaries are as illustrated on a plan approved by a town meeting vote and are delineated by a line extending from a public road ROW centerline 300 feet seaward, starting at the first affected parcel and continuing to the final parcel. A WSA is defined for the purposes of new pier construction and repairs.

Way

Any public way or private way shown in a plan approved under the provisions of the Subdivision Control Law or any way in existence when the provisions of said Subdivision Control Law became effective in the Town, having, in the opinion of the Planning Board, suitable width, suitable grades, and adequate construction to provide for the needs of vehicular traffic in relation to the proposed use of land abutting thereon or served thereby and for the installation of municipal services to serve such land and the buildings erected or to be erected thereon.

Ways to the Water

Designated areas to which the Town has rights as public ways to the water, by gift or otherwise, which may or not be restricted as to their usage and which have not been specifically laid out and surveyed to the low water mark and recorded as Town Landings and including, in north to south orientation along the shoreline, Shipyard Lane Beach, Elder Brewster Road, Samoset Road, Sagamore Road, Massasoit Road, Miles Standish Home Site, Longview Road, Elderberry Lane, and Bay Farm.

ARTICLE 400 - USE, INTENSITY, DIMENSIONAL AND COVERAGE REGULATIONS FOR ALL DISTRICTS

401 BASIC REQUIREMENTS FOR ALL DISTRICTS

401.1 Prohibited Uses

In any district, no use will be permitted which will produce a nuisance or hazard from fire or explosion, flood, toxic or corrosive fumes, gas, smoke, odors, obnoxious dust or vapor, harmful radioactivity, offensive noise or vibration, flashes, objectionable effluent, or electrical interference which may affect or impair the normal use and peaceful enjoyment of any property, structure or dwelling in the Town. Parks for trailers, travel trailers, tent trailers, trailer coaches and motor homes; auto dismantling, junkyards, privately developed and operated septage waste disposal/treatment facilities and refuse disposal facilities are expressly prohibited.

The provisions of this Bylaw shall not apply to lands in excess of five (5) acres actively devoted to agriculture, horticulture, floriculture or viticulture, nor to use of pesticides when used on such lands in accordance with G. L. c. 132b.

401.2 Nonconforming Uses

Any lawful building or structure, or lawful use of a building, structure, or part thereof, existing at the time of adoption of this Bylaw, or existing at the time of an amendment to this Bylaw, which does not conform to the regulations thereof may be continued as a nonconforming use, subject to the following provisions. For the purpose of this 401.2, a use or structure shall not be deemed to not conform to such regulations simply because the lot on which the use or structure exists itself does not conform.

1. Discontinuance

Any nonconforming use which has been discontinued for more than two (2) years or any nonconforming buildings, structures, or land used primarily for agriculture, floriculture or horticulture which has been discontinued for more than five (5) years, shall not be re-established and any future use shall conform to the regulations of this Bylaw.

2. Restoration

A nonconforming structure or structure occupied by a nonconforming use which has been destroyed by fire or other casualty, except coastal or riverine flooding, may be reconstructed; provided that the reconstruction is substantially completed within three (3) years of the date of destruction. A nonconforming structure or structure occupied by a nonconforming use which has been destroyed by coastal or riverine

flooding may be reconstructed only if such reconstruction complies with the requirements of the Flood Hazard Area Overlay District; provided that the reconstruction is substantially completed within three (3) years [*alternatively, a shorter time frame could be selected*] of the date of destruction. Reconstruction of nonconforming structures on land used primarily for agriculture, horticulture or floriculture must be substantially completed within five (5) years of the date of destruction. Any extensions or alterations shall comply with the requirements of Sections 401.2.3 and 401.2.4, as applicable.

3. Changes of Use and Limitation on Intensity and Size of Use - Other Than Single or Two-Family Residential Dwellings:

As provided in G. L. c. 40A, sec. 6, a lawfully pre-existing nonconforming use and/or structure, other than a single or two-family residential dwelling, may be reconstructed, altered or extended only if: (1) said reconstruction, alteration or extension itself conforms with all the provisions of the Zoning Bylaw; (2) there is a finding by the Board of Appeals that such reconstruction, alteration or extension will not be substantially more detrimental to the neighborhood than the existing nonconforming structure or use; (3) that said extension, alteration or change is in accordance with the standards noted below; and (4) that the Board of Appeals grants a special permit as provided in Section 906.2.

a) Guidelines for Review of Extensions, Alterations or Changes to Preexisting, Nonconforming Uses and Structures: Recognizing the need to provide guidelines for determining relative impacts upon the Town and the immediate neighborhood from an expansion, alteration or change of pre-existing nonconforming uses and structures, and recognizing the basis and consistent principles of zoning with respect to minimizing nonconforming uses and structures, the following shall apply to the review of special permit applications under this Section:

(i) The Board of Appeals shall encourage extensions, alterations or changes to nonconforming structures and uses toward greater, if not complete, conformance with the provisions of the Zoning Bylaw and to reduce the degree of nonconformity;

(ii) The Board of Appeals shall not encourage the expansion of a nonconforming structure or use as measured by either the:

(aa) amount of floor space or land area used, or

(bb) volume of activity, including but not limited to an increase in the intensity of use and/or a change in the nature of purpose of the use;

(iii) The Board of Appeals shall prohibit the expansion of nonconforming structures and uses unless there will be no demonstrable adverse impacts on abutting properties and those properties that generally characterize the neighborhood or locus within which the expansion is sought, and;

(iv) The Board of Appeals shall not encourage the expansion of nonconforming structures and uses if the expansion will negatively impact the Town of Duxbury's ground, coastal or surface waterbodies.

(v) The Board of Appeals shall not encourage reconstruction, extension, or

alteration of nonconforming structures and uses within the Flood Hazard Area Overlay District that increase the area of prohibited uses below the Sea Level Rise Base Flood Elevation plus Freeboard, as defined in the Overlay District zoning.

b) Table of Presumptively Not More Detrimental Extensions, Alterations, or Changes to Preexisting, Nonconforming Uses and Structures: An extension, alteration or change to a lawfully preexisting nonconforming use or structure shall be presumed not to be substantially more detrimental to the neighborhood if the guidelines and standards of Section 401.2.3 (a) are met and if the extension, alteration or change also is in compliance with the following:

TABLE OF PRESUMPTIVELY NOT MORE DETRIMENTAL EXTENSIONS, ALTERATIONS, OR CHANGES TO OTHER THAN SINGLE OR TWO-FAMILY RESIDENTIAL DWELLINGS

Issue	Presumptively Allowable Changes, Alterations, or Extensions
If current site coverage requirements are exceeded.	The extension, alteration, or change decreases the percentage of site coverage.
If the structure exceeds current height requirements.	The extension, alteration, or change decreases the violation of the current height requirements.
If the structure or use exceeds current parking or loading area requirements.	The requirements of section 603 of the Zoning Bylaw are met or if the Board of Appeals determines that the existing use and proposed expansion or site conditions do not warrant the number of parking spaces required by Section 603.
If the structure or use exceeds, or is in violation of, or violates any other provision of the Zoning Bylaw.	The extension, alteration, or change meets the guidelines specified in Section 401.2.3 above.

4. Alteration, Reconstruction, Extension or Structural Changes to Preexisting Nonconforming Single and Two-Family Residential Structures.

a) As provided for in G. L. c. 40A sec. 6, a nonconforming single or two-family dwelling or structure accessory thereto may be altered, reconstructed, extended or otherwise structurally changed provided that: (1) the proposed alteration, extension or structural change itself conforms to the requirements of the present Bylaw and does not intensify any existing non-conformities or result in any

additional non-conformities in which event the Zoning Enforcement Officer may issue a building permit and an application to the Board of Appeals need not be made; or (2) as provided below the Board of Appeals finds that (i) there is no substantial increase in the nonconforming nature of **said structure; and (ii) such** reconstruction, alteration or extension will not be substantially more detrimental to the neighborhood than the existing nonconforming structure or use.

Recognizing the need to provide guidelines for determining the meaning of the phrases "increase the nonconforming nature of said structure" and "substantially more detrimental to the neighborhood," the following shall apply to the review of applications **subject to this provision** to alter, reconstruct extend or structurally change a preexisting nonconforming single- and two-family residential structure:

- (i) An application must be made to the Board of Appeals to expand or change the structure;
- (ii) The Board of Appeals must make a determination as to the particular respect or respects in which the existing structure or lot does not conform to the requirements of the present Bylaw;
- (iii) Should the Board of Appeals conclude that the proposed change would substantially increase the nonconforming nature of the structure or lot, the applicant will not be entitled to the issuance of a special permit;
- (iv) If the Board of Appeals determines, that the proposal will not substantially increase the nonconforming nature of the structure or the lot, the applicant will also be required to show that the change will not be substantially more detrimental than the existing nonconforming structure or use to the neighborhood;
- (v) If the Board of Appeals determines that the proposal will be more substantially detrimental to the neighborhood, the special permit sought will be denied unless the Board of Appeals determines that a special permit can be approved with conditions that would make the change substantially not more detrimental, in which case the Board of Appeals may approve a special permit with such conditions.
- (vi) For the purposes of this Section, determination of "substantially more detrimental to the neighborhood" shall include consideration of and impacts to, the general and immediate neighborhood from the resulting height, building coverage, impervious coverage, and width of the altered, reconstructed, extended or structurally changed structure. Additionally, a determination whether an altered, reconstructed, extended or structurally changed structure will be "substantially more detrimental to the neighborhood" shall include the resulting impacts to views and vistas from abutting properties and public and private ways, increase in traffic, noise, surface water runoff, flood-related safety and property damage risks, and related site planning issues.

5. Alteration to Dwellings on a Single Lot

Any alteration, extension, reconstruction or structural change to a dwelling on a lot containing more than one (1) dwelling shall require a special permit and a finding by the Board of Appeals that such alteration, extension, reconstruction or structural change shall not be more detrimental to the neighborhood than the existing dwelling, in accordance with the procedure outlined in Section 401.2.4 above.

401.3 Municipal Uses

Municipal uses shall be established by a two-thirds (2/3) vote of Town Meeting in accordance with the General Laws of the Commonwealth of Massachusetts. All buildings or structures for an approved municipal use shall meet all applicable dimensional, density, and design requirements of this Bylaw.

401.4 Permitted Uses

1. No building or other structure shall be erected and no building, structure, or land shall be used for any purpose or in any manner other than as regulated and as permitted and as set forth herein for each district.
2. Uses permitted and uses allowed by the Board of Appeals, or any other Special Permit Granting Authority (SPGA) authorized by this Bylaw, shall be in conformity with all the density and dimensional regulations and any other pertinent requirements of this Bylaw as set forth herein for each district.
3. A building, use or structure not specifically permitted shall be deemed prohibited.
4. Notwithstanding any other provision of this Bylaw, no more than one (1) single-family dwelling or dwelling unit is permitted by right on any lot in any district. Nothing in this sub-section implies that one (1) single-family dwelling or dwelling unit is permitted in any district where this Bylaw does not expressly so provide.

401.5 Building or Use Permit

No building or structure shall be used, constructed, relocated, added to or demolished without a building permit having been issued by the Zoning Enforcement Officer. No such permit shall be issued until such construction, alteration, or use, as proposed complies in all respects with the provisions of this Bylaw or with a decision rendered or special permit granted by the Board of Appeals or any other Special Permit Granting Authority (SPGA) authorized by this Bylaw.

401.6 Plot Plan Accompanying Application

1. Minimum Requirements

Any application for a building, structure or use permit or a certificate of occupancy shall be accompanied by a plot plan in triplicate, accurately drawn to a scale of one (1) inch equals forty (40) feet, showing the actual shape, area and dimensions of the lot to be built upon, the exact location and size of any buildings or structures already on the lot, the location of proposed alterations to and enlargements of existing buildings or

structures, driveways, the location of new buildings or structures to be constructed together with the lines within which all buildings or structures are to be erected or enlarged, the existing and intended use of each building or structure and all streets and ways on or adjacent to the lot, the delineation of any Wetland Protection Overlay District, Flood Hazard Areas Overlay District, or Aquifer Protection Overlay District areas located within a lot, or include a statement on the plan stating, "No part of lot is within zoned Wetlands Protection Overlay District, Flood Hazard Areas Overlay or Aquifer Protection Overlay Districts" and such other information as the Zoning Enforcement Officer may determine is necessary. In the case of a building or use permit for interior improvements to a building or structure, a plot plan shall not be required.

2. Additional Requirements

In addition, for all new buildings and structures, and all existing buildings and structures to be externally enlarged or expanded in ground area to an extent greater than thirty percent (30%) of internal floor areas or ground coverage, or six hundred (600) square feet, whichever is larger, plot plans shall show existing and approved abutting street grades, the proposed elevation of the top of the foundation of existing and proposed buildings or structures, existing and proposed topography, existing septic disposal systems, private wells, wetland boundary delineations as approved by the Conservation Commission, gas, water and other public utilities in the abutting street and the zoning classification of the abutting properties. Plot plans shall also show such other information as may be necessary to provide for the verification of compliance with the applicable provisions and the enforcement of this Bylaw, including, but not limited to, off street parking, screening and fencing. Plot plans shall be certified by a registered professional engineer or land surveyor. A record of all applications, plans, and permits shall be kept on file by the Zoning Enforcement Officer.

401.7 Lot Requirements for Nonresidential Uses

In a Residential Compatibility District and Planned Development Districts, all nonresidential uses permitted therein shall be located on lots not less than the minimum standards set forth for residential uses in the district in which the lot is located.

401.8

Exemptions for recorded lots are set forth in MGL, Chapter 40A, Section 6.

401.9 Lots in Two Towns

When a lot in one ownership is situated so that a part of it is in the Town and part is in an adjacent town, the provisions of this bylaw shall be applied to that portion of the lot which lies in the Town in the same manner as if the entire lot were situated therein; i.e., the entire area and frontage shall be considered in determining conformity to the dimensional requirements herein. The use of the portion of the lot in the Town shall conform to the provisions herein.

401.10 Reduction of Minimum Requirements

No lot, yard, court or other open space already having less than the minimum requirements in this Bylaw shall be further divided or reduced with respect to such minimum requirement and requirements.

402 FLOOD HAZARD AREAS OVERLAY DISTRICT

[Changes in blue are from Massachusetts 2020 Model Floodplain Bylaws]

402.1 Purpose of the Flood Hazard Areas Overlay District

The purposes of the Flood Hazard Areas Overlay District are to:

1. Ensure public safety through reducing the threats to life and personal injury;
2. Eliminate new hazards to emergency response officials;
3. Prevent the occurrence of public emergencies resulting from water quality, contamination, and pollution due to flooding;
4. Avoid the loss of utility services which if damaged by flooding would disrupt or shut down the utility network and impact regions of the Town beyond the site of flooding;
5. Eliminate costs associated with the response and cleanup of flooding conditions; and
6. Reduce damage to public and private property resulting from flooding waters.

402.2 Flood Hazard Areas Overlay District Boundaries

The Flood Hazard Areas Overlay District shall be considered an overlay district throughout the Town. It shall include all special flood hazard areas within the Town **designated as Zone A, AE, AH, AO, A99, V, or VE** on the Plymouth County Flood Insurance Rate Map (FIRM) dated July 17, 2012, and November 4, 2016, issued by the Federal Emergency Management Agency (FEMA) for the administration of the National Flood Insurance Program (NFIP). The exact boundaries of the District **shall** be defined by the **1% annual chance** base flood elevations shown on the FIRM and further defined by the **Plymouth County** Flood Insurance Study (FIS) report dated November 4, 2016. The FIRM and FIS report are incorporated herein by reference and are on file with the Town Clerk, and available for viewing in the Planning Department.

The Flood Hazard Areas Overlay District shall also include all areas within the Town located within the areas delineated on the Best Available Future Coastal Flood Hazard Areas Map developed using a model adopted by the Commonwealth and applicable to the Town, or otherwise adopted by the Town, for the purposes of incorporating adaptation and resilience to future coastal climate change impacts in planning and design. The exact boundaries of the District, beyond the boundaries of special flood hazard areas shown on the FIRM and further defined by the FIS, shall be defined by the Sea Level Rise Base Flood Elevations (SLR-BFEs) for the Target Year shown on the Best Available Future Coastal Flood Hazard Areas Map. The Best Available Future Coastal Flood Hazard Areas Map is incorporated herein by reference and is on file with the Town Clerk, and available for viewing in the Planning Department.

402.3 Abrogation and Greater Restriction

The floodplain management regulations found in this Flood Hazard Areas Overlay District section shall take precedence over any less restrictive conflicting local laws, ordinances, or codes.

402.4 Compliance with Other Law and Regulations

All development in the district, including structural and non-structural activities, whether permitted by right or by special permit, must comply with the following state statute and regulations, except that provisions of this Section that are more restrictive shall apply.

1. Massachusetts General Laws, Chapter 131, Section 40;
2. Sections of the Massachusetts State Building Code (780 CMR) which address structural and flood resistant design and construction standards in flood hazard areas, coastal high hazard areas, and coastal dunes;
3. Wetlands Protection Act Regulations, DEP (currently 310 CMR 10.00);
4. Adopting Coastal Wetland Orders, DEP (currently 310 CMR 12.00);
5. Adopting Inland Wetland Orders, DEP (currently 310 CMR 13.00); and
6. Minimum Requirements for the Subsurface Disposal of Sanitary Sewage, DEP (currently 310 CMR 15, Title 5).

Nothing in this Section shall be construed as modifying the requirements of the state statute and regulations listed herein.

Any variances from the provisions and requirements of the above referenced state regulations may only be granted in accordance with the required variance procedures of these state regulations.

402.5 Variances to Building Code Floodplain Standards

If an applicant seeks a variance to the flood-resistant standards as found in the State Building Code for development in the Flood Hazard Areas Overlay District, the Town will request from the State Building Code Appeals Board a written and/or audible copy of the portion of the hearing related to the variance, and will maintain this record in the Town's files.

If the State Building Code Appeals Board grants the applicant a variance, the Town shall also issue a letter to the property owner regarding potential impacts to the annual premiums for the flood insurance policy covering that property, in writing over the signature of a community official that (i) the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage and (ii) such construction below the base flood level increases risks to life and property.

Such notification shall be maintained with the record of all variance actions for the referenced development in the Flood Hazard Areas Overlay District.

402.6 Variances Related to Community Compliance with the National Flood Insurance Program (NFIP)

A variance from these floodplain bylaws must meet the requirements set out by State

law, and may only be granted if: 1) good and sufficient cause and exceptional non-financial hardship exist; 2) the variance will not result in additional threats to public safety, extraordinary public expense, or fraud or victimization of the public; and 3) the variance is the minimum action necessary to afford relief.

402.7 Disclaimer of Liability

The degree of flood protection required by this bylaw is considered reasonable but does not imply total flood protection.

402.8 Severability

If any section, provision or portion of this bylaw is deemed to be unconstitutional or invalid by a court, the remainder of the ordinance shall be effective.

402.9 Designation of Community Floodplain Administrator

The Town of Duxbury hereby designates the position of [enter position] to be the official floodplain administrator for the Town.

402.10 Requirement to Submit New Technical Data

If the Town acquires data that changes the base flood elevation in the FEMA mapped Special Flood Hazard Areas, the Town will, within 6 months, notify FEMA of these changes by submitting the technical or scientific data that supports the change(s.)

Notification shall be submitted to:

FEMA Region I Risk Analysis Branch Chief
99 High St., 6th floor, Boston, MA 02110

And copy of notification to:

Massachusetts NFIP State Coordinator
MA Dept. of Conservation & Recreation, 251 Causeway Street, Boston, MA 02114

402.11 Required Permits

[This is included in the model floodplain bylaw based on federal regulatory requirements of the NFIP, but its implications require further review as it may require modification to existing administration procedures]

The Town requires a permit for all proposed construction or other development in the Flood Hazard Areas Overlay District, including new construction or changes to existing

buildings, placement of manufactured homes, placement of agricultural facilities, fences, sheds, storage facilities or drilling, mining, paving and any other development that might increase flooding or adversely impact flood risks to other properties.

The Town's permit review process includes the use of a checklist of all local, state and federal permits that will be necessary in order to carry out the proposed development in the Flood Hazard Areas Overlay District. The proponent must acquire all necessary permits, and must submit the completed checklist demonstrating that all necessary permits have been acquired.

402.12 Base Flood Elevation and Floodway Data

1. Floodway Data. In Zone A and AE, along watercourses that have not had a regulatory floodway designated, the best available Federal, State, local, or other floodway data shall be used to prohibit encroachments in floodways which would result in any increase in flood levels within the Town during the occurrence of the base flood discharge.

2. Base Flood Elevation Data. Base flood elevation data is required for subdivision proposals or other developments greater than fifty (50) lots or five (5) acres, whichever is the lesser, within unnumbered A zones.

3. Unnumbered A Zones. In A Zones, in the absence of FEMA base flood elevation data and floodway data, the Building Commission will obtain, review and reasonably utilize base flood elevation and floodway data available from a Federal, State, or other source as criteria for requiring new construction, substantial improvements, or other development in Zone A as the basis for elevating residential structures to or above base flood level, for floodproofing or elevating nonresidential structures to or above base flood level, and for prohibiting encroachments in floodways.

402.13 Notification of Watercourse Alteration

In a riverine situation, the Building Commission shall notify the following of any alteration or relocation of a watercourse:

1. The Chief Executive Officer of adjacent Cities and Towns
2. NFIP State Coordinator
Massachusetts Department of Conservation and Recreation
Currently located at 251 Causeway Street, 8th floor
Boston, MA 02114-2104
3. NFIP Program Specialist
Federal Emergency Management Agency, Region I
Currently located at 99 High Street, 6th
Floor Boston, MA 02110.

402.14 Prohibited Uses and Structures

1. In Zone AE, along watercourses that have a regulatory floodway designated on the FIRM, encroachments are prohibited in the regulatory floodway which would result in any increase in flood levels within the community during the occurrence of the base flood discharge.
2. Man-made alteration of sand dunes which would increase potential flood damage is prohibited. *[Deleted Zone VE reference as it appears all sand dunes are in Zone VE and the model bylaw and federal regulations do not include the narrower reference to Zone VE]*
3. [In Zones AE, AO, and VE,] private or public wells are prohibited.
4. [In Zones AE, AO, and VE,] on site wastewater disposal septic tanks or leaching fields are prohibited.
5. New construction of Flood Design Class 3 and 4 buildings and structures and substantial improvements to existing Flood Design Class 3 and 4 buildings and structures are prohibited.
6. Use of areas below the SLR-BFE plus Freeboard for any purpose other than access, storage, or parking is prohibited within residential buildings and structures and residential portions of mixed-use buildings and structures. Areas used for building electrical and mechanical systems are not considered storage.
7. Buildings or structures except those permitted by Sections 402.19 and permitted by special permit by Sections 402.15.

402.15 Uses and Structures Permitted by Special Permit

Upon issuance of a special permit by the Board of Appeals, and subject to such special conditions and safeguards as the Board of Appeals may impose, the following uses and structures may be permitted:

1. Use of areas below the SLR-BFE plus Freeboard for any purpose other than access, storage, or parking within non-residential buildings and structures and non-residential portions of mixed-use building and structures. Areas used for building electrical and mechanical systems are not considered storage.
2. Structures providing access to the beach in accordance with applicable state or federal laws.
3. Accessory use or structure to a residential home located on that lot or an adjoining lot in common ownership, such as a footbridge, plank walk or pier.
4. Temporary storage of materials or equipment for a period of not to exceed three (3) months in any calendar year; said permit to be renewable for one additional three-month period only.
5. Dams, excavations, or changes in watercourses to create ponds, pools for swimming, fishing, wildlife or other recreational or agricultural uses, scenic features or for drainage improvements.
6. Fill and structures for coastal flood and erosion control to adapt to long-term sea level rise.
7. Accessory use to residential or commercial structure located on that lot, such as a boat landing and boathouse, the latter not to exceed twenty (20) feet in height or one hundred (100) square feet in the total ground coverage.

8. Utilities installation; unless said utility is a Solar Photovoltaic Facility as defined and regulated by Article 600, Section 621 of this Bylaw, in which case the Planning Board shall serve as the Special Permit Granting Authority and/or Administrative Site Plan Review board in reviewing the application consistent with Article 600, Section 621 and this Section 404.
9. New parking areas, roadways and enlargement of existing parking areas and roadways
10. Wireless Telecommunications Services Facility in accordance with Section 610.

402.16 Review by Special Permit Granting Authority

Prior to granting a special permit for development in the Flood Hazard Areas Overlay District, the Board of Appeals must make the following findings:

1. Any permitted structure or use is consistent with the purposes and standards of the Overlay and include measures to mitigate or adapt areas below the SLR-BFE plus Freeboard to future coastal flooding risks.
2. Any permitted structure or use will not have an adverse effect by increasing the elevation or velocity of flood waters, or by redirecting or increasing flows or causing channelization, in each case at the project site, adjacent or nearby properties, or any public or private way.
3. Any permitted structure or use will avoid or mitigate adverse flooding effects on nearby properties, by ensuring that return flow will not be prevented by confined basins on the site (i.e., ponding).

402.17 Special Permit Procedures

1. The Board of Appeals shall refer a special permit application to the Conservation Commission, the Board of Health, and the Planning Board for written comments and recommendations before taking final action on said special permit application. In addition to the above noted boards, the Board of Appeals may refer a special permit application to any other Town agency/board/department for comments and recommendations if it so desires before taking final action on said special permit application.

Any such board or agency to which applications are referred for comment shall make its written recommendations and comments and send copies thereof to the Board of Appeals and to the applicant within thirty-five (35) days of receipt of the referral request by said board or agency or there shall be deemed no opposition or desire to comment. The Board of Appeals shall not act upon said special permit until either comments from referred boards or agencies have been received or said thirty-five (35) days have elapsed, whichever is sooner.

2. The Board of Appeals shall explain any departures from the recommendations of the other boards or agencies in its decision.

402.18 Other Development Standards

1. Within Zone AO on the FIRM, adequate drainage paths must be provided around structures on slopes, to guide floodwaters around and away from proposed structures.
2. All subdivision proposals and development proposals must be designed to assure that:
 - a) Such proposals minimize flood damage;
 - b) All public utilities and facilities are located and constructed to minimize or eliminate flood damage; and
 - c) Adequate drainage is provided to reduce exposure to flood hazards.
3. Vehicular and pedestrian access to, over, and from the site shall be provided over ways having an elevation of at least the SLR-BFE, except that the standard established by this paragraph shall not apply where the proposed development activity consists of the substantial modification of an existing dwelling unit, and provided further that the Planning Board may waive or condition the application of this standard if the Board determines (1) that the non-compliant portion(s) of the proposed access route involves a way that existed on the effective date of the Bylaw, and (2) that the measures that would be required to raise the non-compliant portion(s) of such existing way to the required elevation, or to construct an alternative access route that would meet the standard would endanger human health and safety, have an adverse effect on the natural function of the floodplain, have a significant adverse impact on wetlands or conservation areas, or be substantially detrimental to the character of the neighborhood.

402.19 Permitted Uses

The following uses of low flood damage potential and causing no obstructions to flood flows are allowed, provided they are permitted in the underlying district and they do not require structures, fill, or storage of materials or equipment:

1. Agricultural uses such as farming, grazing, truck farming, and horticulture.
2. Forestry and nursery uses.
3. Outdoor recreational uses, including fishing, boating, and play areas.
4. Conservation of water, plants, and wildlife.
5. Wildlife management areas, and foot, bicycle, and/or horse paths.
6. Temporary non-residential structures used in connection with fishing, growing, harvesting, storage, or sale of crops raised on the premises.
7. Man-made alteration of sand dunes for dune restoration and beach enhancement projects for the purposes of flood and erosion control to adapt to the long-term effects of sea level rise.

402.20 Plot Plan Requirements

Any application for a building or use permit or a certificate of occupancy in the Flood Hazard Areas Overlay District shall be accompanied by a plot plan that includes the following information, in addition to the applicable requirements for plot plans set forth elsewhere in this Bylaw:

1. Existing site contours and elevations of existing structures;
2. Flood Design Class and associated Freeboard height of all new construction,

- reconstruction, modification, or enlargement of existing buildings and structures;
3. Base Flood Elevations of all special flood hazard areas delineated on the plan;
 4. Sea Level Rise Base Flood Elevations (SLR-BFE) of all future coastal flood hazard areas delineated on the plan;
 5. Proposed uses below the SLR-BFE plus Freeboard;
 6. Minimum elevation of the lowest floor;
 7. Minimum elevation of the bottom of lowest horizontal structural member, if in Zone VE;
 8. Minimum elevation below which flood damage-resistant materials are used;
 9. Minimum elevation of utilities and equipment;
 10. Minimum elevation of dry floodproofing of non-residential structures and non-residential portions of mixed-use buildings (not allowed in Zone VE); and
 11. Minimum elevation of wet floodproofing (not allowed in Zone VE), if permitted by 780 CMR.

402.21 Definitions

Base Flood means the flood having a one percent (1%) chance of being equaled or exceeded in any given year.

Base Flood Elevation means the elevation of the base flood, including wave height, relative to the North American Vertical Datum (NAVD) specified on the Flood Insurance Rate Map (FIRM). For AO and Unnumbered A zones, the base flood elevation shall be the elevation of the highest adjacent grade plus the depth specified on the FIRM or the elevation of the highest adjacent grade plus two (2) feet if no depth is specified.

Best Available Future Coastal Flood Hazard Areas Map means a map with estimated future coastal flood hazard area extents and Sea Level Rise Base Flood Elevations (SLR-BFEs) for the Target Year developed using a model adopted by the Commonwealth and applicable to the Town, or if the Commonwealth has not adopted an applicable model, then the Best Available Future Coastal Flood Hazard Areas Map shall be the map developed using a model adopted by the Planning Board. As the applicable model is modified from time to time, the Planning Board may adopt its modified map by Local Regulation, each time identifying the specific map, model and date of the model.

Building Height. For new construction or substantial improvement within the Overlay, building height shall be measured from the higher of (a) the average finished grade within twenty (20) feet of the structure on the street (frontage) side of a building, (b) the minimum elevation required for flood-resistant design and construction in 780 CMR including Freeboard, or (c) the Sea Level Rise Base Flood Elevation (SLR-BFE) shown on the Best Available Future Coastal Flood Hazard Areas Map plus Freeboard, to:

1. the highest point of the roof or parapet for flat or shed roofs, or
2. the midpoint between the lowest and highest points of the roof for

gable, hip and gambrel roofs, or

3. the deck line for mansard roofs (with upper slope under four [4] inches per foot), and provided that at no point shall an exterior wall exceed the permitted heights by more than twelve (12) feet.

Development means any man-made change to improved or unimproved real estate, including but not limited to building or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program. FEMA provides a nationwide flood hazard area mapping study program for communities as well as regulatory standards for development in the flood hazard areas.

Flood Design Class means, for the purposes of determining compliance with the provisions of the Overlay, a classification of buildings, structures, or portions thereof on the basis of risk associated with certain uses. The specific Flood Design Class to be applied for determining compliance shall be as specified in 780 CMR based on the proposed use or occupancy of the structure, building, or portions thereof.

Flood Insurance Rate Map (FIRM) means the official map of a community on which FEMA has delineated both the areas of special flood hazard and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) means an examination, evaluation, and determination of flood hazards, and, if appropriate, corresponding water surface elevations, or an examination, evaluation and determination of flood-related erosion hazards.

Floodway means the channel of a river, creek, or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Freeboard means, for the purposes of determining compliance with the provisions of the Overlay, additional height used as a factor of safety in setting the minimum elevation of a use to provide a higher level of protection for certain uses based on importance (Flood Design Class). The specific amount of Freeboard to be applied for the purposes of measuring building height and compliance with use regulations within the Overlay shall be the amount specified in 780 CMR based on the Flood Design Class of the proposed structure, building, or portions thereof.

Functionally Dependent Use means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related

manufacturing facilities.

Highest Adjacent Grade means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

Historic Structure means any structure that is:

(a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

(b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;

(c) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or

(d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:

(1) By an approved state program as determined by the Secretary of the Interior or

(2) Directly by the Secretary of the Interior in states without approved programs.

Lowest Floor means the lowest floor of the lowest enclosed area (including basement or cellar). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor, PROVIDED that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of NFIP Regulations 60.3.

New Construction means structures for which the start of construction commenced on or after the effective date of the first floodplain management code, regulation, ordinance, or standard adopted by the authority having jurisdiction, including any subsequent improvements to such structures. New construction includes work determined to be substantial improvement.

Recreational Vehicle means a vehicle which is:

(a) Built on a single chassis;

(b) 400 square feet or less when measured at the largest horizontal projection;

(c) Designed to be self-propelled or permanently towable by a light duty truck; and

(d) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

Regulatory Floodway - see Floodway.

Sea Level Rise Base Flood Elevation (SLR-BFE) means the water surface elevation, including wave height, resulting from any inundation caused by coastal storms up to and including that predicted to have a one-percent (1%) annual chance of being equaled or exceeded in the Target Year, as shown on the Best Available Future Coastal Flood Hazard Areas Map.

Special Flood Hazard Area means the land area subject to flood hazards and shown on a Flood Insurance Rate Map or other flood hazard map as Zones A, AO, AE and VE.

Start of Construction means the date of issuance for new construction and substantial improvements to existing structures, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement or other improvement is within 180 days after the date of issuance. The actual start of construction means the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of a slab or footings, installation of pilings or construction of columns.

Permanent construction does not include land preparation (such as clearing, excavation, grading or filling), the installation of streets or walkways, excavation for a basement, footings, piers or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main building. For a substantial improvement, the actual "start of construction" means the first alteration of any wall, ceiling, floor or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

Structure means, for floodplain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home. STRUCTURE, for insurance coverage purposes, means a walled and roofed building, other than a gas or liquid storage tank, which is principally above ground and affixed to a permanent site, as well as a manufactured home on foundation. For the latter purpose, the term includes a building while in the course of construction, alteration, or repair, but does not include building materials or supplies intended for use in such construction, alteration, or repair, unless such materials or supplies are within an enclosed building on the premises.

Substantial Damage means, for the purposes of determining compliance with the provisions of the Overlay, damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed twenty-five percent [*alternatively 35, 40, 45, or 49%*] of the market value of the structure before the damage occurred.

Substantial Improvement means, for the purposes of determining compliance with the provisions of the Overlay, any combination of repair, reconstruction,

rehabilitation, addition, or other improvement of a building or structure taking place during a ten-year *[alternatively, five-year, or one-year]* period, the cumulative cost of which equals or exceeds twenty-five percent *[alternatively 35, 40, 45, or 49%]* of the market value of the building or structure either (a) before the improvement or repair is started, or (b) if the structure has been damaged and is being restored, before the damage occurred. For each building or structure, the ten-year *[or alternative]* period begins on the date of the first permit issued for improvement or repair of that building or structure subsequent to. If the structure has incurred "substantial damage," any repairs are considered substantial improvement regardless of the actual repair work performed. The term does not, however, include either:

- (1) Any project for improvement of a building required to correct existing health, sanitary, or safety code violations identified by the building official and that are the minimum necessary to assure safe living conditions.
- (2) Any alteration of a historic structure provided the alteration will not preclude the structure's continued designation as a historic structure.

Substantial Repair of a Foundation. When work to repair or replace a foundation results in the repair or replacement of a portion of the foundation with a perimeter along the base of the foundation that equals or exceeds 50% of the perimeter of the base of the foundation measured in linear feet, or repair or replacement of 50% of the piles, columns or piers of a pile, column or pier supported foundation, the building official shall determine it to be substantial repair of a foundation. Applications determined by the building official to constitute substantial repair of a foundation shall require all existing portions of the entire building or structure to meet the requirements of 780 CMR.

Target Year means the year specified by the Planning Board for estimation of future sea level rise and coastal flood hazard area exposure. If the Best Available Future Coastal Flood Hazard Areas Map is based on a model with a single target year, then the Planning Board shall adopt that year as the Target Year. If the map is based on a model that includes multiple target years, then the Planning Board shall adopt, by Local Regulation, the Target Year for the Best Available Future Coastal Flood Hazard Areas Map.

Variance means a grant of relief by a community from the terms of a flood plain management regulation.

Violation means the failure of a structure or other development to be fully compliant with the community's flood plain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in §60.3(b)(5), (c)(4), (c)(10), (d)(3), (e)(2), (e)(4), or (e)(5) is presumed to be in violation until such time as that documentation is provided.

Zone A means area of special flood hazard without water surface elevations determined.

Zone AE means area of special flood hazard with water surface elevations determined.

Zone AO means area of special flood hazards having shallow water depths and/or unpredictable flow paths between (1) and (3) ft. (*Velocity flow may be evident; such flooding is characterized by ponding or sheet flow.*)

Zone VE (for new and revised maps) means area of special flood hazards without water surface elevations determined, and with velocity, that is inundated by tidal floods (coastal high hazard area).

Zone X means area of moderate or minimal flood hazard.

403 DUNES PROTECTION DISTRICT

403.1 General

This section does not grant any property rights, it does not authorize any person or persons to trespass, infringe upon or injure the property of another, and it does not excuse any person of the necessity of complying with other sections of this Bylaw or other applicable laws, regulations or Bylaws.

403.2 Boundary Line Plot Plan

Whenever an application is made for a permitted use or a special permit in the Dunes Protection District which the Zoning Enforcement Officer believes may be affected by flooding, there shall be provided as part of such application a plan certified by a registered land surveyor of the lot for which the permit has been requested showing existing and proposed elevations at one-foot intervals. In the cases of a building permit for an interior improvement, this paragraph is not applicable.

403.3 Permitted Uses

1. Conservation and restoration of dunes and beach vegetation.
2. Wildlife management shelters and enclosures.
3. Outdoor recreation, nature study, boating, fishing including shell fishing.
4. Fences to prevent the erosion of beaches and dunes and to delineate rights-of-way acceptable for pedestrian and vehicular travel, and appropriate non-commercial signs not exceeding thirty-two (32) square feet, notwithstanding the provisions of Section 601 Sign Regulations.
5. Harvesting kelp and seaweed.
6. Footpaths.
7. Conservation of soil, water, plants, and wildlife.

8. Maintenance and replacement of existing roadways and parking areas.
9. Temporary storage of materials or equipment for a period not to exceed three (3) months in any calendar year; said permit to be renewable for one additional three-month period only.

403.4 Prohibited Uses and Structures

1. Dumping, filling, excavating or transferring of any material, which will substantially alter said district, interfere with the natural flow patterns of the tidal areas, be detrimental to dune areas or interfere with stabilization efforts within said district are prohibited, except as authorized by a special permit granted under Section 403.5, and those activities allowed as permitted uses in Section 403.3.
2. Residential dwellings.
3. Structures except as authorized by a special permit under Section 403.5.

403.5 Uses and Structures Permitted by Special Permit

1. New parking areas, roadways and enlargement of existing parking areas and roadways of the Town or a non-profit organization.
2. Structures providing access to the beach in accordance with applicable state or federal laws.
3. Accessory use to an existing residential home or commercial structure located on that lot, such as a footbridge or plank walk.
4. Accessory use to an existing residential or commercial structure located on that lot, such as a boat landing and boathouse, the latter not to exceed twenty (20) feet in height or one hundred (100) square feet in total ground coverage.
5. Wireless Telecommunications Services Facility in accordance with Section 610.

403.6 Special Permit Goals

Whenever the Board of Appeals is authorized to grant a special permit in the Dunes Protection District said Board shall assure to a degree consistent with a reasonable use of the location that any permitted structure or use conserves the land and any structures, and protects and preserves the marshes, dunes, beaches and other adjoining wetlands in order to regulate development, to protect marine life, to preserve land and water for recreation purposes and to encourage the most appropriate uses of the land.

403.7 Special Permit Procedures

1. The Board of Appeals shall refer a special permit application to the Conservation Commission, the Board of Health, and the Planning Board for written comments and recommendations before taking final action on said special permit application. In addition to the above noted boards, the Board of Appeals may refer a special permit application to any other Town

agency/board/department for comments and recommendations if it so desires before taking final action on said special permit application.

Any such board or agency to which applications are referred for comment shall make its written recommendations and comments and send copies thereof to the Board of Appeals and to the applicant within thirty-five (35) days of receipt of the referral request by said board or agency or there shall be deemed no opposition or desire to comment. The Board of Appeals shall not act upon said special permit until either comments from referred boards or agencies have been received or said thirty-five (35) days have elapsed, whichever is sooner.

2. The Board of Appeals shall explain any departures from the recommendations of the other boards or agencies in its decision.

403.8 Exemptions:

The following are specifically exempt from the provisions of Section 403:

All residential dwellings, commercial and business buildings existing in the Dunes Protection District on April 4, 1978, or building permits for which were issued prior to April 4, 1978, and those portions only of the lots needed to repair, rebuild, modify or enlarge, any such buildings, including but not limited to, the addition of garage and living space and construction of appurtenant outbuildings, together with such filling, diking, and/or drainage as may be necessary for the protection of said structures from flood inundation, provided that all construction of any type is consistent with the laws of the Commonwealth of Massachusetts, in compliance with all other zoning requirements, and does not affect the natural flow pattern of any watercourse. *[Note that the Flood Hazard Areas Overlay District requirements may be more restrictive, so these exemptions may be at least partly nullified.]*

404 WETLANDS PROTECTION OVERLAY DISTRICT

404.1 Purpose

The foundation of the Wetlands Protection Overlay District is to afford safeguards for both the coastal and inland wetlands located within the Town of Duxbury. The district encompasses both wetland areas and an upland buffer zone located along the edge of the wetlands as depicted on the Wetlands and Watershed Protection Map, as amended. These upland areas are vital components to ensuring the proper function of the wetlands serving to recharge the Town's groundwater resources and enabling future climate change induced wetland transition, including marsh, dune, and beach migration in response to long-term sea level rise. This Bylaw serves to minimize any potential adverse impacts in the Wetlands Protective Overlay District and afford protection to the community's groundwater and environmentally sensitive areas.

This section does not grant any property rights, it does not authorize any person to trespass, infringe upon or injure any property of another, and it does not excuse any person of the necessity of complying with other sections of this Bylaw or other applicable laws, regulations and Bylaws.

404.2 Location of District

The location and boundaries of the Wetlands Protection Overlay District shall be as shown on map entitled "Map of Wetlands and Watershed Protection District in the Town of Duxbury, Massachusetts," dated March 4, 1971, as revised and amended to date and on file in the office of Town Clerk, and said map with all its contents is a part of Duxbury Protection Zoning Map and Bylaw.

All land within one hundred (100) feet, measured horizontally, of the high water line of all waterbodies, the estimated future mean high tide line *[alternatively, base mean high tide line on the most recent 19-years of tidal data]*, and the banks of all watercourses is within the Wetlands Protection Overlay District, except when specifically excluded. Where contours are used on the Wetlands and Watershed Protection District Map as the boundaries of the district, their location on the ground shall be determined by their elevation based on the datum irrespective of their delineated location on the zoning map.

Where a boundary line shall include a numerical figure followed by the letters M.S.L., it is at that number of feet above Mean Sea Level. The basic source for determining such a line shall be the United States Geological Survey as interpreted by the Zoning Enforcement Officer or subsequent field surveys. *[See note in 202.2 regarding the use of MSL versus NAVD88 vertical datum]*

404.3 Boundary Line Plot Plan

Whenever an application is made for a building or use permit which the Zoning Enforcement Officer believes may involve the use of land in the Wetlands Protection Overlay District boundary, there shall be provided as part of such application a plan certified by a registered land surveyor of the lot on which such building or structure is intended to be built, showing the exact location of the Wetlands Protection Overlay District boundary as described in the "Wetlands and Watershed Protection District Map, dated March 4, 1971" as amended to date and the Duxbury zoning map dated March 4, 1971.

404.4 Permitted Uses and Structures

1. Conservation of soil, water, plants and wildlife.
2. Outdoor recreation, including play and sporting areas, hunting where legally permitted, including duck blinds and foot-bicycle-horse paths.
3. Proper operation and maintenance of dams and other water control devices, including temporary alteration of the water level for agricultural, emergency or maintenance purposes or for propagation of fish.
4. Forestry, grazing, farming, nurseries, truck gardening and harvesting of crops including but not limited to such crops as cranberries, marsh hay, seaweed, berries, fruits and seeds and nonresidential buildings or structures used only in conjunction with fishing, shellfishing or the growing, harvesting or storage of crops raised on the premises.
5. Flower or vegetable garden, lawn and fence.
6. Conservation and restoration of dunes and beach vegetation.
7. Wildlife management shelters.
8. Harvesting kelp and weeds.
9. Fences to prevent the erosion of beaches and dunes and to delineate rights of way acceptable for pedestrian and vehicular travel, and appropriate non-commercial signs not exceeding thirty-two (32) square feet, notwithstanding the provisions of Section 601 Sign Regulations.
10. Nature Study, boating, fishing including shellfishing.
11. Alterations of uplands, marshes, or wetlands for the purposes of ecological restoration, ecological enhancement, and adaptation of ecosystems to climate change.

404.5 Prohibited Uses and Structures

1. Dumping, filling, excavating or transferring of any materials which will alter any marsh, wetland or bog or which will reduce the natural water storage capacity of the land, interfere with the natural flow patterns of any watercourse or tidal areas, or degrade the quality of surface or groundwater within this district is prohibited.
2. Private or public wells.
3. On site wastewater disposal septic tanks or leaching fields.
4. Buildings or structures except those permitted by Sections 404.4 and permitted by special permit by Sections 404.6 and 404.9.

404.6 Uses and Structures Permitted by Special Permit

Upon issuance of a special permit by the Board of Appeals, and subject to such special conditions and safeguards as the Board of Appeals may impose, the following uses and structures may be permitted:

1. Accessory use or structure to a residential home located on that lot or an adjoining lot in common ownership, such as a footbridge, plank walk or pier.
2. Temporary storage of materials or equipment for a period of not to exceed three (3) months in any calendar year; said permit to be renewable for one additional three-month period only.
3. Dams, excavations, or changes in watercourses to create ponds, pools for swimming, fishing, wildlife or other recreational or agricultural uses, scenic features or for drainage improvements.
4. Fill and structures for coastal flood and erosion control to adapt to long-term sea level rise.
5. Accessory use to residential or commercial structure located on that lot, such as a boat landing and boathouse, the latter not to exceed twenty (20) feet in height or one hundred (100) square feet in the total ground coverage.
6. Utilities installation; unless said utility is a Solar Photovoltaic Facility as defined and regulated by Article 600, Section 621 of this Bylaw, in which case the Planning Board shall serve as the Special Permit Granting Authority and/or Administrative Site Plan Review board in reviewing the application consistent with Article 600, Section 621 and this Section 404.
7. Parking areas enlargement of existing parking areas.
8. Wireless Telecommunications Services Facility in accordance with Section 610.

404.7 Special Permit Goals

Whenever the Board of Appeals is authorized to grant a special permit in the Wetlands Protection Overlay District, said Board shall assure to a degree consistent with a reasonable use of the location that said use: conserves the value of land, buildings and structures; facilitates the protection and provision of a water supply through preservation and maintenance of the groundwater table; protects and preserves the inland marshes, bogs, ponds and watercourses and their adjoining wetlands in order to prohibit development and thereby to safeguard their purity, protect marine life and reserve for recreation purposes; protects and preserves coastal wetlands and their ability to migrate gradually landward in response to long-term sea level rise; and encourages appropriate uses of the land.

404.8 Special Permit Procedures

1. The Board of Appeals shall refer a special permit application to the Conservation Commission, the Duxbury Bay Management Commission, the Board

of Health, and the Planning Board for written comments and recommendations before taking final action on said special permit application. In addition to the above noted boards, the Board of Appeals may refer a special permit application to any other Town agency/board/department for comments and recommendations if it so desires before taking final action on said special permit application.

2. Any such board or agency to which applications are referred for comment shall make its written recommendations and comments and send copies thereof to the Board of Appeals and to the applicant within thirty-five (35) days of receipt of the referral request by said board or agency or there shall be deemed no opposition or desire for comment. The Board of Appeals shall not act upon said special permit until either comments from referred boards or agencies have been received, or said thirty-five (35) days have elapsed, whichever is sooner.

3. The Board of Appeals shall explain any departures from the recommendations of the other Town boards or agencies in its decision.

404.9 Special Permit for Use and Construction

The Board of Appeals may grant a special permit for the use and construction on land in the Wetlands Protection Overlay District despite the prohibition of Section 404.5 provided that:

- a. The proposed use is allowed in the Residential Compatibility District or, if more restrictive, the zoning district in which the majority of the remainder of the parcel lies;
- b. All other requirements of the Bylaw are met;
- c. The Board makes a determination, following referral to the Conservation Commission, Board of Health, and Planning Board, that:
 - The location is not within the wetland as defined either under Section 40, chapter 131 M. G. L., or by soils type (very poorly drained, poorly drained or alluvial) as determined by the USDA Soils Conservation Service or on-site investigation by a qualified soil scientist, and
 - The site is not within the Flood Hazard Areas Overlay District boundaries, and
 - The use will not endanger health or safety.
- d. The Conservation Commission acting within the scope of its jurisdiction has approved such use and construction.

The Conservation Commission, Board of Health and the Planning Board shall report their written recommendations to the Board of Appeals within thirty-five (35) days of receipt of the referral. The Conservation Commission shall be deemed to have approved such use and construction unless its written disapproval is received by the Board of Appeals within such thirty-five (35) days. The Board of Appeals shall explain any departures from the recommendations of other Town agencies in its decision.

404.10 Special Requirements for Utility Installation

Any other Bylaw or regulation to the contrary notwithstanding, no construction requiring any utility, including electric line, water line, gas line and telephone line, or waste disposal or drainage facilities shall be permitted within the Wetlands Protection Overlay District unless the Board of Appeals shall determine that all utilities are located, elevated and constructed so as to minimize or eliminate flood damage, including from future coastal flood hazards due to climate change, and that methods of disposal for sewage, refuse and other wastes and methods of providing drainage are adequate to reduce flood hazards and prevent pollution. For solar photovoltaic facilities as defined and regulated by Article 600, Section 621 of this Bylaw, the Planning Board shall serve as the Special Permit Granting Authority and/or Administrative Site Plan Review board in reviewing the application consistent with Article 600, Section 621 and shall make the determination required by this Section.

404.11 Exemptions

The following are specifically exempt from the provisions of Section 404:

404.20 All residential dwellings, commercial and business buildings existing in the Wetlands Protection Overlay District on March 13, 1971, or building permits for which were issued prior to March 13, 1971, and those portions only of the lots needed to repair, rebuild, modify or enlarge, any such buildings, including but not limited to, the addition of garage and living space and construction of appurtenant outbuildings, together with such filling, diking, and/or drainage as may be necessary for the protection of said structures from flood inundation, provided that all construction of any type is consistent with the laws of the Commonwealth of Massachusetts, in compliance with all other zoning requirements, and does not affect the natural flow pattern of any watercourse. *[Note that the Flood Hazard Areas Overlay District requirements may be more restrictive, so these exemptions may be at least partly nullified.]*

Determination of Suitability of Residential

Piers New residential piers require a special permit and must conform to the following criteria:

1. The pier shall be located and constructed consistent with safety and navigational concerns.
2. The pier shall not exceed two hundred (200) feet in length and must extend the full distance over any salt marsh used to access the water's edge. The width of the pier shall not exceed four (4) feet.
3. The platform at the seaward end of the pier shall not exceed six (6) feet by ten (10) feet, i.e.: two (2) feet by ten (10) feet wider than the walkway. All pile bents shall be no less than ten (10) feet on center from each other except the last bent on the landward end.
4. The most seaward piles shall not extend more than two (2) feet seaward of the salt marsh except to allow the attached float to be located seaward of any vegetation.
5. Floats attached to piers shall not exceed two hundred (200) square feet

unless permitted by the Duxbury Conservation Commission and the Duxbury Harbormaster.

6. Rails shall not exceed thirty-six (36) inches in height off the pier and shall have a top rail five (5) inches or less in vertical dimension and a mid-rail three and one-half (3 ½) inches or less in vertical dimension.

7. Piers, floats and gangways must be made principally out of wood or other materials of a color and reflective quality similar to natural wood.

8. All new piers shall be setback twenty-five (25) feet from abutting property lines unless this single requirement would otherwise prevent a new pier from being approved. In no case shall the setback be less than fifteen (15) feet.

9. All new piers shall be located no closer than fifty (50) feet from the nearest sideline of a Town Landing or Way to the Water.

10. New piers shall be constructed no higher above the salt marsh than the minimum standard for construction permitted by State and Federal regulations. The height of the pier deck shall not exceed fifteen (15.0) feet mean low water unless required by Federal or State regulations. *[This may be inadequate due to sea level rise]*

11. A reconstruction of a pre-existing residential pier does not need to comply with the above requirements; however the reconstructed pier shall conform to these requirements in as much as the pre-existing pier did.

404.30 Reconstruction of a Pre-existing Pier

The reconstruction of a Pre-existing Pier that has been licensed under Chapter 91 and recorded at the Registry of Deeds shall be reconstructed with design standards as approved in the Chapter 91 license. In the event such pier does not have a Special Permit, subject to the provisions of 404.2 (11.), the Zoning Board of Appeals shall accept the design standards as approved in the Chapter 91 license as meeting the requirements of the Zoning Bylaw and issue a Special Permit to such structure.

404.40 Shared Piers

Shared Piers shall comply with all suitability criteria for new piers, except as noted below:

1. All piers constructed, utilizing the shared pier permitting criteria, shall require deed restrictions on each owner's lot prohibiting another pier on those owners' lots and deeded easements granting each owner access to the shared pier, so long as the shared pier in which the owner has rights exists.

2. The Pier location shall not be required to access the water over the shortest distance of salt marsh coverage. The pier may be located on one (1) or more lots and may cross any internal lot lines of the owners. The pier shall be required to meet the sideline setback of the property lines of abutting properties.

3. Float sizes of two hundred (200) square feet per owner shall be permitted up to a maximum of six hundred (600) square feet total, unless permitted by the Duxbury Conservation Commission and the Duxbury Harbormaster.

404.50 Waterfront Scenic Area Overlay District (WSA)

Any new pier in the WSA shall comply with the following special criteria in addition to the other applicable criteria in Section 404.20:

1. A pre-existing pier shall not be reconstructed as a new pier unless the cost to repair the existing pier is greater than fifty percent (50%) of the cost of a new pier on the same footprint.
2. Repairs to a pre-existing pier shall be made subject to no increase in pier length, height, width, footprint or modification of the railing dimension.
3. New piers shall be limited to three and one-half (3.5) feet in width, may have a handrail only on one (1) side of the pier with its upper rail member having a profile of no greater than one and one-half (1.5) inches viewed horizontally and a mid-rail member having a profile of no greater than one-quarter ($\frac{1}{4}$) inch viewed horizontally.
4. New piers shall be constructed no higher above the salt marsh than the minimum standard for construction permitted by State and Federal regulations.

405 PUBLICLY OWNED LAND OVERLAY DISTRICT

This district consists of land owned by the Town and voted by a Town Meeting to be added to this district and shown on the Zoning Map. The municipal uses of this publicly owned land are as established by vote of a Town Meeting, and, if that vote includes action to amend the zoning map, such land is shown on the Duxbury Zoning Map. In accordance with Section 401, all buildings and structures for approved municipal uses shall meet all applicable dimensional, density, and design requirements of this Bylaw.

406 AQUIFER PROTECTION OVERLAY DISTRICTS

406.1 Findings

The Town of Duxbury finds that:

1. The ground water underlying this Town is the sole source of its existing and future drinking water supply. The ground water aquifer is integrally connected with, and flows into, the surface waters, lakes, streams and coastal estuaries which constitute significant recreational and economic resources of the Town used for bathing and other water-related recreation, shellfishing and fishing.
2. Accidental spills and discharges of petroleum products and other toxic and hazardous materials and sewage discharge have repeatedly threatened the quality of such groundwater supplies and related resources throughout towns in Massachusetts, posing potential public health and safety hazards and threatening economic losses to the affected communities.

406.2 Aquifer Protection Overlay Districts

There are hereby established within the Town certain groundwater protection areas consisting of aquifers or recharge areas and approved Zone I, Zone II and Zone III areas which are shown on a map entitled "Aquifer Protection Districts, Town of Duxbury dated March 24, 1993" being an amendment of the Aquifer Protection District Map dated December 4, 2002. This map is hereby made a part of the Duxbury Zoning Bylaw and is on file in the office of the Town Clerk. The Aquifer Protection Overlay Districts, as shown on the maps described above, as well as the above-noted Zone I, II and III areas, shall be considered to be superimposed over any other district established in this Bylaw.

406.3 Relationship to Other Laws

This Bylaw is supplementary to other laws and Bylaws within Duxbury. Where this Bylaw or any portion thereof imposes a greater restriction than is imposed by other regulations, the provisions of this Bylaw shall control. Where this Bylaw references statutes or regulations promulgated by the Commonwealth or its agencies, the statute or regulation shall be that in effect as of January 1, 2002.

406.4 Determination of Location with the Aquifer Protection Overlay District

In determining the location of properties and facilities within the Aquifer Protection Overlay District, the following rules shall apply:

1. Properties located wholly within one (1) zone reflected on the Aquifer Protection Overlay District maps shall be governed by the restrictions applicable to that zone.

2. Properties located such that the site lies within more than one (1) zone as reflected on the Aquifer Protection Overlay District maps shall be governed by the restrictions applicable to the zone in which the activity, structure or sewage disposal system is located.

406.5 Definitions

“Applicant” means any person filing an application.

“Department” means the Massachusetts Department of Environmental Protection (DEP).

“Person” means any agency or political subdivision of the federal government or the Commonwealth, any state, public or private corporation or authority, individual, trust, firm, joint stock company, partnership, association, or other entity, and any officer, employee, or agent or such person, and any group of persons.

“Toxic or Hazardous Materials” means any substance or mixture of such physical, chemical or infectious characteristics as to pose a significant, actual or potential hazard to water supplies, or other hazard to human health, if such substance or mixture were discharged to land or waters of this Town. Toxic or hazardous materials include, without limitation, organic chemicals, petroleum products, heavy metals, radio-active or infectious wastes, acids and alkalis, and include products such as pesticides, herbicides, solvents and thinners. Waste generated by the following activities, without limitation, are presumed to be toxic or hazardous unless and except that anyone engaging in such an activity can demonstrate this contrary to the satisfaction of the Board of Health and the Water Advisory Board.

- Airplane, boat and motor vehicle service and repair
- Chemical and bacteriological laboratory operation
- Cabinet making
- Dry cleaning
- Electronic circuit assembly
- Metal plating, finishing and polishing
- Motor and machinery service and assembly
- Painting, wood preserving and furniture stripping
- Pesticide and herbicide application
- Photographic processing
- Printing

“Zone I” means the four hundred (400) foot protective radius required by the Department around a public water supply well or wellfield.

“Zone II” means that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (one hundred eighty [180] days of pumping at safe yield, with no recharge from

precipitation), as defined in 310 CMR 22.00. It is bounded by the groundwater divides, which result from pumping the well, and by the contact of the aquifer with less permeable materials such as till or bedrock. In some cases, streams or lakes may act as recharge boundaries. In all cases, Zone II shall extend upgradient to its point of intersection with prevailing hydrogeologic boundaries (a groundwater flow divide, a contact with till or bedrock, or a recharge boundary).

“Zone III” means that land area beyond the area of Zone II from which surface water and groundwater drain into Zone II, as defined in 310 CMR 22.00. The surface drainage area as determined by topography is commonly coincident with the groundwater drainage area and will be used to delineate Zone III. In some locations, where surface and groundwater drainage are not coincident, Zone III shall consist of both the surface drainage and the groundwater drainage areas.

406.6 Prohibited Uses and Structures

Land in an Aquifer Protection Overlay District may be used for any purpose otherwise permitted in the underlying district, subject to the additional restrictions presented herein. This Bylaw shall not apply to land or activities located outside of the corporate boundaries of the Town, but shall apply to Zones I, II and/or III areas to wells located in adjacent municipalities that fall within the Town.

Within the Aquifer Protection Overlay District, the following uses are specifically prohibited:

1. Sanitary landfills.
2. Junkyards.
3. Municipal sewage treatment facilities with on-site disposal of primary or secondary-treated effluent.
4. Package sewage treatment plants.
5. Car washes.
6. Road salt stockpiles.
7. Dumping of snow from outside the district.
8. Dry cleaning establishments.
9. Boat and motor vehicle service and repair.
10. Metal plating.
11. Chemical and bacteriological laboratories.
12. All underground storage tanks.
13. Any other use which involves, as a principal activity, the manufacture, storage, use, transportation or disposal of toxic or hazardous materials, except as allowed by special permit in Section 406.8 below.

In addition, the following uses as contained in 310 CMR 22.00 et seq. are prohibited within the Aquifer Protection Overlay District:

14. Automobile graveyards and junkyards, as defined in G. L. c. 140B, sec. 1.
15. Stockpiling and disposal of snow or ice removed from highways and streets located outside of Zone II that contains sodium chloride, chemically treated abrasives or other chemicals used for snow and ice removal.
16. Storage of sodium chloride, chemically treated abrasives or other chemicals used for removal of ice and snow on roads, unless such storage is within a structure designed to prevent the generation and escape of contaminated runoff or leachate.
17. Storage of commercial fertilizers, as defined in G. L. c. 128, sec. 64, unless such storage is within a structure designed to prevent the generation and escape of contaminated runoff or leachate.
18. Storage of animal manure, unless such storage is covered or contained in accordance with the specifications of the Natural Resource Conservation Service.
19. Landfills and open dumps, as defined in 310 CMR 19.006.
20. Landfills receiving only wastewater residuals and/or septage approved by the Department pursuant to G. L. c. 21 sec. 26-53; G. L. c. 111, sec. 17; G. L. c. 83, sec. 6-7; and any regulations promulgated thereunder.
21. Petroleum, fuel oil and heating oil bulk stations and terminals, including, but not limited to, those listed as of January 1, 2002 under Standard Industrial Classification (SIC) Codes 5171 and 5983. SIC Codes are established by the U.S. Office of Management and Budget and may be determined by referring to the publication, Standard Industrial Classification Manual, and any subsequent amendments thereto.
22. Treatment or disposal works subject to 314 CMR 5.0 for wastewater other than sanitary sewage. This prohibition includes, but is not limited to, treatment or disposal works related to activities under the Standard Industrial Classification (SIC) Codes set forth in 310 CMR 15.004(6) Title 5, except the following:
 - (i) publicly owned treatment works (POTWs).
23. Individual sewage disposal systems handling more than 110 gallons per day per 10,000 square feet of land area.
24. Facilities that generate, treat, store or dispose of hazardous waste that are subject to G. L. c. 21C and 310 CMR 30.000 except for the following:
 - (i) very small quantity generators, as defined by 310 CMR 30.00,
 - (ii) household hazardous waste collection centers or events operated pursuant to 310 CMR 30.390, or
 - (iii) waste oil retention facilities required by G. L. c. 21, sec. 52A.
25. Treatment works approved by the Department designed in accordance with 314 CMR 5.00 for the treatment of contaminated ground or surface waters.
26. Any floor drainage systems in existing facilities, in industrial or commercial process areas or hazardous material and/or hazardous waste storage areas, which discharge to the ground without a Department permit or authorization. Any existing facility with such a drainage system shall be required to either seal the floor drain (in accordance with the State Plumbing Code, 248 CMR 2.00), connect the drain to a municipal sewer system (with all appropriate permits and

pre-treatment), or connect the drain to a holding tank meeting the requirements of all appropriate DEP regulations and policies.

27. Storage of sludge and septage, as defined in 310 CMR 32.05, unless such storage is in compliance with 310 CMR 32.30 and 310 CMR 32.31.

28. Storage of liquid hazardous materials, as defined in G. L. c. 21E, and/or liquid petroleum products unless such storage is:

(i) above ground level, and

(ii) on an impervious surface; and either (i) in container(s) or above-ground tank(s) within a building, or (ii) outdoors in covered container(s) or above-ground tank(s) in an area that has a containment system designed and operated to hold either ten percent (10%) of the total possible storage capacity of all containers, or one hundred ten percent (110%) of the largest container's storage capacity, whichever is greater; however, these storage requirements shall not apply to the replacement of existing tanks or systems for the keeping, dispensing or storing of gasoline provided the replacement is performed in a manner consistent with state and local requirements.

29. Land uses that result in the rendering impervious of more than fifteen percent (15%) or two thousand five hundred (2,500) square feet of any lot, whichever is greater, unless a system for artificial recharge of precipitation is provided in accordance with Best Management Practices.

30. The removal of soil, loam, sand, gravel or any other mineral substances within six (6) feet of the historical high groundwater table elevation (as determined from monitoring wells and historical water table fluctuation data compiled by the United States Geological Survey, except for excavations for the construction of building foundations or the installation of utility works.

31. Commercial outdoor washing of vehicles.

32. Commercial car washes.

33. Motor vehicle repair operations.

34. Solid waste combustion facilities or handling facilities as defined at 310 CMR 16.00.

406.7 Density Regulations

Residential dwellings shall be permitted at a density not to exceed one (1) dwelling unit per sixty thousand (60,000) square feet of upland lot area as defined in Section 300, providing:

1. The individual on-site wastewater disposal system does not exceed one hundred ten (110) gallons per day design flow for each ten thousand (10,000) square feet of upland, and

2. All land uses, buildings, and accessory structures shall not render impervious more than fifteen percent (15%) or two thousand five hundred (2,500) square feet of any lot, whichever is greater, unless a system of artificial recharge of precipitation is provided in accordance with Best Management Practices.

406.8 Uses and Structures Permitted By Special Permit

Within the Aquifer Protection Overlay District, the following shall be allowed only upon receipt of a special permit:

1. Any use involving toxic or hazardous materials in quantities greater than associated with normal household use.
2. Golf courses, either private or public use.
3. Residential Conservation Cluster Developments permitted by Section 540.

406.9 Special Permits

1. **Special Permit Granting Authority.** The special permit granting authority (SPGA) under Section 406 of this Bylaw shall be the Planning Board. Such special permit shall be granted if the SPGA determines in conjunction with other Town agencies as specified in Section 406.9.2 below, that the intent of the Bylaw as well as its specific criteria are met. In making such determination, the SPGA shall give consideration to the simplicity, reliability and feasibility of the control measures proposed and the degree of threat to water quality that would result if the control measures failed. The SPGA shall explain any departures from the recommendations of other Town agencies in its decision.

2. **Review by Other Town Agencies.** Upon receipt of the special permit application the SPGA shall transmit one (1) copy to the Director of Public Works, the Water Advisory Board, the Town Manager, the Zoning Enforcement Officer, the Board of Health, the Conservation Commission, and any other relevant Town board/agency or department for their written recommendations. Failure to respond in writing within thirty (30) days shall indicate approval or no desire to comment by said agency. The applicant shall furnish the necessary number of copies of the application.

3. **Special Permit Criteria.** Special Permits under Section 406.8 shall be granted only if the SPGA determines in conjunction with the comments from the above noted agencies that ground-on-site operations will not fall below Federal or State standards for drinking water at the down gradient property boundary, except for nitrate nitrogen which shall not exceed five (5) parts per million.

4. The SPGA may withhold approval of a special permit for the construction of any new structures or structures intended for residential use requiring a special permit under Section 406.8 (Residential Conservation Cluster) which are located on a lot or lots that lie within a zoned Aquifer Protection Overlay District if, after weighing all pertinent facts and evidence the SPGA finds that:

- a) The existing condition of the receiving waters is at or above critical eutrophic levels or in case of well recharge areas, nitrate nitrogen concentration in the groundwater exceed five (5) parts per million, and;
- b) The nutrient combination from the proposed development, when added to the existing and potential nutrient level of developments within the specific recharge area, will generate on a pounds per acre basis, nutrient waters' critical eutrophic level or, in

the case of well recharge area, nitrate nitrogen concentrations in the groundwater in excess of five (5) parts per million. It shall be the responsibility of the applicant to demonstrate to the SPGA that proposed mitigating measures will work as designed, and the SPGA may require the applicant to demonstrate on an annual basis that the said mitigating measures are operating satisfactorily.

5. Submittals. In applying for a special permit required by this section, the information listed below shall be submitted.

a) A complete list of all chemicals, pesticides, fuels and other potentially toxic or hazardous materials to be used or stored on the premises in quantities greater than those associated with normal household use, accompanied by a description of methods proposed to protect all storage containers/facilities from vandalism, corrosion and leakage, and to provide for control of spills.

b) A description of potentially toxic or hazardous wastes to be generated, indicating storage and disposal methods.

c) Evidence of approval by the Massachusetts Department of Environmental Protection (DEP) of any industrial waste treatment or disposal system of any wastewater treatment system over ten thousand gallons per day capacity.

d) Projections of downgradient concentrations of nitrogen and other relevant chemicals at property boundaries and other locations deemed pertinent by the SPGA. Projections shall be based upon appropriate groundwater models and the following information/standards;

(i) Nitrogen Loading Calculations:

- Wastewater per person: five pounds (5 lbs.) nitrogen per year; twenty-five pounds (25 lbs.) phosphorus per year.
- Persons per dwelling unit = three (3).
- Lawn Fertilizers: Three pounds (3 lbs.) nitrogen per one thousand (1,000) square feet of lawn (assume 15,000 square feet of lawn area).
- Road Run-off: 0.19 lbs. nitrogen per curb mile per day.
- Background Nitrogen Concentration: Actual field measurements.

(ii) Groundwater Flow and Impacts to Drinking Water Supply Wells:

- Identify probable impacted water supply wells by constructing flow lines downgradient of the proposed site on the Duxbury Water Table Map (1986).
- Recharge Rate: Sixteen (16) inches per year for sand and gravel; nine (9) inches per year for till.
- Hydraulic Conductivity: Listed value for closest downgradient public supply well in Duxbury Aquifer Protection Plan (1986).
- Saturated Thickness: Saturated Thickness Map (1986) supplemented by site-specific borings.
- Groundwater Gradient: Duxbury Water Map (IEP, 1986) supplemented with site-specific measurements.

- e) Analysis of Development Impact which at a minimum includes the following:
- (i) The existing conditions of the waterbody or water supply, including physical characteristics and water chemistry.
 - (ii) The expected change in the condition of the water supply as a result of the proposed development.
 - (iii) The comparison, on a per acre basis, of the total nutrient loading from the proposed development with:
 - The existing and potential loading from all other developments and acreage within the recharge area of the water supply of the waterbody.
 - The loading rate which would be expected to produce critical eutrophic levels in a waterbody or in the case of a water supply the loading rate which would produce nitrate nitrogen levels in excess of five (5) parts per million in the groundwater.
 - (iv) In determining the impact of nutrient loading from a development, the following standards and definitions shall be used:
 - Loading per person: five (5) pounds nitrogen per person per year; twenty-five (25) pounds phosphorus per person per year for sewage disposal systems within three hundred (300) feet of the shoreline.
 - Loading from lawn fertilizers: three (3) pounds nitrogen per one thousand (1,000) square feet of lawn area per year.
 - Loading from road runoff: 0.19 pounds nitrogen per curb mile per day; 0.15 pounds phosphorous per curb mile per day.
 - Critical eutrophic levels: fresh water concentrations; total nitrogen: 0.75 mg/liter.

406.10 Design and Operations Guidelines

The following design and operation guidelines shall be observed within the Aquifer Protection Overlay District.

1. Safeguards. Provisions shall be made to protect against toxic or hazardous materials discharge or loss resulting from corrosion, accidental damage, spillage or vandalism through measures such as: prohibition of underground fuel storage tanks; spill control provisions in the vicinity of chemical or fuel delivery points; secured storage areas for toxic or hazardous materials; and indoor storage provisions for corrodible or dissolvable materials. For operations which allow the evaporation of toxic or hazardous materials into the interiors of any structures, a closed vapor recovery system shall be provided for each such structure to prevent discharge of contaminated condensate into the ground water.
2. Location. Where the premises are partially outside of the Aquifer Protection Overlay District, potential pollution sources such as on-site waste disposal systems shall be located outside the district to the extent feasible.

3. Disposal. For any toxic or hazardous wastes to be produced in quantities greater than those associated with normal household use, the applicant must demonstrate the availability and feasibility of disposal methods that are in conformance with G. L. c. 21C.

4. Drainage. All runoff from impervious surfaces shall be recharged on the site diverted toward areas covered with vegetation for surface infiltration to the extent possible. Dry wells shall be used only where other methods are not feasible and shall be preceded by oil, grease, and sediment traps to facilitate removal of contaminants.

406.11 Violations

The Zoning Enforcement Officer shall provide written notice of any violation of this Bylaw to the owner of the premises, specifying the nature of the violations and a schedule of compliance, including cleanup of any spilled materials. This compliance schedule must be reasonable in relation to the public health hazard involved and the difficulty of compliance. In no event shall more than thirty (30) days be allowed to either compliance or finalization of a plan for longer-term compliance.

406.12

The provisions of this Bylaw shall not apply to lands in excess of five (5) acres actively devoted to agriculture, horticulture, floriculture or viticulture, nor to use of pesticides when used on such lands in accordance with G. L. c. 132b.

410 RESIDENTIAL COMPATIBILITY DISTRICT

410.1 Permitted Uses and Structures

Residential Compatibility District shall include all areas designated on the Duxbury Zoning Map dated March 13, 1973 as revised and amended to date on file in the office of Town Clerk, as Residential Compatibility District established by Section 201. The following regulations shall apply.

In a Residential Compatibility District no building or accessory structure shall be erected or altered and no building, accessory structure or land shall be used for any purpose or in any manner other than is permitted and set forth herein.

1. Detached, single-family dwelling.
2. Religious.
3. Educational.
4. Accessory use and accessory structures on the same lot which are customarily incidental to a single-family residence.
5. Trailer for a temporary residential occupancy only for a period totaling not more than six (6) months on a premises whose dwelling has been destroyed by fire with a permit from the Zoning Enforcement Officer.

6. The keeping of one (1) service type vehicle not to exceed ten thousand (10,000) pounds gross weight by a resident who carries on a trade or profession away from his/her premises.

410.2 Prohibited Uses and Structures

1. Garage, attached or unattached, for the storage of more than three (3) vehicles.
2. Use of a trailer coach, travel trailer, motor home, tent trailer or mobile home on a residential lot.
3. Except on a farm, outdoor storage of any unregistered motor vehicle for more than ninety (90) days.
4. Advertising signs, as regulated by Section 601, except temporary signs pertaining to the lease, sale, or rental of a lot or building on which they are placed and not exceeding six square feet in area, or as allowed by Section 410.7(b).
5. Any use which will produce a nuisance or hazard from fire or explosions, toxic or corrosive fumes, gas, smoke, odors, obnoxious dust or vapor, harmful radio-activity, offensive noise or vibration, flashes, objectionable effluent, or electrical interference which may affect or impair the normal use and peaceful enjoyment of any property in Town.
6. Parks for trailers, travel trailers, tent trailers, trailer coaches and motor homes; auto dismantling, junkyards, privately developed and operated septage waste disposal/treatment facilities and refuse disposal facilities are expressly prohibited.
7. Planned Development.

410.3 Uses and Structures Permitted by Special Permit

The following uses and structures are permitted, and only to the extent authorized, by a Special Permit from the Board of Appeals. The Planning Board shall be the Special Permit Granting Authority for Residential Conservation Cluster Developments:

1. Stand for the sale of produce raised on the premises.
2. Home occupation in accordance with Section 410.7.
3. Conversion of a single-family dwelling in existence for ten (10) years prior to the application for a special permit in accordance with Section 410.6.
4. Cemetery.
5. Golf course.
6. Hospital, convalescent home, sanatorium, institution, including a continuing care or similar assisted living retirement facility for persons age 62 and over operated in connection with a skilled nursing facility subject to state licensure. Any such use to be reviewed pursuant to the applicable provisions of Article 800 of the Protective Bylaw, or philanthropic use.
7. Riding stable.
8. Bed and Breakfast within existing footprint of an existing single-family dwelling, in which the operator resides.

9. Private club not conducted for profit and not containing sleeping quarters for more than four (4) persons.
10. Residential Conservation Cluster Development in accordance with Section 540.
11. Wireless Telecommunications Services Facility in accordance with Section 610.
12. Veterinary Hospital for the care and treatment of domestic animals.

410.4 Residential Compatibility District Intensity, Dimensional and Coverage Regulations

No building or structure shall be located, constructed, changed, enlarged or permitted and no use of premises in Residential Compatibility District shall be permitted except in conformity to the intensity and dimensional regulations as set forth herein. If a lot is determined by the rules of Section 406.4 to be within an Aquifer Protection Overlay District, then the more restrictive regulations of Section 406 Aquifer Protection Overlay District shall prevail.

Lot Size/Lot Frontage – In a Residential Compatibility District no dwelling shall be erected on a lot unless such lot has an area of forty thousand (40,000) square feet or more of upland and shall have a frontage measurement on a way equal to or greater than two hundred (200) feet. Frontage cannot accrue from a limited access highway.

Lot Area – The horizontal and contiguous area of the lot exclusive of any area in a public or private way open to the public uses. Land under any waterbody, bog, swamp, wet meadow or marsh, as defined in G. L. c. 131 sec. 40, and/or land within the Wetlands Protection Overlay District and/or land within any overhead easement the purpose for which is the transmission of high voltage electricity, shall not be included in the horizontal and contiguous portion of the lot area required for zoning compliance. If the distance between any two (2) points on lot lines is less than fifty (50) feet, measured in a straight line, the smaller portion of the lot, as divided by that line, shall not be included in lot area unless the two points are separated by less than one hundred fifty (150) feet along lot line. (See drawing in section 300.)

Lot Shape – The following shall apply to all lots for residential use except those created under special permits, such as created in Planned Development and Residential Conservation Cluster Developments.

1. Lot width shall be at least one hundred sixty (160) feet at the required setback line, to the way. (1987)
2. The lot shall contain at least four thousand five hundred (4,500) square feet between the required setback line and the right-of-way line from which the lot takes its frontage.
3. Each single-family dwelling shall be located on a lot containing an imaginary circle one hundred fifty (150) feet in diameter within its lot lines. (1987)

Intensity – The maximum density shall be one single family dwelling per 40,000 square feet or more of upland.

Front Setback – In a Residential Compatibility District, where the way is forty (40) or more feet in width, no building, roadside stand, or accessory structure shall be erected or placed within twenty-five (25) feet of a right-of-way and if the way is less than forty (40) feet in width no building, roadside stand, or accessory structure shall be erected or placed within forty-five (45) feet from the center line of the way. Where present buildings on adjoining lots are less than twenty-five (25) feet from the right-of-way line, new buildings may be placed as near the right-of-way lines as the average of the buildings on said adjoining lots.

In a Residential Compatibility District, the minimum front setback shall be measured from a right-of-way line of the way giving legal access to any lot where a plan of the way is on file with the Registry of Deeds or, in the absence of such a plan, from a line twenty (20) feet from and parallel with the centerline of the traveled way. In the case of a corner lot, the distance of the front setback shall apply to any structure adjacent to either right-of-way.

Minimum front setbacks shall apply to swimming pools, tennis courts, and other accessory structures.

Side and Rear Setbacks – In a Residential Compatibility District no dwelling or accessory structure, other than a swimming pool or tennis court shall be built within fifteen (15) feet of a side or rear lot line. No swimming pool or tennis court shall be built within ten (10) feet of a side or a rear lot line.

Projections – Nothing herein shall prevent the projection of steps, stoops not exceeding thirty (30) square feet in area, cornices, window sills or belt courses into any setback.

Height – In a Residential Compatibility District, no dwelling shall be more than thirty (30) feet in height. No detached structure or building shall be closer than its height to any other. The limitations of height in feet shall not apply to chimneys, elevators, poles, ventilators, skylight, tanks, bulkheads, and other accessory structural features usually carried above roofs, nor to domes, towers, or spires of churches or other buildings provided such features are in no way used for living purposes and further provided that no such structural feature of any building shall exceed a height of sixty-five (65) feet from the ground.

Coverage – In a Residential Compatibility District, building coverage as defined in Section 302 shall be no more than fifteen percent (15%) of the total area of the lot (as defined in Section 302 and not "Lot Area"), except that in the case of a lot having a total area of less than twenty thousand (20,000) square feet the Board of Appeals by

Special Permit may permit additional building coverage in an amount not greater than three percent (3%) of the difference between the total area of the lot and twenty thousand (20,000) square feet.

Corner Clearance – Within the triangle formed by the lines of intersecting ways and a line joining points on such lines fifteen (15) feet distance from their point of intersection, or in case of a rounded corner, the point of intersection of their tangents, no structure and no foliage shall be maintained between a height of three and one-half (3-1/2) feet and a height of eight (8) feet above the plane through their curb grades.

Reduction of Minimum Requirements – In a Residential Compatibility District no lot, setback, or other open space already having less than the minimum requirements in this Bylaw shall be further divided or reduced with respect to such minimum requirement or requirements.

Parking Regulations for Residential Compatibility District – Off-street parking for a minimum of two (2) motor vehicles shall be provided.

410.5 Residential Plot Plan Required for Building Permit

No building permit shall be issued for new construction, reconstruction, or enlargement of existing residential buildings and other structures without a Site Plan being submitted as part of an application for a building permit and approved by the Zoning Enforcement Officer. In addition to the requirements set forth in Section 905.1, such plot plan shall, to the extent deemed necessary by the Zoning Enforcement Officer or the Board of Appeals, show the dimensions and shape of the lot; delineate any Wetlands Protection Overlay District, Flood Hazard Areas Overlay District or Aquifer Protection Overlay District areas located within the lot; location of all existing and proposed structures or additions; location of existing and/or proposed septic disposal systems including leaching field and reserve area; existing and proposed contours at two foot intervals. The Zoning Enforcement Officer may require additional information or documentation of materials submitted.

410.6 Accessory Apartment Special Permit Regulations and Restrictions

1. General – No accessory apartment shall be constructed in a single family dwelling without a special permit from the Board of Appeals as provided hereunder. For the purpose of this provision, single-family dwellings authorized under a special permit for a Residential Conservation Cluster or Planned Development shall be ineligible for an accessory apartment. Application for a special permit may be made to the Board of Appeals in the usual manner. The Board of Appeals may grant a special permit under 906.2 and Site Plan approval under 410.5 provided the following conditions are met. No construction shall commence without issuance of a building permit by the Zoning

Enforcement Officer and no use or occupancy of the accessory apartment may occur until the Zoning Enforcement Officer has issued a certificate of occupancy.

2. The Board of Appeals may approve an application for a special permit to construct an accessory apartment where:
 - a) The accessory apartment does not exceed eight hundred fifty (850) square feet in area.
 - b) The accessory apartment does not require alteration or addition to the single-family dwelling in such a manner that there is any exterior change to the dwelling, so that the accessory apartment is located wholly within the building footprint in existence at the time of the special permit application. For the purpose of this section, exception shall be made only for installation of exterior doorways and means of egress at grade in conformance with Massachusetts Building Code.
 - c) The area of the lot on which the single-family dwelling is located shall not be less than twenty thousand (20,000) square feet.
 - d) Sufficient parking area shall be provided, including at least one (1) additional space to serve the accessory apartment. Said additional space shall have access to the driveway serving the dwelling.
 - e) The applicant shall be an owner-occupant of the premises, and shall remain an occupant of either the principal dwelling or the accessory apartment.
 - f) The Board of Health certifies that the existing or proposed septic system and expansion area comply with the requirements of Title 5 of the State Environmental Code and the Rules and Regulations of the Duxbury Board of Health, and is capable of serving both the single-family dwelling and the accessory apartment.
 - g) The applicant submits floor plans of the proposed accessory apartment, a site plan in conformance with Section 410.5 and a plot plan as required under Section 905, all being acceptable to the Board of Appeals.
 - h) The single-family dwelling is at least ten (10) years old at the time of the application for an accessory apartment special permit, and no additions or alterations as would have created additional living space were constructed in the single-family dwelling within one (1) year of the date of application for special permit hereunder.
 - i) Upon approval, the Board of Appeals may require the applicant to record a restriction at the Plymouth County Registry of Deeds verifying that the apartment is accessory to a single-family dwelling and that no application shall be made under Chapter 183A to convert the accessory apartment to a condominium.

410.7 Home Occupation Special Permit Regulations

1. In a Residential Compatibility District, the Board of Appeals may issue a special permit for the use of a portion of a dwelling as a principal location for the practice of their occupation by a person (such as an architect, counselor, consultant, dentist,

doctor, engineer, insurance broker, investment counselor, lawyer or real estate broker) who is a resident therein, provided that:

- a) The home occupation use shall be clearly incidental and subordinate to the residential use and not more than twenty-five percent (25%) of the floor area of the dwelling shall be devoted to the home occupation use;
- b) There shall be no change in the exterior appearance of the premises, nor any visible evidence of the conduct of the home occupation other than one (1) non-illuminated sign not to exceed two (2) square feet in area if such sign has been allowed under a special permit granted by the Board of Appeals;
- c) A special permit has been granted by the Board of Appeals under the standards of Section 906.2.

2. A home occupation, which will have no clients or pupils calling, will have no extraordinary deliveries of mail or packages, will have no signage, and will employ only residents of the dwelling, may obtain a permit for such use from the Zoning Enforcement Officer.

420 NEIGHBORHOOD BUSINESS DISTRICTS

The Town shall have designated Neighborhood Business Districts as established by Section 201, described herein and as shown on the Zoning Map dated March 13, 1973 as revised and amended to date and on file in the office of the Town Clerk, and as defined in and subject to Section 421, through and including Section 425.

421-A NEIGHBORHOOD BUSINESS LIGHT DISTRICT

The Town shall have a Neighborhood Business Light District (NB-L) as established by Section 201, described herein and as shown on the Zoning Map dated March 13, 1973 as revised and amended to date and on file in the office of the Town Clerk, and as defined in and subject to this Section 421A.

General: No structure shall be erected or altered and no building, structure, premises or land shall be used for any purpose or in any manner other than as permitted as follows:

421A.1 Permitted Uses and Structures

1. Uses and structures as permitted by Section 410.1 and 410.3 in accordance with all intensity, dimensional, and coverage regulations of Section 410.4.
2. Signs in accordance with Section 601.
3. The keeping of any registered commercial motor vehicle.

421A.2 Prohibited Uses and Structures

1. Any use which will produce a nuisance or hazard from fire or explosion, toxic or corrosive fumes, gas, smoke, odors, obnoxious dust or vapor, harmful radioactivity, offensive noise or vibration, flashes, objectionable effluent or electrical interference which may affect or impair the normal use and peaceful enjoyment of any property, structure or dwelling in Town. Parks for trailers, travel trailers, tent trailers, trailer coaches and motor homes, auto dismantling, junkyards, privately developed and operated septage waste disposal/treatment facilities are expressly prohibited.
2. All Neighborhood Business 2 Structures, and all Neighborhood Business 1 Structures not otherwise listed in Section 421A.3.
3. In NB Light, no drive-through establishment, drive-through business or drive-through restaurant use shall be allowed.

421A.3 Uses and Structures That May Be Permitted Subject to Special Permit and Site Plan Requirement

The following uses shall only be permitted by a special permit from the Board of Appeals when the off-street parking requirement is more than three (3) vehicles and/or off-street loading space is required. If the off-street parking requirement is less than three (3) vehicles and no off-street loading space is required, the Zoning Enforcement Officer may approve the following uses, provided that the provisions of Section 424.2 are complied with:

1. Professional office for dental, architectural, engineering, renewable and alternative energy research and development, legal, medical, and other similar recognized professions; medical and dental clinics, including retail uses accessory thereto providing no more than twenty-five percent (25%) of the rentable floor space in a principal building exclusive of all storage areas is used therefor.
2. Real estate, insurance and general business office, banks, telephone office.
3. Dwelling in a business structure above the ground floor.
4. Greenhouse that is accessory to a business.

421A.4 Special Permit Uses

1. Retail sale of food items, including confectionery, dairy products, fruits, vegetables, groceries and meats.
2. Sale of baked goods and the manufacture of same for sale.
3. Sale of dry goods, variety merchandise and handicraft work.
4. Sale of clothing and clothing accessories.
5. Sale of hardware, household items including appliances, furniture, furnishings and supplies.
6. Sale of printed matter, drugs, stationery and photographic supplies.

421 NEIGHBORHOOD BUSINESS DISTRICT 1: USE AND REGULATIONS

General: In Neighborhood Business District 1, no structure shall be erected or altered and no building, structure, premises or land shall be used for any purpose or in any manner other than as permitted as follows.

421.1 Permitted Uses and Structures

1. Uses and structures as permitted by Section 410.1 and 410.3 in accordance with all intensity, dimensional, and coverage regulations of Section 410.4.
2. Signs in accordance with Section 601.
3. The keeping of any registered commercial motor vehicle.

421.2 Prohibited Uses and Structures

1. Any use which will produce a nuisance or hazard from fire or explosion, toxic or corrosive fumes, gas, smoke, odors, obnoxious dust or vapor, harmful radioactivity, offensive noise or vibration, flashes, objectionable effluent or electrical interference which may affect or impair the normal use and peaceful enjoyment of any property, structure or dwelling in Town. Parks for trailers, travel trailers, tent trailers, trailer coaches and motor homes, auto dismantling, junkyards, privately developed and operated septage waste disposal/treatment facilities are expressly prohibited.
2. All Neighborhood Business District 2 structures and uses.

421.3 Uses and Structures That May Be Permitted Subject to Special Permit and Site Plan Requirement

The following uses shall only be permitted by a special permit from the Board of Appeals when the off-street parking requirement is more than three (3) vehicles and/or off-street loading space is required. If the off-street parking requirement is less than three (3) vehicles and no off-street loading space is required, the Zoning Enforcement Officer may approve the following uses, provided that the provisions of Section 424.2 are complied with:

1. Uses allowed in NB Light and as described in Section 421A.3.
2. Public transportation passenger station and right-of-way passenger bus terminal.
3. Shop of an electrician, painter, paper-hanger, plumber, upholsterer, carpenter or cabinet-maker and similar trades.

421.4 Special Permit Uses

1. Special Permit Uses allowed in NB Light and as described in Section 421A.4.
2. Wireless Telecommunications Services Facility in accordance with Section 610.

3. Service establishment: barber and beauty shop, laundry agency, shoe and hat repair, bicycle and household appliance repair, dressmaking, dry cleaning and pressing or tailor shop where no work is done on the premises for retail outlets elsewhere.
4. Mortuary and funeral parlor.
5. Restaurant and other places for serving of food or beverages inside or outside the building at tables or counters, including public or private clubs.
6. Take-out food establishment or delicatessen where food is prepared but not consumed on the premises and sold retail; catering services.

422 NEIGHBORHOOD BUSINESS DISTRICT 2: USE AND REGULATIONS

General: In a Neighborhood Business District 2, no structure shall be erected or altered and no building, structure, premises or land shall be used for any purpose or in any manner other than as permitted as follows.

422.1 Permitted Uses

All uses permitted in Section 421A.1 (Neighborhood Business Light District) and section 421.1 (Neighborhood Business District 1) shall be permitted in Neighborhood Business District 2. Permitted signs shall comply in all respects with the requirements of Section 601.

422.2 Prohibited Uses and Structures

Any use which will produce a nuisance or hazard from fire or explosion, toxic or corrosive fumes, gas, smoke, odors, obnoxious dust or vapor, harmful radioactivity, offensive noise or vibration, flashes, objectionable effluent or electrical interference which may affect or impair the normal use and peaceful enjoyment of any property, structure or dwelling in Town. Parks for trailers, travel trailers, tent trailers, trailer coaches and motor homes, auto dismantling, junkyards, privately developed and operated septage waste disposal/treatment facilities are expressly prohibited.

422.3 Uses and Structures Permitted by Special Permit

The following uses shall only be permitted by a Special Permit issued by the Board of Appeals subject to all regulations and site plan approval for Neighborhood Business Districts.

1. All uses and structures permitted by special permit in Sections 421A.4, 421.3 and 421.4.
2. Retail business, services or public utility not involving manufacture on the premises, except of products, the major portion of which is to be sold at retail by the manufacturer to the consumer and provided further that no more than ten (10) operators shall be employed in such manufacture. Such retail businesses may include sales at wholesale, provided that the physical incidents (wholesale transactions)

occurring on the premises are of substantially the same character as the physical incidents of its retail sale direct to the consumer and provided further that the major portion in number of its sales shall continue to be retail sales.

3. Automobile sales and services provided that, where it is proposed to dispense, sell or offer for sale, motor fuels directly to users of motor vehicles, all of the following criteria must be met:
 - a) There is no existing salesroom, service station, garage or other establishment dispensing motor fuels within one thousand three hundred (1,300) feet;
 - b) No public or private playfield or playground, church or other places of public worship, cemetery, police station, fire station, hall or other place of public assembly, municipal building used for public business meetings or assemblies, Town-owned sites held for future schools, playgrounds or playfields is within five hundred (500) feet of the proposed facility;
 - c) A landscaped safety island parallel to the street line sixty (60) feet in length along the street and twenty-five (25) feet in depth shall be provided;
 - d) On either end of this island, "curb cuts" or access drives of not more than thirty (30) feet and not less than twenty-five (25) feet in width at the exterior of the street shall be provided;
 - e) No more than three (3) pumps and/or hoses in one "island" for dispensing leaded gasoline or motor fuel, plus one (1) additional pump and hose for dispensing either diesel fuel or white gasoline, so called, shall be allowed;
 - f) The minimum frontage shall be at least one hundred fifty (150) feet.
4. Automobile sales and service including automobile sales, outdoor automobile sales display, service stations, repair and storage garage provided that washing, lubrication and major repair of motor vehicles are performed inside an enclosed building and all dispensing of fuels, lubricants and fluids is done entirely on the property of the business.
5. Boat sales, service and outdoor business and storage provided that major repair of engines is performed inside enclosed buildings and that all dispensing of fuels, lubricants and fluids is done entirely on the property of the business.
6. Sale of building materials.
7. Wireless Telecommunications Services Facility in accordance with Section 610.

424 SPECIAL PERMIT PROCEDURES AND CRITERIA FOR NEIGHBORHOOD BUSINESS DISTRICTS 1 AND 2

- 1. The Special Permit Granting Authority:** The special permit granting authority (SPGA) under this Bylaw shall be the Board of Appeals.
- 2. Requirements:** An application for a Neighborhood Business Special Permit shall include a written description of the proposal for which a special permit is requested and a Site Plan prepared by a Registered Professional Engineer and/or Registered Land Surveyor at an appropriate scale to clearly show dimensions, legend,

and all other information deemed necessary to describe the site and its conditions. Three (3) copies of the Site Plan shall be submitted to each of the following boards: Board of Appeals, Planning Board, Board of Health, Conservation Commission, and DPW. One (1) copy shall be submitted to the Zoning Enforcement Officer and the Design Review Board. To the extent to which the following information is necessary to delineate and describe site conditions related to the purpose for which the special permit is requested, said Site Plan shall show, among other things:

- a) all existing and proposed buildings, structures, parking spaces, driveways, driveway openings, service areas, and other uses;
- b) existing and proposed contours at two (2) foot intervals;
- c) proposed clear-sight distances at all driveway openings, existing and proposed ways;
- d) existing and proposed water sources and volumes of use;
- e) existing traffic counts and estimated future traffic volumes;
- f) abutting land uses;
- g) all facilities for disposal of sewerage, storage, and disposal of refuse and other waste disposal;
- h) all facilities for surface water drainage or retention;
- i) all principle landscape features;
- j) where applicable, the limits of any defined Aquifer Protection Overlay District areas, Flood Hazard Areas Overlay District areas, and/or Wetlands Protection Overlay District areas as specified in this Bylaw and the Zoning Map; and
- k) all signs, parking and lighting shall be included.

If the proposed business use would add one thousand (1,000) square feet or more of gross floor area to an existing business or would require a total of ten (10) or more parking spaces based upon both existing and new development, or any change of use which under Section 603 requires ten (10) or more parking spaces based only on new business development then the Site Plan shall be governed by the provisions of Section 615.

3. Referral: The Board of Appeals shall refer a special permit application to the Planning Board, the Historical Commission, the Board of Health, the Conservation Commission, Design Review Board, and Water Advisory Board for written comments and recommendations before taking final action on said special permit application. Any board or agency to which applications are referred shall make its recommendations and send copies thereof to the Board of Appeals and the applicant within thirty-five (35) days of receipt of the referral request by said board or agency or there shall be deemed no opposition or desire to comment. The Board of Appeals shall not act upon said special permit until either comments from referred boards or agencies have been received, or said thirty-five (35) days have elapsed, whichever is sooner.

4. Criteria: In approving a special permit under this section, the Board of Appeals shall, to the degree consistent with a reasonable use of the site for the purpose

permitted within a Neighborhood Business District in which it is located, provide for the following:

- a) Protection of adjoining premises against detrimental or offensive uses on the site;
- b) Adequacy of space for vehicular access to the site and off-street parking and loading/unloading on the site;
- c) Convenience and safety of vehicular and pedestrian movement within the site and in relation to adjacent ways and land;
- d) Adequacy of water supplies and distribution for domestic use fire protection;
- e) Adequacy of the methods of storage and disposal for sewage, refuse and other wastes resulting from the uses permitted on the site and the methods of drainage or retention of surface water;
- f) Resilience to future climate change impacts, including flooding;
- g) Maintenance and promotion of dispersed shade on paved areas through the effective use of established and/or new trees; and
- h) Conformance to sign regulations in Section 601.

425 INTENSITY AND DIMENSIONAL REGULATIONS FOR ALL NEIGHBORHOOD BUSINESSDISTRICTS

425.1 Lot Area, Frontage, Depth Dimensions and Coverage

- 1. Minimum lot size for NB-L is 30,000 square feet.
- 2. Lot Dimension for NB-L:
 - Frontage 200 linear feet
 - Depth 100 linear feet
 - Front setback 25
 - Side setback 25 to residential use; 0 to NB-1 or NB-2
 - Rear setback 15 to residential use; 0 to NB-1 or NB-2
- 3. Minimum lot size for NB-1 and NB-2 is 15,000 square feet.
- 4. Lot Dimension for NB-1 and NB-2:
 - Frontage 100 linear feet
 - Depth 100 linear feet
 - Front setback 10 linear feet
 - Side setback 0 linear feet
 - Rear setback 0 linear feet
- 5. In a Neighborhood Business District where present buildings are less than forty (40) feet from the right-of way line, new buildings may be placed as near the right-of-way line as the average buildings on said adjoining lots. A vacant lot shall, for this purpose, be treated as though occupied by a building set back forty (40) feet.
- 6. The minimum front setback shall be measured from the right-of-way giving legal

access to any lot where a plan of the way is on file with the Registry of Deeds or, in the absence of such a plan, from a line twenty feet from and parallel with the center line of the traveled way. In the case of a corner lot, the distance of the front setback shall apply to any structure adjacent to either right-of-way.

7. In a Neighborhood Business District, no accessory building or structure shall be located within the required front setback. Accessory structures may be appended to the principal building or to another accessory building.

- a) Corner Clearance – Within the triangle formed by the lines of intersecting ways and a line joining points on such lines fifteen feet distance from their point of intersection, or in the case of a rounded corner, the point of intersection, or in the case of a rounded corner, the point of intersection of their tangents, no structure and no foliage shall be maintained between a height three and one-half (3.5) feet and height of eight (8) feet above the plan through their curb grades.
- b) Projections – Nothing herein shall prevent the projection of steps, stoops, not exceeding thirty square feet in any area, cornices, window sills or belt courses into any required setback.
- c) Height – Maximum height shall be thirty (30) feet in all NB Districts.
- d) Exemptions to Height Regulations – The limitations of height in feet shall not apply to chimneys, elevators, poles, ventilators, skylights, tanks, bulkheads, and other accessory structural features usually carried above roofs, nor to domes, towers, or spires of churches or other buildings provided such features are in no way used for living purposes and further provided that no such structural feature of any building shall exceed a height of sixty-five (65) feet from the ground. The Board of Appeals may grant a special permit for greater height for such structures and provided such greater height would not be hazardous or detrimental to the neighborhood.
- e) Site Coverage – In all NB Districts the maximum site coverage of a lot shall be no more than fifty percent (50%) of the total area of the lot as defined in Section 302 and not "Lot Area."
- f) Bedrooms – Above ground floor apartments in all NB Districts shall be limited to no more than two (2) bedrooms.
- g) Reduction of Minimum Requirements – No lot, setback, court or other open space already having less than the minimum requirements in this Bylaw shall be further divided or reduced with respect to such minimum requirement or requirements.

430 PLANNED DEVELOPMENT DISTRICTS

Planned Development District 1, Planned Development District 2, Planned Development District 3 are established by Section 201 of this Bylaw and land zoned Planned Development 1,2, or 3 are designated on the Duxbury Zoning Map dated March 13, 1973 as revised and amended to date.

430.1 Permitted Uses and Structures

Permitted uses and structures in a Planned Development District shall be those permitted by right and by Special Permit in a Residential Compatibility District, Section 410.1 and 410.3, and in accordance with all intensity, dimensional and coverage regulations of Section 410.4.

If any portion of the land of the Planned Development is within the Aquifer Protection Overlay District as determined per Section 406.4, then the stricter intensity, dimensional and coverage regulation of Section 406 shall apply.

430.2 Special Permit Uses

Planned Development as outlined in Section 700 and Section 800 of this Bylaw.

No Planned Developments shall be undertaken without a Special Permit granted by the Board of Appeals as provided for in Section 808 and 906.2 and in accordance with the Design Standards enumerated in Section 700 and Procedures and Regulations for Planned Development as enumerated in Section 800 of this Bylaw.

ARTICLE 500 - REQUIREMENTS FOR CERTAIN LAND DIVISIONS, LAND DEVELOPMENTS, AND INCLUSIONARY HOUSING

530 DIVISION OF LAND AND DEVELOPMENT OF MULTIPLE DWELLINGS

530.1 Purpose

The purpose of this Bylaw is to ensure that land divisions, subdivisions, and developments of multiple dwellings on single lots are afforded the depth and breadth of review allowed by G.L. c. 40A, sec. 9 to adequately protect public health, safety and welfare of the current and future residents of the Town. This Bylaw, in concert with Section 540, 560 and/or 906.2 allows the Board of Appeals or Planning Board to grant a special permit for land divisions, subdivisions and large multi-unit developments, provided specific enumerated criteria are satisfied.

530.2 Applicability

1. The division and/or subdivision of land held in single ownership as of January 1, 2001 or anytime thereafter into six (6) or more lots, or

2. The division of a tract of land greater than ten (10) acres into five (5) or more lots,

shall require a special permit from the Planning Board under the provisions of Section 540, unless application is made under Section 700 of the Zoning Bylaw, in which case the special permit granting authority shall be the Board of Appeals.

3. The construction of six (6) or more dwelling units on land that does not require land division and/or subdivision, whether on one or more contiguous parcels held in single ownership as of January 1, 2001 or anytime thereafter, shall require a special permit from the Board of Appeals under Article 700.

In cases where the proposed division of land is for six (6) or more lots and said division is proposed as a division of land not requiring Planning Board approval (G. L. c. 41, sec. 81-P), the Planning Board's special permit powers shall be limited to enforcing the provisions of Section 560 of the Zoning Bylaw. The provisions of Section 530.2.3 shall not apply to the construction of six (6) or more dwelling units on individual lots, if said six (6) or more lots were in existence as of January 1, 2001.

530.3 Multiple Special Permits

The special permit requirements of Section 530 may be subsumed by the special permit requirement of Sections 406, 540 and 700.

540 RESIDENTIAL CONSERVATION CLUSTER

540.1 Purpose and Intent

1. Allow for greater flexibility and creativity in the design of residential developments.
2. Encourage the permanent preservation of open space, agricultural and forestry land, other natural resources including waterbodies and wetlands, and historical and archeological resources.
3. Maintain the Town's traditional character and land use pattern in which small villages contrast with open land.
4. Protect scenic vistas from the Town's roadways and other places.
5. Encourage screening of new residential development from the Town's roads, open spaces and scenic areas.
6. Facilitate the construction and maintenance of streets, utilities and public services in a more economical and efficient manner.
7. Protect existing and potential municipal water supplies.

8. Encourage a less sprawling and more efficient form of development that consumes less open land and conforms to existing topography and natural features better than a conventional subdivision.
9. Minimize the total amount of disturbance on the site.
10. Preserve open space areas for active and passive recreational use, including the provision of neighborhood parks and trails.
11. Encourage the provision of diverse housing opportunities and the integration of a variety of housing types.
12. Further the goals and policies of the Duxbury Comprehensive Plan.

540.2 Definitions

In this Bylaw, the following words have the meanings indicated:

Residential Conservation Cluster (RCC) Development - A residential development in which the buildings are clustered together with reduced lot sizes and frontage. The land not included in the building lots is permanently preserved as open space. RCC Development is generally the preferred form of residential development and/or redevelopment in the Town for residential developments of five (5) or more acres and/or six (6) or more lots.

540.3 Applicability

A proposed subdivision of land into six (6) or more lots shall be filed in accordance with the provisions of Section 540.4, below. The Planning Board shall determine whether the proposed location is suitable for an RCC Development under the terms and provisions of this section. If the Planning Board determines that the proposed location is suitable for an RCC Development, any further subdivision of the land into six (6) or more lots shall be accomplished only through the provisions of this Bylaw. If the Planning Board determines, after discussion and analysis provoked by Section 540.4, that the location is best suited for subdivision under a conventional subdivision design, the Planning Board shall so inform the applicant and the applicant may then proceed to design a subdivision plan under the provisions of the Subdivision Control Law and the Duxbury Rules and Regulations Governing the Subdivision of Land (Subdivision Rules and Regulations) and the provisions of this section shall not apply. In cases where the Planning Board determines that the site is not suitable for an RCC Development, and where the proposed subdivision of land is for six (6) or more lots, the Planning Board's special permit powers shall be limited to enforcing the provisions of Section 560 of the Zoning Bylaw. In either case, however, a special permit from the Planning Board shall be required.

Notwithstanding the provisions above, the Planning Board may grant a special permit for an RCC Development for any parcel or contiguous parcels of at least five (5) acres in any district permitting single-family dwellings subject to the regulations and conditions herein.

Determination of whether the proposed location is not suitable for an RCC Development shall be based upon the opinion and judgment of the Planning Board, after consultation with its advisors and staff and may include the following criteria:

1. The degree to which the topography of the locus will not be preserved by a RCC Development;
2. The degree to which stormwater runoff and erosion will not be minimized by a RCC Development;
3. The degree to which the RCC Development will result in inappropriate site planning, subdivision design and/or damage to the site's natural features;
4. The degree to which the RCC Development will not preserve or protect abutting properties and associated views and vistas;
5. The degree to which public safety will be threatened by a RCC Development;
6. The degree to which other site specific attributes or site specific concerns are not appropriately addressed by a RCC Development.

540.4 Procedural Requirements

1. Pre-Application Meeting: A pre-application meeting between the Planning Board and/or Planning Department and the applicant is strongly encouraged.
2. Preliminary (Conventional) Plan/RCC Sketch Plan: Applicants proposing the subdivision of land into six (6) or more lots shall submit a Sketch Plan for an RCC Development along with a Preliminary (Conventional) Subdivision Plan for review by the Planning Board. One of the purposes of this review is to determine the number of lots possible in the RCC Development. For this reason, it is strongly recommended that a copy of the existing conditions plan required in Section 540.4.3 below be submitted at this stage. The Planning Board shall approve, approve with conditions, or disapprove the preliminary plan/RCC Sketch Plan within forty-five (45) days of receipt of a completed application. Upon receipt of the Planning Board's written decision regarding said plan, the applicant may submit a definitive subdivision and RCC Development plan in accordance with the Planning Board's written decision. If the above-noted forty-five (45) day time period has lapsed without a written decision being issued by the Planning Board, the applicant may submit a definitive subdivision and RCC Development plan in accordance with Section 540.4.3 of this Bylaw.
3. Definitive Subdivision and RCC Development Plan: The Definitive RCC Development Subdivision Plan shall show: location and boundaries of the site, proposed land and building uses, lot lines, location of open space, proposed grading, location and width of streets and ways, parking, landscaping, existing vegetation to be retained, water supply or approximate location of wells, drainage, proposed easements and methods of sewage disposal. A team including a Registered Civil Engineer, Registered Land Surveyor, and a Registered Landscape Architect shall prepare the plan. An accompanying Existing Conditions Plan shall depict existing topography, wetlands, waterbodies and the boundaries of the Flood Hazard Areas Overlay District, all existing rights of way, easements, existing structures, the location of significant features such as woodlands, tree lines, open fields or meadows, scenic views, watershed divides and

drainage ways,

fences and stone walls, roads, driveways, and cart paths. Submission of photographs depicting existing conditions, views and vistas from various locations on the property and from public and private ways shall accompany the plan submission. The Site Analysis shall also show locations of soil test pits and percolation tests, with supporting documentation on test results. Applicants shall also include a statement indicating the proposed use and ownership of the open space as permitted by this Bylaw. Applicants should refer to the Subdivision Rules and Regulations for provisions regarding preparation and submittal of plans.

4. Density/Number of Dwelling Units: The total number of dwelling units in a Residential Conservation Cluster shall be determined by the following formula:

a) [Total area of land subject to the application] – [Area of wetlands and waterbodies] = Applicable Land Area

[[Applicable Land Area] x [.75]] Divided by Minimum Lot Area Established for the Zoning District = Total number of dwelling units.

The number of dwelling units permitted in a Residential Conservation Cluster shall not exceed that which would be permitted under a conventional subdivision that complies with the Zoning Bylaw and the Subdivision Rules and Regulations of the Planning Board and any other applicable laws and regulations.

5. Review and Decision: Upon receipt of the application and the required plans, the Planning Board shall transmit one copy each to the Board of Health, Historical Commission, and Conservation Commission. Within forty-five (45) days of their receipt of the application/plans, these agencies shall submit any recommendations to the Planning Board. The Planning Board shall act on applications according to the procedure specified in G. L. c. 40A, sec. 9. Notice shall be provided of hearings in accordance with Chapter 40A, sec. 11 and Chapter 41, sec. 81T. Public hearings for the subdivision application and the special permit application shall be conducted concurrently.

6. Criteria for Special Permit Decision:

a) Findings: The Planning Board may approve the development upon finding that it complies with the purposes and standards of the RCC Development Bylaw and is superior in design to a conventional subdivision with regard to protection of natural features and scenic resources of the site. The Planning Board shall consider the following criteria in making its decision:

1. Upland open space as required by this Bylaw has been provided and generally conforms to the Design Requirements in Section 540.8 of this Bylaw.
2. Approximate building sites have been identified and are not located closer than one hundred (100) feet to wetlands and waterbodies.
3. Proposed streets have been aligned to provide vehicular access to each dwelling unit in a reasonable and economical manner. Lots and

streets have been located to avoid or minimize adverse impacts on open space areas and to provide lots with views of and access to the open space.

4. All lots meet the applicable dimensional requirements of Section **540.5** of the RCC Development Bylaw and all other relevant provisions of the Zoning Bylaw.

5. The provisions of Section 560 of the Zoning Bylaw will be met. The Planning Board's findings, including the basis of such findings, shall be stated in the written decision of approval, conditional approval or denial of the application for special permit.

b) Conditions: The Planning Board shall impose conditions in its decision as necessary to ensure compliance with the purposes of this Bylaw. Approval of an RCC Development shall be conditioned upon Definitive Subdivision approval and shall be conditioned to provide that no further division of land which increases the number of lots or results in an alteration to the area to be set aside as open space may occur without a modification of the special permit. Any alteration of lot lines or layout of ways shall require approval of the Planning Board and shall be in compliance with the requirements of the RCC Development Bylaw and the Subdivision Rules and Regulations.

c) Time Limit: A special permit is granted for a period of two (2) years from the date of its approval and shall lapse if substantial use or construction has not commenced by such date, except for good cause shown. In its sole discretion, the Planning Board may grant extensions to allow construction of subdivisions within the vested rights limits set forth in G.L. c. 40A, sec.6 except where such extension would derogate from the intent and purpose of this Bylaw.

d) Relationship to Subdivision Control Law: Nothing contained herein shall exempt a proposed subdivision from compliance with other applicable provisions of these Bylaws or the Subdivision Rules and Regulations of the Planning Board, nor shall it affect the right of the Board of Health and of the Planning Board to approve, condition or disapprove a subdivision plan in accordance with the provision of such Rules and Regulations and of the Subdivision Control Law.

540.5 Standards and Dimensional Requirements

Where the requirements of this section differ from or conflict with the requirements found elsewhere in this Bylaw, the requirements of this section shall prevail.

1. Minimum Lot Size: The minimum lot size shall be one-half (1/2) the square footage otherwise required by the Zoning District in which the project is located.

2. Minimum Frontage: The minimum frontage may be reduced from frontage otherwise required in the Zoning District, provided however that no lot shall have less than fifty (50) feet of frontage and provided further that such frontage reduction shall apply only to lots fronting on proposed internal roadways.

3. Setbacks: Provided that no objection to the contrary is raised by the Fire Department, the Planning Board may reduce by up to one-half (1/2) the setbacks otherwise required by the Zoning Bylaw if the Board finds that such reduction will result

in better design, improved protection of natural and scenic resources, and will otherwise comply with this Bylaw. Notwithstanding this provision or the requirements of the Zoning Bylaw, every dwelling fronting on the proposed roadways shall be set back a minimum of fifteen (15) feet from the roadway right-of-way, and a minimum of fifty (50) feet from the outer perimeter of the land subject to the application. This fifty (50) foot setback shall be maintained in a naturally vegetated state to screen and buffer the development and may be included within the open space. This setback may be eliminated where the proposed development abuts existing permanent open space. Wherever feasible, construction of the dwelling at the front setback line is encouraged.

4. Required Open Space: All land area not utilized for lots, roads, and drainage shall be set aside as open space. A minimum of sixty percent (60%) of the upland area of the parcel ("applicable land area") shall be provided as open space. As an exception, where the open space is proposed to be deeded to the Town or a qualified land trust pursuant to 540.7 of this Bylaw, and in fact, such a transfer occurs, a minimum of fifty percent (50%) of the upland area of the parcel shall be provided as open space. Applicants are encouraged to include wetlands and waterbodies within the open space; however, they do not count toward the open space requirement. Roadway rights-of-way shall not count toward the area to be provided as open space.

540.6 Permissible Uses of Open Space

1. Purposes: Open space shall be used solely for recreation, conservation, or agriculture purposes by residents and/or the public. Where appropriate, multiple use of open space is encouraged. At least half of the required open space may be required by the Planning Board to be left in a natural state. The proposed use of the open space shall be specified in the application. If several uses are proposed, the plans shall specify what uses will occur in what areas. The Planning Board shall have the authority to approve or disapprove particular uses proposed for the open space.

2. Leaching Facilities: Subject to the approval of the Board of Health, as otherwise required by law, the Planning Board may permit a portion of the open space to be used for components of sewage disposal systems serving the subdivision, where the Planning Board finds that such use will not be detrimental to the character, quality, or use of the open space, wetlands or waterbodies, and enhances the site plan. The Planning Board shall require adequate legal safeguards and covenants that such facilities shall be adequately maintained by the lot owners within the development. No portion of the open space containing components of a sewage disposal system(s) shall count toward the open space requirements of Section 540.5.4, nor shall any portion of said open space areas be accepted by the Town or conveyed to a nonprofit organization other than a corporation or trust described in Section 540.7(c).

540.7 Ownership of Open Space

1. Ownership Options: At the developer's option and subject to approval by the Planning Board, all areas to be protected as open space shall be:

- a) Conveyed to the Town to be placed under the care, custody and control of the Conservation Commission, and be accepted by it for a park or open space use. Land conveyed to the Town shall be open for public use;
 - b) Conveyed to a non-profit organization, the principal purpose of which is the conservation or preservation of open space, with a conservation restriction as specified below. Such organization shall be acceptable to the Town as a bona fide conservation organization; or
 - c) Conveyed to a corporation or trust owned or to be owned by the owners of lots or residential units within the development (i.e. "homeowners' association") and placed under conservation restriction. If such a corporation or trust is utilized, as indicated herein, ownership thereof shall pass with conveyance of the lots or residential units. The developer is responsible for the maintenance of the open space and other facilities to be held in common until such time as the homeowners' association is capable of assuming such responsibility. Thereafter, the members of the association shall share the cost of maintaining the open space. The Planning Board shall require the applicant to provide documentation that the homeowners' association is an automatic (mandatory) association that has been established prior to the conveyance of any lots within the subdivision.
2. Permanent Restriction: In any case when open space is not conveyed to the Town, a permanent conservation or agricultural preservation restriction, in accordance with G. L. c. 184 sec. 31, approved by the Planning Board and Board of Selectman, and enforceable by the Town, conforming to the standards of the Massachusetts Executive Office of Environmental Affairs, Division of Conservation Services, shall be recorded to ensure that such land shall be kept in an open or natural state and not be built for residential use or developed for accessory uses such as parking or roadways except as permitted by this Bylaw and approved by the Planning Board. Restrictions shall provide for periodic inspection of the open space by the Town. Such restriction shall be submitted to the Planning Board prior to approval of the project and recorded at the Registry of Deeds/Land Court simultaneously with recording of the definitive subdivision plan. A management plan may be required by the Planning Board that describes how existing woods, fields, meadows or other natural areas shall be maintained in accordance with good conservation practices.
3. Encumbrances: All areas to be set aside as open space shall be conveyed free of any mortgage interest, security interest, liens or other encumbrances.
4. Maintenance of Open Space: In any case where open space is not conveyed to the Town, the Town shall be granted an easement over such land sufficient to ensure its perpetual maintenance as conservation or recreation land. Such easement shall provide that in the event the trust or other owner fails to maintain the open space in reasonable condition, the Town may, after notice to the lot owners and public hearing, enter upon such land to maintain it in order to prevent or abate a nuisance. The cost of such maintenance by the Town shall be assessed against the properties within the development and/or to the owner of the open space. The Town may file a lien against the lot or lots to ensure payment of such maintenance expenses.

540.8 Design Process

Each development plan shall follow the design process outlined below. When the development plan is submitted, applicants shall be prepared to demonstrate to the Planning Board that this design process was considered in determining the layout of proposed streets, house lots, and contiguous open space.

1. Understanding the Site. The first step is to inventory existing site features, taking care to identify sensitive and noteworthy natural, scenic and cultural resources on the site, and to determine the connection of these important features to each other.
2. Evaluating Site Context. The second step is to evaluate the site in its larger context by identifying physical (e.g., stream corridors, wetlands), transportation (e.g., road and bicycle networks), and cultural (e.g., recreational opportunities) connections to surrounding land uses and activities.
3. Designating the Contiguous Open Space. The third step is to identify the contiguous open space to be preserved on the site. Such open space should include the most sensitive and noteworthy resources of the site, and, where appropriate, areas that serve to extend neighborhood open space networks.
4. Location of Development Areas. The fourth step is to locate building sites, streets, parking areas, paths and other built features of the development. The design should include a delineation of private yards, public streets and other areas, and shared amenities, so as to reflect an integrated community, with emphasis on consistency with Duxbury's historical development patterns.
5. Lot Lines. The final step is to draw the lot lines.

540.9 Design Requirements

The location of open space provided through this Bylaw shall be consistent with the policies contained in the Duxbury Comprehensive Plan and the Open Space and Recreation Plan, as amended. The following design requirements shall apply to open space and lots provided through this Bylaw:

1. Open space shall be planned as large, contiguous areas whenever possible. Long thin strips or narrow areas of open space (less than one hundred [100] feet wide) shall occur only when necessary for access, as vegetated buffers along wetlands or the perimeter of the site, or as connections between open space areas.
2. Open space shall be arranged to protect valuable natural and cultural environments such as stream valleys, wetland buffers, unfragmented forestland and significant trees, wildlife habitat, open fields, scenic views, trails, and archeological sites and to avoid development in hazardous areas such as floodplains and steep slopes. The development plan shall take advantage of the natural topography of the parcel and cuts and fills shall be minimized.
3. Open space may be in more than one parcel provided that the size, shape and location of such parcels are suitable for the designated uses. Where feasible, these parcels shall be linked by trails.

4. Where the proposed development abuts or includes a body of water or a wetland, these areas and the one hundred (100) foot buffer to such areas shall be incorporated into the open space. Where appropriate, reasonable access shall be provided to shorelines.
5. The maximum number of house lots compatible with good design shall abut the open space and all house lots shall have reasonable physical and visual access to the open space through internal roads, sidewalks or paths. An exception may be made for resource areas vulnerable to trampling or other disturbance.
6. Open space shall be provided with adequate access, by a strip of land at least twenty (20) feet wide, suitable for a footpath, from one (1) or more streets in the development.
7. Development along existing scenic roads and creation of new driveway openings on existing regional roadways shall be minimized.
8. Where a proposed development abuts land held for conservation purposes, the development shall be configured to minimize adverse impacts to abutting conservation land. Trail connections should be provided where appropriate.
9. Residential structures shall be oriented toward the street serving the premises.

540.10 Types of Buildings

The provisions of Section 410.1.1 notwithstanding, an RCC Development may consist of any combination of single-family, two-family and multifamily residential structures. A multifamily structure shall not contain more than three (3) dwelling units. The architecture of all multifamily buildings shall be residential in character, particularly providing gabled roofs, predominantly wood siding, an articulated footprint and varied facades.

540.11 Affordable Component

As a condition of the grant of any special permit for a RCC Development containing six (6) or more lots or dwelling units, the Planning Board shall ensure compliance with the provisions of Section 560 ("Inclusionary Housing") of the Zoning Bylaw.

540.12 Special Permit Requirements

In reviewing an application under this Bylaw, the Planning Board shall rely, to the extent warranted, on the provisions of Section 906.2 of the Zoning Bylaw.

560 INCLUSIONARY HOUSING

560.1 Purpose and Intent

The purpose of this Bylaw is to outline and implement a coherent set of policies and objectives for the development of affordable housing in compliance with the Duxbury Comprehensive Plan, G.L. c. 40B sec. 20-23 and ongoing programs within the Town to promote a reasonable percentage of housing that is affordable to moderate income buyers. It is intended that the affordable housing units that result from this Bylaw be considered as Local Initiative Program (LIP) dwelling units in compliance with the requirements for the same as specified by the Department of Community Affairs, Division of Housing and Community Development and that said units count toward the Town's requirements under G. L. c. 40B sec. 20-23.

560.2 Definitions

1. Affordable Housing Unit. A dwelling unit that qualifies as a local initiative unit under the Commonwealth's Local Initiative Program and meets the requirements of a subsidized housing unit for purposes of listing in the subsidized housing inventory under G. L. c. 40B Sec. 20-23.
2. Qualified affordable housing unit purchaser. An individual or family with household incomes that do not exceed 80% of the median income, with adjustments for household size, as reported by the most recent information from the United States Department of Housing and Urban Development (HUD) and/or the Massachusetts Department of Housing and Community Development (DHCD).

560.3 Applicability

1. Division of Land. This Bylaw shall apply to the division of land into six (6) or more lots, and shall require a special permit from the Planning Board under Section 530 or Section 540 of the Zoning Bylaw. A special permit shall be required for land divisions under G. L. c. 40A sec. 9 as well as for "conventional" or "grid" divisions allowed by G. L. c. 41 sec. 81-L and sec. 81-U, including those divisions of land that do not require subdivision approval.
2. Multiple Units. This Bylaw shall apply to the construction of six (6) or more dwelling units in accordance with Section 700 of the Zoning Bylaw, whether on one or more contiguous parcels, and shall require a special permit from the Board of Appeals.

560.4 Mandatory Provision of Affordable Units

The Planning Board or Board of Appeals shall, as a condition of approval of any development referred to in Sections 560.3.1 and 560.3.2, require that the applicant for special permit approval comply with the obligation to provide affordable housing pursuant to this Bylaw and more fully described in Section 560.5.

560.5 Provision of Affordable Units

The Planning Board or Board of Appeals shall deny any application for a special permit for development under Sections 530, 540, and 700, and this section if the applicant for special permit approval does not agree that:

1. At least ten percent (10%) of the lots in a division of land or units in a multiple unit development subject to this Bylaw shall be established as affordable housing units in any one or combination of methods provided for below. Fractions of a lot or dwelling unit shall be rounded up to the nearest whole number, such that a development proposing six (6) dwelling units shall require one affordable unit, a development proposing eleven (11) dwelling units shall require two affordable units and so on.
 - a) Constructed or rehabilitated on the locus subject to the special permit;
 - b) Constructed or rehabilitated on a locus different than the one subject to the special permit (see Section 560.8);
 - c) An applicant may offer, and the Planning Board or Board of Appeals, in concert with the Board of Selectmen, may accept donations of land in fee simple, on or off-site, that the Planning Board or Board of Appeals determines are suitable for the construction of affordable housing units. The value of donated land shall be equal to or greater than the value of the construction or set-aside of the affordable units. The Planning Board or Board of Appeals may require, prior to accepting land as satisfaction of the requirements of this Bylaw, that the applicant submit appraisals of the land in question, as well as other data relevant to the determination of equivalent value;
 - d) For non-rental affordable housing units, a cash payment to the Town of Duxbury Affordable Housing Trust may be made subject to Section 560.11 of this Bylaw.

The applicant may offer, and the Planning Board or Board of Appeals may accept, any combination of the Section 560.5.1(a)-(d) requirements provided that in no event shall the total number of units or land area provided be less than the equivalent number or value of affordable units required by this Bylaw.

560.6 Provisions Applicable to Affordable Housing Units On- and Off-Site

1. Siting of affordable units – All affordable units constructed or rehabilitated under this Bylaw shall be situated within the development so as not to be in less desirable locations than market-rate units in the development and shall, on average, be no less accessible to public amenities, such as open space, as the market-rate units.
2. Minimum design and construction standards for affordable units – Affordable housing units within market rate developments shall be integrated with the rest of the development and shall be compatible in design, appearance, construction and quality of materials with other units.
3. Timing of construction or provision of affordable units or lots – Where feasible, affordable housing units shall be provided coincident to the development of market-rate units, but in no event shall the development of affordable units be delayed beyond the schedule noted below:

MARKET-RATE UNIT %	AFFORDABLE HOUSING UNIT%
Up to 30%	None required
30% plus 1 unit	At least 10%
Up to 50%	At least 30%
Up to 75%	At least 50%
75% plus 1 unit	At least 70%
Up to 90%	100%

Fractions of units shall not be counted.

560.7 Marketing Plan for Affordable Units

Applicants under this Bylaw shall submit a marketing plan or other method approved by the Planning Board or Board of Appeals, to the Planning Board or Board of Appeals for approval, which describes how the affordable units will be marketed to potential homebuyers. This plan shall include a description of the lottery or other process to be used for selecting buyers. The marketing plan must describe how the applicant will accommodate local preference requirements, if any, established by the Board of Selectmen, in a manner that complies with the nondiscrimination in tenant or buyer selection guidelines of the Local Initiative Program.

560.8 Provision of Affordable Housing Units Off-Site

As an alternative to the requirements of Section 560.5.1(a), an applicant subject to the Bylaw may develop, construct or otherwise provide affordable units equivalent to those required by Section 560.5 off-site. All requirements of this Bylaw that apply to on-site provision of affordable units, shall apply to provision of off-site affordable units. In addition, the location of the off-site units to be provided shall be approved by the Planning Board or Board of Appeals as an integral element of the special permit review and approval process.

560.9 Maximum Incomes and Selling Prices: Initial Sale

1. The developer of the housing units or his/her agent shall verify prior to transferring title or executing a lease that each prospective purchaser or renter of an affordable housing unit created under this Bylaw is a household of low or moderate income, as defined by the Commonwealth's Local Initiative Program (LIP). Toward this end:

- a) The developer shall engage a qualified certifying agent acceptable to the Planning Board, or to the Board of Appeals for a special permit application pursuant to Section 700 of the Zoning Bylaw, to receive purchase or rental applications, obtain and review documentation concerning sources and amounts of household income, and certify to the Town that all purchasers or renters approved for an affordable unit meet LIP income eligibility requirements.
- b) The developer is responsible for making arrangements acceptable to the Planning Board, or to the Board of Appeals for a special permit application pursuant to Section 700 of the Zoning Bylaw, to provide annual certifications to

the Town as may be required to place and maintain the affordable units on the Commonwealth's Chapter 40B Subsidized Housing Inventory.

2. The maximum allowable purchase price or maximum allowable rent for affordable units created under this Bylaw shall comply with the regulations and guidelines of the Local Initiative Program (LIP).

560.10 Preservation of Affordability; Restrictions on Resale

Each affordable unit created in accordance with this Bylaw shall have the following limitations governing its resale. The purpose of these limitations is to preserve the long-term affordability of the unit and to ensure its continued availability to qualified purchasers in the future. The resale controls shall be established through a deed rider or an affordable housing restriction as defined by G.L. c.184, Section 31, recorded at the Plymouth County Registry of Deeds or the Land Court, and shall be in force for as long a period as is lawful. The affordable housing use restriction shall meet the requirements of the Local Initiative Program.

1. Resale price – Sales beyond the initial sale to a qualified affordable income purchaser shall include the initial discount rate between the sale price and the unit's appraised value at the time of resale. This percentage shall be recorded as part of the restriction on the property noted in Section 560.10. For example, if a unit appraised for \$300,000 is sold for \$225,000 as a result of this Bylaw, it has sold for seventy-five percent (75%) of its appraised value. If, several years later, the appraised value of the unit at the time of proposed resale is \$325,000, the unit may be sold for no more than \$243,750, or seventy-five percent (75%) of the appraised value of \$325,000.

2. Right of first refusal to purchase – The purchaser of an affordable housing unit developed as a result of this Bylaw shall agree to execute a deed rider prepared by the Town, granting, among other things, the Town's right of first refusal for a period not less than the maximum period allowable under guidelines set by the Department of Housing and Community Development for Local Initiative Units as defined by the Local Initiative Program, to purchase the property or assignment thereof, in the event that, despite diligent efforts to sell the property, a subsequent qualified purchaser cannot be located.

3. The Planning Board or Board of Appeals shall require, as a condition for special permit approval under this Bylaw, that the deeds to the affordable housing units contain a restriction against renting or leasing said unit during the period for which the housing unit contains a restriction on affordability.

4. The Planning Board or Board of Appeals shall require, as a condition for special permit approval under this Bylaw, that the applicant comply with the mandatory set-asides and accompanying restrictions on affordability, including the execution of the deed rider noted in Section 560.10. The Zoning Enforcement Officer shall not issue an

occupancy permit for any affordable unit until the deed restriction is recorded at the Plymouth County Registry of Deeds or the Land Court.

560.11 Fees in Lieu of Affordable Housing Units

As an alternative to Section 560.5 (a) through (c), an applicant may contribute a cash payment to the Town of Duxbury Affordable Housing Trust, to be used for the development of affordable housing by the Town or its designees, in lieu of constructing and offering affordable units within the locus of the proposed development or off-site.

1. Calculation of fees-in-lieu of units. The applicant for development subject to this Bylaw may pay a fee in lieu of the construction of affordable units. For each affordable unit not constructed or provided through one or a combination of the methods specified in 560.5 (a) through (c), the fee shall be an amount equal to the difference between the median sale price for new single-family homes built in Duxbury during the preceding three fiscal years, as determined and reported by the Board of Assessors, and the purchase price of a home that is affordable to a qualified purchaser.

a) For developments of multi-family condominiums, the Planning Board may substitute the median sale price for new condominiums built in Duxbury during the preceding three (3) fiscal years for the median sale price of new single-family homes.

b) The methodology used to determine an affordable purchase price shall comply with Local Initiative Program guidelines in effect at the time of application for a special permit.

c) The assumptions used to determine an affordable purchase price, including but not limited to minimum down payment, mortgage interest rate, term, closing and other costs shall be consistent with first-time homebuyer mortgage products available from commercial lending institutions located in or serving Duxbury at the time of application for a special permit, all in accordance with the Inclusionary Housing Submission Requirements and Procedures Manual adopted by the Planning Board and filed with the Town Clerk.

d) Upon adoption of this bylaw by town meeting, the Planning Board shall prepare and adopt an Inclusionary Housing Submission Requirements and Procedures Manual after holding a public hearing on the same.

2. Schedule of fees in lieu of construction. Fees in lieu of construction shall be paid to the Town of Duxbury Affordable Housing Trust by the applicant at the time of application for building permits, according to the applicant's choice of one of the two following payment schedules:

a) A lump sum total payment submitted with the initial building permit application in the amount as calculated in accordance with Section 560.11 and established with the Planning Department;

or

b) A prorated payment calculated in accordance with Section 560.11 and divided as equal per unit fees established by the Planning Department, initiated

with the first building permit application and paid in full with the filing of the building permit application representing the project's eighty percent (80%) completion.

570 AFFORDABLE HOUSING

570.1 Purpose

To facilitate affordable housing development on qualified pre-existing non-conforming lots as defined in this Bylaw. The intent of this section is to provide a mechanism for the construction of affordable housing units to satisfy the needs of the present and future inhabitants of Duxbury of low and moderate income. The Planning Board is designated as the Special Permit Granting Authority (SPGA) for purposes of this Bylaw and may grant a special permit for the specific and sole purpose of constructing an Affordable Housing dwelling pursuant to this section of this Bylaw.

570.2 Definitions

1. Affordable Housing Unit: See Section 560.2.1
2. Low and Moderate Income Household: A household income not exceeding eighty percent (80%) of the median household income, adjusted for household size, in the metropolitan or non-metropolitan statistical area that includes the Town of Duxbury, as determined annually by the U.S. Department of Housing and Urban Development (HUD).
3. Median Household Income: The median household income for the metropolitan or non-metropolitan statistical area that includes the Town of Duxbury, as determined annually by the U.S. Department of Housing and Urban Development (HUD).
4. Qualified Affordable Housing Unit Purchaser: See Section 560.2.2.
5. Use Restriction: A deed restriction or other legal instrument recorded in the Plymouth County Registry of Deeds or land court registry district which effectively restricts the occupancy of an affordable housing unit to households of low and moderate income during the term of affordability. Selection of eligible tenant/owners shall be made in a fair and reasonable manner in compliance with any and all applicable fair housing and antidiscrimination laws.
6. Upland Area: All lands not defined herein as wetlands.
7. Floor Area Ratio (FAR): Gross floor area of all buildings on the lot measured in square feet, divided by the total square footage of the entire lot.
8. Vacant Lot: A lot absent of any man-made structure above the surface.
9. Appraised Value: An opinion of value developed by a Massachusetts licensed real estate appraiser that conforms to the Uniform Standards of Professional Appraisal Practice (USPAP).
10. Effective Date: March 8, 2008.

570.3 Special Permit Criteria for Eligible Lots

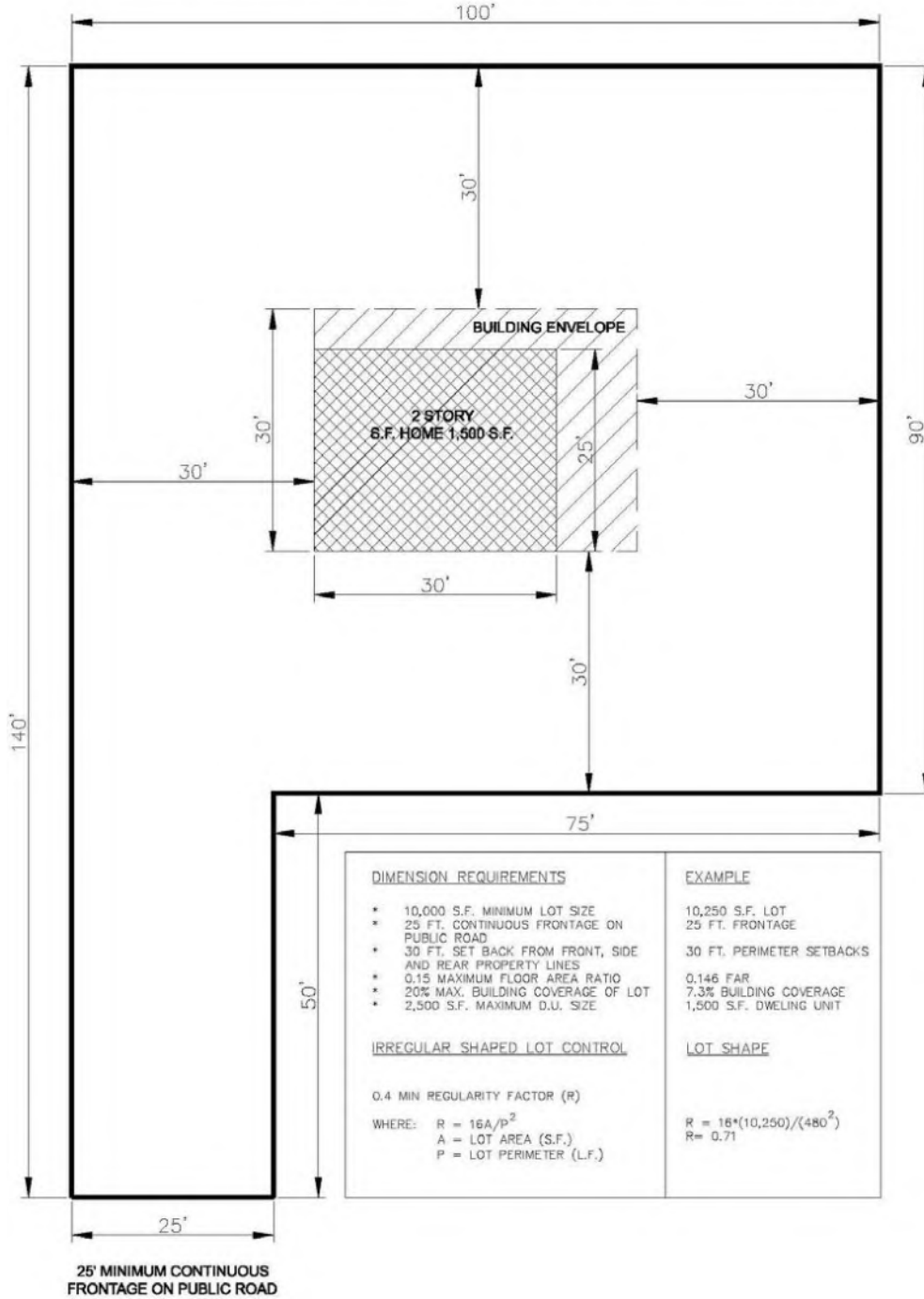
The Planning Board, as the Special Permit Granting Authority (SPGA) under this section of the Bylaw, may grant a special permit to allow construction of an Affordable Single Family Housing Unit on an eligible parcel of land in the Residential Compatibility (RC) and Planned Development (PD) Zoning Districts that meets the following criteria:

1. Pre-Existing Lot: Eligible parcels must have existed as a separate lot of record prior to the effective date of this Bylaw (the "Effective Date"). No landowner shall be eligible for more than one (1) affordable housing unit lot from a single parcel of land, or from adjoining parcels of land in common ownership, based on the ownership status of the land as determined by instruments and plans on file at the Plymouth County Registry of Deeds as of the Effective Date. No affordable housing unit lot shall be further divided. The Planning Board shall note such limitations, with a description of the land affected by such limitations, in its written decision.
2. Existing Ownership and Use: Eligible lots must be in private ownership and vacant prior to and following the Effective Date. Eligible lots may also be owned by the Duxbury Affordable Housing Trust and/or any other non-profit housing entity.
3. Dimensional Characteristics: Eligible lots must meet the dimensional characteristics prior to the Effective Date:
 - a) Lot Area: Minimum ten thousand (10,000) square feet of upland area.
 - b) Continuous Frontage: Twenty-five (25) feet on a public road.
 - c) Lot Shape: See Section 570.3.13 below.
4. Setbacks: All structures must be set back thirty (30) feet from all front, side and rear property lines.
5. Access: The applicant shall provide for safe access for public safety vehicles and personnel to the dwelling unit to be constructed on the lot, and the intersection of such access driveway to the public way shall be placed across the frontage in the best location available to the applicant.
6. Dwelling Unit Size and Coverage: The size of a dwelling unit and number of bedrooms in the Aquifer Protection Overlay District (APOD) zone shall meet the requirements of Section 406 herein.
7. Floor Area Ratio: The maximum floor area ratio (FAR) of the dwelling shall not exceed 0.15 up to a maximum of two thousand five hundred (2,500) square feet per dwelling unit. Future additions or alterations that would exceed the two thousand five hundred (2,500) square feet maximum floor area ratio are prohibited once a special permit has been issued.
8. Minimum and Maximum and Dwelling Unit Size: Each Affordable Housing Unit shall contain a minimum area of seven hundred (700) square feet with one (1) bedroom; a minimum area of eight hundred fifty (850) square feet with two (2) bedrooms; a minimum area of one thousand two hundred (1,200) square feet with three (3) bedrooms; or a minimum area of one thousand four hundred (1,400) square feet with four (4) bedrooms or more. The maximum dwelling unit size shall not exceed the FAR.
9. Utilities: All utilities shall be installed underground.

10. Purchase or Rent: The Affordable Housing Unit permitted by this section shall be restricted for purchase or rent by only low and moderate households, in accordance with the standards set forth in this section.
11. Parking: All private parking areas shall be contained entirely on the property.
12. Plans: The applicant shall submit, along with the special permit application, a surveyed site plan depicting the proposed affordable housing unit and lot layout. The plan shall be prepared by a registered land surveyor, and shall be in such form as will be required for recording with the Registry of Deeds or filing with the Land Court.
13. Control of Substantially Irregular Lot Shape: No lot shall be created which is substantially irregular in shape. For the purposes of this section, a lot is "substantially irregular" if it has a regularity factor which is less than 0.4 as determined by the following formula: $r = 16A/P^2$ where r = regularity factor; A = area of the lot (in square feet); and P = perimeter of the lot (in feet). Lots less than 0.4 by the applied formula shall be considered ineligible for the purposes of this Bylaw. (See Figure 1 below).
14. Other Requirements: All other requirements of Article 500 and the remainder of this Bylaw shall remain applicable and in full force and effect.

FIGURE 1

EXAMPLE OF ELIGIBLE LOT FOR AFFORDABLE HOUSING UNIT



570.4 Use Restrictions

Any affordable housing unit created under this section shall be subject to a use restriction/regulatory agreement on the lot conforming to the following criteria:

1. The restriction shall be assured in perpetuity or for the longest period of time allowed by applicable law.
2. The restriction shall be recorded as a condition of deed or mortgage.
3. The restriction shall have a legal mechanism for compliance that occurs without Town intervention in any form or manner.
4. The restriction shall include a process for verification of compliance.
5. The restriction shall ensure that the affordable housing unit may only be sold to Qualified Affordable Housing Unit Purchasers at an affordable price, or leased to Qualified Affordable Housing Unit Renters at affordable rents, subject to Section 570.6.3 herein.
6. The restriction shall provide that the affordable housing unit must be sold or rented on a fair and open basis.

For purposes of this bylaw, the Town of Duxbury either through the Duxbury Housing Authority or any designee established by the Town, agrees to perform the duties of Monitoring Agent and to adhere to the responsibilities as defined in the Monitoring and Marketing Agreement entered between the Town and the applicant.

570.5 Maximum Incomes and Selling Prices: Initial Sale

1. Proof of Income Eligibility: To ensure that only eligible households may purchase affordable housing units pursuant to this Bylaw, the purchaser of an affordable housing unit shall be required to submit copies of the last three (3) years' federal and state income tax returns and certify, in writing and prior to transfer of title, to the developer of the housing units or his/her/their agent, and within thirty (30) days following transfer of title, to the local housing trust, community development corporation, housing authority or other agency as established by the Town, that his/her or their family's annual income level does not exceed the maximum level as established by the Commonwealth's Department of Housing and Community Development, and as may be revised from time to time.
2. Maximum Housing Cost: The maximum housing cost for affordable units created under this Bylaw is as established by the Commonwealth's Department of Housing and Community Development, Local Initiative Program, as may be revised from time to time, or as revised from time to time by the Town.

570.6 Preservation of Affordability; Restrictions on Resale

1. Preservation of Affordability: Each affordable unit created in accordance with this Bylaw shall have limitations governing its resale. The purpose of these limitations is to preserve the long-term affordability of the unit and to ensure its continued availability for affordable income households. The resale controls shall be established through a

use restriction on the property pursuant to Section 570.4 above and shall be in full force and effect in perpetuity or the longest period of time allowed by applicable law.

2. Resale Price: Sales beyond the initial sale to a qualified affordable income purchaser shall include the initial discount sale price not to exceed ninety percent (90%) of the property's appraised value (as defined under Section 570.1 above) at the time of sale. This percentage shall be recorded as part of the restriction on the property pursuant to Section 570.4 above.

3. Right of First Refusal to Purchase: The purchaser of an affordable housing unit developed as a result of this Bylaw shall agree to execute a deed rider approved by the Town, consistent with model riders prepared by Department of Housing and Community Development, granting, among other things, the Town of Duxbury or the Duxbury Affordable Housing Trust the right of first refusal to purchase the property in the event that a subsequent qualified purchaser cannot be located.

4. Deed Restrictions: The Planning Board shall require, as a condition for a special permit under this Bylaw, that the applicant comply with the mandatory set-asides and accompanying restrictions on affordability, including the execution of a regulatory agreement pursuant to Section 570.4 above. The Building Commissioner/Inspector shall not issue a building permit for any affordable unit until the regulatory agreement is recorded.

570.7 Conflict with Other Bylaws

The provisions of this Bylaw shall be considered supplemental of existing zoning bylaws. To the extent that a conflict exists between this Bylaw and others, the more restrictive bylaw, or provisions therein, shall apply.

570.8 Review by Special Permit Granting Authority

Prior to granting a special permit for an affordable housing unit under this section, the Planning Board must make the following findings:

1. The proposed affordable housing unit will be in harmony with the general purpose and intent of the Bylaws;
2. The increase in density resulting from the grant of a special permit will not adversely affect the surrounding neighborhood;
3. The placement of a new single family housing unit on the non-conforming lot can be accomplished without jeopardizing public health or safety, and without detriment to the environment; and
4. In determining whether or not to grant a special permit for development of an affordable housing unit lot, and in determining what conditions, if any, to impose on such a special permit, the Planning Board may consider, among other things, circumstances related to soil conditions, topography, lot history, wetlands, floodplains, proposed building locations, and public safety and convenience.

570.9 Severability

If any provision of this Bylaw is held invalid by a court of competent jurisdiction, the remainder of this Bylaw shall remain in full force and effect.

ARTICLE 600 - SPECIAL REGULATIONS

601 SIGN REGULATIONS

The provisions of Section 601 shall apply to all zoning districts.

The purpose of the following regulations to all types of signs is to reasonably regulate the size, location, illumination and types of materials in order to:

1. Encourage signs that have locations, materials and designs that are compatible with the surrounding neighborhood and buildings;
2. Eliminate excessive and confusing signs; and
3. Eliminate potential hazards to motorists and pedestrians.

601.1 Definitions

Sign

Any word, letter, symbol, drawing, picture, design, device, article or object which advertises, calls attention to or indicates the location of any premises, person or activity; whatever its manner of composition or construction and however displayed.

Accessory Sign

A sign, which advertises or indicates the person occupying the premises on which it is erected or the business transacted thereon or advertises the property itself for sale or rent and which contains no other matter.

Freestanding Sign

Any sign not attached to a building.

Hanging Sign

Any sign which projects more than eight (8) inches from a wall or façade.

Primary Sign

A sign which contains information on the name of the business, the owner, and/or goods or services offered, located on the same side of the premises as the main entrance.

Sign, Area of

1. The area of a sign shall be considered to include all lettering, wording, and accompanying designs and symbols, together with the background on which they are displayed, any frame around the sign and any "cutouts" or extensions, but shall not include any supporting structure or bracing.
2. The area of a sign consisting of individual letters or symbols attached to or painted on a surface, building, wall or window, shall be considered to be that of the smallest quadrangle or a triangle which encompasses all of the letters and symbols.
3. The area of a sign consisting of a three-dimensional object shall be considered to be the area of the largest vertical cross-section of that object.

4. In computing the area of double faced signs, the area of one side shall be used.

Sign, Temporary

Any sign maintained for a continuous period of not more than thirty days in a calendar year.

601.2 Procedure

A written application for the installation of all types of signs shall be submitted at the office of the Zoning Enforcement Officer, including signs requiring Special Permits. The application shall include all information necessary to determine compliance with the regulations of this Bylaw.

601.3 General Requirements

1. In all districts, all exterior signs or advertising devices erected or maintained must, unless expressly provided, conform to the following requirements.
2. The information contained on all signs for business shall be limited to the type of business, goods or service offered and name of business and/or owner.
3. Whenever possible, a flush mounted sign attached to the wall of the building shall be used. The method of attaching the sign must be approved by the Zoning Enforcement Officer.
4. If, in the opinion of the Board of Appeals a flush mounted sign would not be adequately visible from a public way, a Special Permit may be sought from the Board of Appeals for the erection of one freestanding sign of not more than two faces. The Special Permit may be conditional upon restrictions that regulate design, illumination, size, colors and construction.
5. Private signs shall not be placed on publicly owned property unless authorized by the Board of Selectmen.
6. Signs not exceeding one square foot containing cautionary or directional information for traffic flow require the approval of the Zoning Enforcement Officer. Informational, directional and traffic signs owned and installed by a government agency are permitted by right.
7. Sign materials should be durable and easy to maintain. Materials such as wood, brass or bronze are most appropriate.
8. In the case of a sign for business use, a primary sign containing information on the name of the business, owner, and goods or services offered shall be limited to one that is located on the same side of the building as the main entrance. In addition, one accessory sign may be erected on any other side of the building in view of a parking area or public way.

601.4 Signs Requiring Special Permit Approval

All freestanding signs and projecting/hanging signs, which are attached by a bracket to a wall and project more than eight inches, require a Special Permit issued by the Board of Appeals.

1. Sign applications for a Special Permit approval must include the following information: Three (3) copies of a scale drawing showing the dimensions of the proposed sign, construction details, any designs or logo, lettering, colors, materials and a cross section of the sign with dimensions. The proposed location of the sign must be identified on a photograph or scale architectural drawing of the building that shows the height above grade and any other necessary dimensions or design features requested by the Board of Appeals. The Design Review Board shall review the application and submit its comments to the Board of Appeals.
2. Proposed signs should, by their location and design, be harmonious with the buildings and sites that they occupy. When acting upon a Special Permit application for a sign, the Board of Appeals shall consider the proposed sign in relation to the character of the building and surrounding neighborhood. Signs should be informative, legible and designed to improve the quality of the streetscape.

601.5 Signs Approved by the Zoning Enforcement Officer

Flush mounted, awning, special events and temporary signs require approval of the Zoning Enforcement Officer.

1. Applications for sign permits must include two copies of the following information. The proposed size, colors, dimensions, materials and location of the sign in sufficient detail for the Zoning Enforcement Officer to evaluate the application. The method of attaching the sign to a structure or erecting the sign must be described.
2. The Zoning Enforcement Officer shall evaluate the proposed sign's location, size, materials, and design to determine if the sign is in compliance with the dimensional regulations set forth in Section 601.6 prior to issuance of a sign permit.

601.6 Dimensional Requirements

General: Lettering shall not exceed fourteen (14) inches in vertical dimension.

1. Awning Signs: Advertising on awnings must be painted on or attached flat against the surface of the awning and not project beyond the valance nor be attached to the underside.
2. Cautionary Signs: Not to exceed three (3) square feet in area.
3. Directional Signs: Not to exceed three (3) square feet in area.
4. For Sale, Rent or Lease Signs:
 - a) Advertising a lot, building or portion thereof: not to exceed six (6) square feet in area;
 - b) Advertising lots or buildings in approved subdivisions: not to exceed twenty (20) square feet in area or be larger than ten (10) linear feet any side.
5. Flush Mounted Signs: Not to exceed one (1) square foot for each linear foot of the façade or wall on the side of the premises containing the main

entrance minus the area of any accessory signs, to a maximum of fifty (50) square feet.

6. Freestanding Signs: Not to exceed twenty-five (25) square feet in area with a maximum height of twelve (12) feet and a minimum height above the ground of thirty (30) inches.

7. Hanging Signs: Not to exceed five (5) square feet in area with the lowest part of the sign a minimum of ten (10) feet above ground and not extending above the top of the wall or façade.

8. Temporary Signs:

a) Political signs: May be erected.

b) Special Event Signs: Not to exceed six (6) square feet in area, may be erected no sooner than fourteen (14) days before the event, and must be removed no later than twenty-four (24) hours after the event.

9. Window Signs: Signs mounted on windows in addition to the requirements for flush mounted signs, shall not cover more than thirty percent (30%) of the window area.

601.7 Prohibited Signs

1. No sign shall extend above the roof line of the building to which it is fastened.

2. Electric or any other powered signs shall not blink, flash or have moving parts. Neon signs are prohibited. Signs containing reflective elements which sparkle in the sunshine are not permitted.

3. Billboards are not permitted.

4. Any sign advertising a business or organization no longer located on the premises is not permitted.

5. Any signs that obstruct the corner clearance, clear site triangle of any intersection as defined in Section 603.10.3 of this Bylaw are not permitted.

6. String lights used in connection with commercial enterprises, except for temporary lighting used for decoration during the specific holiday season.

601.8 Exempted Signs

1. Signs not exceeding one square foot in area and bearing only property numbers, names of occupants or other identification of premises not having commercial connotations.

2. Flags and insignia of any government except when displayed in connection with commercial promotion.

3. Legal notices, identification, informational or directional signs erected or required by governmental bodies.

4. Carved or other integral devices identifying the building name or date of erection.

5. Signs directing and guiding traffic and parking on private property, but bearing no advertising matter.

6. Standard gasoline pumps, vending machines, or similar devices bearing thereon in usual size and form the product name and type, provided that copy area not exceed four (4) square feet.

7. Temporary signs erected for any charitable or religious cause or allowed by the Board of Selectmen.

8. Signs not exceeding three (3) square feet, necessary to warn of a hazard or to post land, shall be permitted as required to accomplish these purposes.

9. Signs that advertise the sale, lease or rent of a lot or building shall be located only on the property which is being advertised. Signs shall not exceed six (6) square feet in area or two in number. One sign advertising the sale of lots or buildings in approved subdivisions is permitted at the intersection of the new and existing streets. Said sign shall not exceed twenty (20) square feet or be greater than ten (10) feet in any dimension. Any such signs shall be removed within five days of the lease or sale of the premises or the sale of the last lot in the subdivision.

601.9 Illumination

Signs may be illuminated by a constantly steady white light that is shielded and directed at the sign in order to prevent direct glare on a public way or adjacent property. Signs using interior lighting shall have non-exposed white lights of reasonable intensity. Signs shall only be lighted during the hours of operation and shall require a Special Permit.

601.10 Nonconforming Signs

Nonconforming signs shall not be altered by changing the design, construction, wording, painting or lighting without written approval of the Zoning Enforcement Officer.

601.11 Enforcement

1. Maintenance and Removal:

Every sign shall be maintained in good structural condition at all times. All signs shall be kept neatly painted, including all metal parts and supports thereof that are not galvanized or of rust resistant material. The Zoning Enforcement Officer shall inspect and shall have the authority to order the painting, repair, alteration or removal of a sign which shall constitute a hazard to safety, health, or public welfare by reason of inadequate maintenance, dilapidation, or obsolescence.

2. Abandoned Signs:

Except as otherwise provided in the section, any sign that is located on property which becomes vacant and is unoccupied for a period of three months or more, or any sign which pertains to a time, event or purpose which no longer applies, shall be deemed to have been abandoned. Permanent signs applicable to a business temporarily suspended because of a change of ownership or management of such business shall not be deemed abandoned, unless the property remains vacant for a period of six months or more. An abandoned sign

is prohibited and shall be removed by the owner of the sign or owner of the premises.

3. Dangerous or Defective Signs:

No person shall maintain or permit to be maintained on any premises owned or controlled by him any sign which is in a dangerous or defective condition. Any such sign shall be removed or repaired by the owner of the sign or the owner of the premises.

4. Removal of Signs by the Zoning Enforcement Officer:

The Zoning Enforcement Officer shall cause to be removed any sign that endangers the public safety, such as an abandoned, dangerous, or materially, electrically, or structurally defective sign, or a sign for which no permit has been issued.

603 PARKING REGULATIONS

603.1 General Requirements

Off-street parking shall be provided in all zoning districts for new construction, conversion, expansion or increase in intensity of use for any structure. In the case of an expansion or conversion these standards shall apply to the expanded or converted areas.

603.2 Use of Setback Areas for Parking

In Neighborhood Business Districts, a strip not less than ten feet wide on which to grow grass, bushes, flowers or trees shall be maintained open, unpaved and not parked upon along each side and rear property line of such a lot wherever it abuts a residential district.

603.3 Purpose

The purposes of the parking standards are to:

1. Provide adequate parking for business and residences in all zoning districts.
2. Promote traffic safety for both vehicular and pedestrian traffic.
3. Ensure orderly access and egress to and from the public way.
4. Protect abutting residential properties from such nuisances as noise, fumes, headlight glare, dust and increased surface water runoff from the land covered by impervious surfaces.
5. Provide visual relief from broad expanses of pavements and vehicles.
6. Reduce congestion on public ways.

603.4 Number of Parking Spaces, Loading Areas

The following table sets forth the required number of parking spaces and loading areas for uses in all zoning districts. The Board of Appeals may, by Special Permit allow fewer spaces than are required below if they make a finding that the proposed use or site

conditions do not warrant the number of spaces specified in this section. The Zoning Enforcement Officer shall determine the number of parking spaces required for any use or structure not specifically provided for in this section.

PARKING REQUIREMENTS FOR PERMITTED USE

TYPE OF USES	REQUIRED NUMBER OF SPACES
In All Districts:	
Dwelling/apartment over business structure	2 spaces
Automobile retail and service establishment and other retail and service establishments involving usually extensive display areas, either indoor or outdoor in relation to customer traffic.	2 spaces per 800 square feet of gross floor space. In case of outdoor display areas, one space for each 1,000 square feet of lot area.
Commercial, retail, and personal service establishments. Professional and business offices, including banks, insurance, and real estate establishments.	1 space per 300 square feet of gross floor area.
Medical / dental office / clinics / kennels / veterinary establishments	5 spaces per professional office / establishment. Parking areas adequate to accommodate, under normal conditions, the vehicles of occupants, employees, members, customers, clients, and visitors to the premises, shall be provided as determined by the Board of Appeals.
Gas / service stations	3 spaces for each service bay.
Funeral parlors	10 spaces per reposing room.
Restaurants, taverns	1 space for every 4 seats. One additional space for every 2 employees on the largest shift.
All other business uses, including, but not limited to, farm stands, tradesman’s shops, storage, or distribution plants.	Parking spaces adequate to accommodate, under normal conditions, the vehicles of occupants, employees, members, customers, clients, and visitors to the premises shall be provided as determined by the Board of Appeals.

603.5 Design Standards

All parking spaces shall have dimensions of nine feet in width and eighteen and one half feet in length. Curbing or wheel stops shall be used where needed for safety or to delineate spaces in gravel lots. A maximum of two feet of landscaped setback area adjacent to the front or back of the stall for bumper overhang, may be used to satisfy the stall length requirements.

All driveways and maneuvering aisles shall be designed so that traffic flows freely at all times and can exit and enter into a public way being driven in a forward direction. All travel aisles must be a minimum of twenty-four feet wide.

Parking and loading areas shall not be located wholly or partially within the right-of-way of a public street.

603.6 Drainage / Surfacing

1. Parking and loading areas shall be designed and constructed to contain all stormwater runoff on the premises. The drainage system shall be designed and constructed to include the following:
 - a) Oil and grease traps;
 - b) Accommodate the fifteen-year storm event if connected to an existing Town system; connections are subject to Town Engineer's approval; and
 - c) All structures within parking and loading areas shall be designed for H-20 loading capacity.
 - d) Best Management Practices in accordance with industry standards and Massachusetts Department of Environmental Management Guidelines for Stormwater Management, as revised.
2. The following information shall be submitted for review of the drainage design:
 - a) Location and types of inlets;
 - b) Drainage watershed limits, flow paths and acreage of areas tributary to drainage structures and water detention areas;
 - c) The location, type, size, length, invert elevations and slope of all drainage pipes and culverts;
 - d) Construction details of proposed drainage structures including inlets, outlets, manholes, pipes, headwalls and all other proposed drainage structures;
 - e) The location of wetlands and waterbodies within one hundred feet of the site. The boundaries of wetland areas shall be approved by the Duxbury Conservation Commission.
 - f) Drainage calculations prepared by a registered professional engineer, licensed in the Commonwealth of Massachusetts.

All drainage systems must be constructed to adequately dispose of surface water generated on that property and to have low maintenance.

Consideration must be given to the location of snow piles and where meltwater will travel. This must be accounted for in the drainage design.

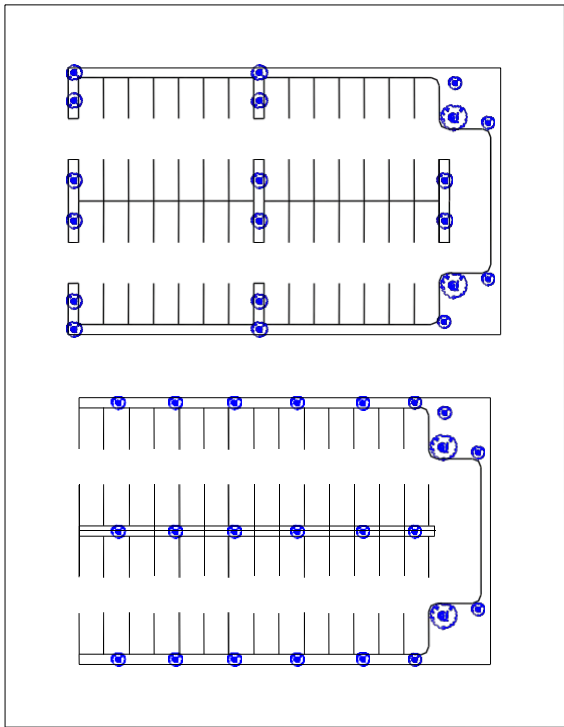
603.7 Lighting

Where lighting is needed, it shall be designed and located so as to provide sufficient illumination of the ground below, for the safe passage and identification of vehicles and pedestrians in the immediate areas and directed away from any public or private way or adjacent property. An average of three- to five-foot candle lighting level throughout the parking area shall be required for safe and sufficient illumination. Lighting shall not

be projected from the lighting fixture in excess of a forty-five degree angle above the parking lot. Where lighting levels in excess of the above average are deemed necessary by owners, lessees or others exercising control of said parking areas, the Board of Appeals may grant a Special Permit for lighting level in excess of five foot candles. The type and height of lighting fixtures is subject to review by the Board of Appeals and the Design Review Board.

603.8 Landscaping

1. In large parking areas with fifty or more spaces, the parking lot shall be subdivided by landscaped islands. The landscaped islands shall have a width of not less than three feet and shall be planted with bushes and mulched or otherwise designed as stormwater Best Management Practices (green infrastructure). One tree or bush shall be provided for every five parking spaces. The diagram below illustrates two alternative types of parking for landscaping.
2. A landscaped elevated berm shall be provided adjacent to the traveled way to separate parking and other uses from the road. This buffer strip shall be planted with grass and shrubs or trees. Plantings must not obstruct the clear sight distance of driveways.
3. Storage and loading areas, dumpsters, utility buildings, machinery and other unsightly uses shall be screened from view by a tight fence or dense plantings.
4. All areas that are landscaped must be properly maintained. Trees and shrubs that die must be replaced within one growing season.
5. Parking areas that abut the Residential Compatibility District shall provide a ten-foot (10') landscaped buffer strip that will adequately screen the parking lot from residential buildings. Trees, hedges, bushes, berms or tight fences shall be provided. All landscaped areas shall be properly maintained. Shrubs or trees that die must be replaced within one (1) growing season.



603.9 Mixed Uses

In the case of mixed uses, the required parking spaces shall be the sum of the requirements of the individual uses computed separately. Parking facilities for one use shall not be considered as providing the required parking spaces for any other use unless it can be clearly demonstrated that the need for parking occurs at different times.

603.10 Entrance Requirements

1. **Curb Cuts:** The number of curb cuts on state and local roadways shall be minimized in order to promote the orderly flow of traffic on public streets and provide for pedestrian safety. The number of driveways shall be limited to two per street line. To the extent feasible, access to business shall be provided by one of the following:
 - a) Access via a common driveway serving adjacent lots or businesses;
 - b) Access via an existing side street;
 - c) Access via a cul-de-sac or loop road that serves adjacent lots or business.
2. **Width:** The width of an entrance or exit for one-way traffic shall not be less than twelve (12') feet wide. The width of a driveway for two way traffic shall be twenty-four (24') feet wide. Both shall have the appropriate radius curbing installed.
3. **Sight Distance:** All driveways serving a business must comply with the corner clearance requirements of this section. Parking plans shall include delineation of the clear sight triangle. Clear sight distance at the intersection of a driveway serving a business and an existing way shall be defined by a clear sight triangle at the intersection. Two sides of the triangle shall coincide with the centerline of the access road and the existing way respectively. The third side of the triangle, measured from the centerline of the access road at a point thirty (30') feet from the centerline of the existing way, shall be identified as the clear sight distance. Depending on the speed limit along the existing way, the minimum sight distance shall be as follows:

Maximum Design Approach Speed	Clear Sight Distance
45 mph*	350 feet
35 mph	250 feet
25 mph	150 feet

*miles per hour

Measurements of the clear sight distance shall be based on a line of sight at a level three and one-half (3.5) feet above road surface at each end of the clear sight distance.

Inside the clear sight triangle, no vision-obstructing object or landscaping shall be permitted between a height of three and one-half (3.5') feet and eight (8') feet above the plane identified by the adjacent curb grades.

603.11 Loading Zones

Areas for loading and unloading shall be provided in all parking lots. They shall be of sufficient size to accommodate all vehicles making routine deliveries to the facility. The location of the loading areas shall be designed so that trucks can maneuver safely and conveniently to and from the public way and, when in use, vehicles do not block the public way, any parking space or parking lot aisle. The areas used for the loading zone cannot be used for parking.

603.12 Handicapped Parking

All parking lots shall provide for handicapped parking in accordance with the Rules and Regulations of the Architectural Access Board, 521 CMR 1.00-3.00.

603.13 Erosion Control

During and after construction all soils, mulch, wood chips, etc. will be confined to the property.

603.14 Location of Facilities

Required off-street parking facilities shall be provided on the same lot. Where the requirements of the section cannot be met on the same lot, the Board of Appeals may, by Special Permit, allow the provision of the required parking on any lot in the same zoning district and in the same ownership within three hundred (300') feet of the use served or on a municipal parking lot located within three hundred feet of the use served.

603.15 Change of Use

Whenever there is an expansion or change of the use of a property which necessitates an increase of more than twenty percent (20%) of the required parking as measured by the parameters of this Bylaw, the required parking facilities shall be provided.

603.16 Restrictions

Parking areas shall be used for registered motor vehicle parking only, with no sales, dead storage, repair work, dismantling or servicing of any kind. The required parking areas shall be permanently available for use by patrons and employees of establishments for which such space was provided.

Section 609 DEMOLITION OF HISTORICALLY SIGNIFICANT BUILDINGS

609.1 Purpose

This Bylaw is adopted to protect and preserve buildings and structures within the Town, which reflect or constitute distinctive features of the architectural, cultural, economic, political, or social history of the Town and to encourage the preservation and restoration rather than demolition of such buildings and structures. By furthering these purposes, the public welfare shall be promoted, making the Town a more attractive and desirable place in which to live, learn and work.

609.2 Definitions

Demolition

The intentional act of pulling down, destroying, removing, or razing a building or structure or commencing the work of total or substantial destruction with intent of completing same.

Regulated Buildings or Structures

The provisions of this Bylaw shall apply only to buildings or structures which in whole or in part were built seventy-five (75) years or more prior to the date of the application for a demolition permit and are:

- a) Listed or eligible to be listed on the National Register of Historic Places, or on the State Register of Historic Places; or
- b) Associated with one or more historic persons or events, or with broad architectural, cultural, economic, political or social history of the Town; or
- c) Historically or architecturally significant in terms of period style, method of building construction or association with a significant architect or builder either by itself or as part of a group of buildings.

609.3 Procedures

No permit for the demolition of any building or structure shall be issued other than in conformity with this Bylaw. Upon receipt of an application for a demolition permit, the Zoning Enforcement Officer shall forward a copy to the Historical Commission and to the Planning Director.

Within thirty (30) business days of receipt of the application from the Zoning Enforcement Officer to the Commission, the Commission shall make a determination whether or not the building or structure is a "regulated building or structure." If the Commission determines that the building or structure is not regulated by this Bylaw, it

shall sign the permit immediately and forward it to the Zoning Enforcement Officer who shall issue the permit.

If the Commission determines that the building or structure is regulated by this Bylaw, it shall review the application for demolition at a public hearing to be held within twenty (20) business days of determining that the building or structure is a regulated building or structure. The Commission shall publish a notice of the hearing in a newspaper of local circulation during each of the two weeks preceding the date of the public hearing, noting the date, location and subject of the hearing. Such notice shall be paid for by the applicant for a demolition permit. The Commission shall also mail, certified return receipt, a copy of said notice to the applicant, and, by regular mail, to the owners of all properties within three hundred (300') feet of the regulated building's or structure's property as they appear on the most recent real estate tax list of the Board of Assessors; and the Planning Board.

No more than ten (10) business days after the public hearing on the demolition permit, the Commission shall make its determination and notify the applicant in writing stating its reasons with a copy to the Zoning Enforcement Officer and Planning Director.

If a determination is made that the building or structure is historically significant meeting one of the three criteria of a "regulated building or structure," the Zoning Enforcement Officer shall not issue a demolition permit for a period of twelve (12) months from the date of determination.

Once the Commission determines the building or structure is historically significant and demolition should be delayed, within forty five (45) days, the Commission shall invite the owner of record of the building, the Zoning Enforcement Officer, the Planning Director, and a representative of the Design Review Board to participate in an investigation of alternatives to demolition including but not limited to incorporation of the building or structure; utilization of financial incentives to rehabilitate the building or structure; seeking new owners willing to purchase and preserve, restore or rehabilitate the building or structure, or moving the building or structure.

The Zoning Enforcement Officer may issue a demolition permit prior to the expiration of the twelve (12) month period after receiving written notice from the Commission that:

- a) The Commission is satisfied that there is no reasonable likelihood that either the owner of some other person or group is willing to purchase, preserve, rehabilitate, restore or relocate such building or structure; or
- b) The Commission is satisfied that the owner has made continuing, bona fide, and reasonable efforts to locate a purchaser to preserve, rehabilitate, restore or relocate the subject building or structure, and that such efforts have been unsuccessful. These efforts could include, but not be limited to, listing the building with a realtor or realtors, advertising in local general circulation newspapers; and advertising in one Boston general circulation newspaper; or

c) The applicant has agreed to accept specific conditions approved by the Commission.

A decision by the Commission is transferable to another party; however, it expires two years from the date of the determination. If demolition has not occurred prior to the expiration of the determination, a new application for a demolition permit must be filed prior to any subsequent demolition.

In an emergency, nothing in this Bylaw shall prohibit the Zoning Enforcement Officer from exercising the authority of G. L. c. 143, but the Zoning Enforcement Officer shall make every reasonable effort to inform the Commission of his actions in such an emergency.

610 WIRELESS TELECOMMUNICATIONS SERVICES FACILITIES

610.1 Purpose

The purpose of this section is to regulate the design and location of wireless telecommunications service facilities in a manner that minimizes the visual and environmental impacts of such facilities consistent with both the requirements of the Federal Telecommunications Act of 1996, 47 U.S. C. sec 332(c) et seq., and rights conferred to local government thereby. The standards set forth herein are intended to preserve the safety, character, appearance, property values, natural resources and historic structures of the Town; mitigate adverse visual effects through proper design, location and screening; encourage co-location of antennas on a structure where feasible in order to minimize the number of sites and structures required; encourage location of antennas on existing towers; and protect the Town from the effects of uncontrolled development and location of wireless telecommunications towers, wireless service facilities and accessory structures, while recognizing federally granted rights of carriers to provided necessary and marketable telecommunications services and the desire of the public and the Town departments to access and utilize new technologies.

610.2 Scope

In addition to any applicable sections of the Protective Bylaw, Section 610 shall apply to all wireless telecommunications service antennas and tower related equipment, fixtures and enclosures, including any modifications to any of these, but shall not apply to Police, Fire, ambulance or any other communications systems used by the Town, amateur ham radio or citizens band radio antennas, or non-transmitting television antennas.

610.3 Definitions

Above Ground Level (AGL)

A measure of vertical distance from the average existing natural grade of a site at the base of a wireless service structure to a point of a structure.

Antenna

The surface from which wireless radio signals are sent and/or received by a wireless service facility.

Camouflaged

A wireless service facility that is disguised, hidden, part of an existing or proposed structure or placed within an existing or proposed structure is considered "camouflaged".

Carrier

A company that provides wireless service.

Co-location

The use of a single mount on the ground by more than one carrier (vertical co-location) and/or several mounts on an existing building or structure by more than one carrier.

Environmental Assessment (EA)

An EA is the document required by the Federal Communications Commission (FCC) and the National Environmental Policy Act (NEPA) when a wireless service facility is placed in certain designated areas.

Equipment Shelter

An accessory, enclosed structure, cabinet, shed or box at the base of the mount within which are housed batteries and electrical equipment.

Fall Zone

The area on the ground within a prescribed radius from the base of a wireless service facility. The fall zone is the area within which there is a potential hazard from falling debris (such as ice) or collapsing material.

Guyed Tower

A monopole or lattice tower that is secured to the ground or other surface by diagonal cables.

Licensed Carrier

A company authorized by the FCC to construct and operate a commercial mobile radio services system.

Monopole

The type of mount that is self-supporting with a single shaft of wood, steel or concrete and a platform (or racks) for panel antennas arrayed at the top.

Mount

The structure or surface upon which antennas are mounted, including the following four types of mounts:

- 1) Roof-mounted. Mounted on the roof of a building.
- 2) Side-mounted. Mounted on the side of a building.
- 3) Ground-mounted. Mounted on the ground.
- 4) Structure-mounted. Mounted on a structure other than a building.

Omnidirectional (Whip) Antenna

A thin rod that transmits and/or receives a signal in all directions.

Panel Antenna

A flat surface antenna usually developed in multiples.

Radio Frequency Engineer (RF)

An engineer specializing in electrical or microwave engineering, especially the study of radio frequencies.

Radio Frequency Emission

The emissions from wireless service facilities.

Security Barrier

A locked, impenetrable wall, fence or berm that encloses an area to prevent unauthorized entry or trespass.

Telecommunications Specialist

A qualified professional with expertise in monitoring of electromagnetic fields and telecommunications engineering who has a record of service to municipalities.

Tower

A structure that is intended to support equipment used to receive and/or transmit electromagnetic waves. Design examples include: lattice tower (self-supporting with multiple legs and cross-bracing structural steel) and monopole (self-supporting with a single shaft).

Wireless Telecommunications Service Facility

Facility, fixture, structure or equipment for the provision of wireless services for resale or lease, as defined by the Federal Telecommunications Act, used or intended for use by a public utility or an FCC-licensed carrier.

Wireless Telecommunications Services

All forms of wireless communication included in the definition in the Federal Telecommunications Act of 1996, including commercial mobile radio services, licensed wireless services, common carrier wireless exchange services and other forms of wireless communication of a similar nature. Common carrier wireless exchange services include cellular telephone services, communications systems and paging services, wireless computer networking, wireless internet access and wireless communication services of a similar nature. Wireless telecommunications services shall not be construed to include a telephone exchange.

610.4 Use Regulations

A wireless telecommunications service facility shall require a building permit in all cases and may be permitted as follows:

1. A wireless telecommunications service facility antenna may be attached to any existing lattice tower, monopole, utility pole, electric utility transmission tower or water tank in any zoning district, except on towers supporting antennas used for citizen's bands, amateur radio, or television receiving antennas, provided that the installation of the new facility does not substantially alter the size or increase the height of the existing structure. Issuance of a building permit for such installations shall require prior site plan approval by the Planning Board in accordance with the applicable requirements

and determinants under Section 615. The installation of a wireless telecommunications service facility attached to such existing structure may exceed the height of the existing structure by no more than ten (10) feet, subject to the issuance of a Special Permit by the Board of Appeals and prior site plan approval by the Planning Board.

2. A wireless telecommunications service facility antenna may be installed within any existing church steeple in any zoning district, provided such antenna and accessory equipment is completely enclosed and not visible from outside the structure.

3. A wireless telecommunications service facility antenna may be installed within any structure used exclusively for business in a business district, provided such antennas are completely enclosed and not visible from any adjacent street. Issuance of a building permit for such installations shall require prior site plan approval by the Planning Board in accordance with the applicable requirements and determinants under Section 615.1. The installation of an exterior wireless communication facility antenna on a structure used exclusively for business in a business district shall not exceed the existing height of the building by more than ten (10) feet, subject to the issuance of a Special Permit by the Board of Appeals and prior site plan approval by the Planning Board.

4. A wireless telecommunications service facility tower and accessory equipment shelter(s) may be constructed provided the maximum tower height shall be one-hundred (100) vertical feet above ground level. Whip antennas may extend a maximum of ten (10) feet above the top of a tower. Such facilities shall require a Special Permit by the Board of Appeals and prior site plan approval by the Planning Board. Guyed towers are prohibited. No more than one such tower may be located on a lot.

5. Wireless telecommunications service facilities and antennas shall not be located:

a) Within or on residences, business structures within which there is a dwelling unit, schools, nursing homes, or structures of historic significance, and except as otherwise permitted under Section 610.5(2);

b) Within one-hundred (100) feet, or such greater distance at which radio frequency emissions therefrom can be detected and determined unacceptable by the Duxbury Board of Health, of a dwelling unit, school, nursing home, or structure of historic significance, except where a greater separation is required under Section 610.6(3);

c) Within any area in which the Telecommunications Specialist has determined that the applicant has adequate coverage and capacity measured by the minimum FCC standards for such coverage and capacity;

d) In the Dunes Protection District and Wetlands Protection Overlay District or in wetlands, wetland buffer areas or other environmentally sensitive natural areas that are subject to the jurisdiction of the Conservation Commission under the Massachusetts Wetlands Protection Act, the Duxbury Wetlands Bylaw or this Bylaw, without approval of the Conservation Commission. All proposals shall be subject to review by the Conservation Commission as authorized by state and local regulations.

610.5 Dimensional Requirements

1. Height
 - a) Height shall be one-hundred (100) vertical feet above ground level. Whip antennas may extend a maximum of ten (10) feet above the top of a tower. The maximum height of any equipment shelter shall be twelve (12) feet above ground level.
 - b) Existing structures. New wireless telecommunication service antennas may be attached to any existing tower, monopole, utility pole, electric transmission tower or water tank in any zoning district, except on towers supporting antennas used for citizen's bands, amateur radio, or television receiving antennas, provided that such structure is not increased in vertical height or substantially altered except for strengthening and maintenance. Installation of a wireless service facility on such existing structure may exceed the height of the original structure by up to ten (10) vertical feet, subject to a Special Permit by the Board of Appeals and prior site plan approval by the Planning Board.
 - c) Business District. The installation of a wireless telecommunication service facility antenna on a business structure shall not exceed the maximum vertical height of the original structure by more than ten (10) feet, subject to issuance of a Special Permit by the Board of Appeals and prior site plan approval by the Planning Board.
- 2) Setback from Side Lot Lines and Street. Any wireless telecommunications service tower shall be set back from adjacent lot lines and any street line by the sum of its vertical height above ground level and the height of the highest attached whip antenna above the structure, or by its fall zone, whichever is greater.
- 3) Setback from Nearest Dwelling Unit. The minimum distance from the center of the tower base of any wireless telecommunications service tower to a dwelling unit located on adjacent or nearby property shall be four hundred (400) feet.
4. Equipment Shelters. An equipment shelter accessory to a tower shall not exceed an aggregate of eight hundred (800) square feet in structure footprint. No more than one (1) such above-ground auxiliary structure shall be constructed.

610.6 Approval Standards

Approval Standards. In addition to the standards for Special Permits under Section 906.2 of the Bylaw, all wireless telecommunications service facilities and any equipment shelters shall meet the following standards:

1. Federal and State Requirements. Wireless telecommunications service facilities and equipment shelter shall be constructed, installed, maintained and used in compliance with all applicable Federal and State laws, rules and regulations.
2. Visibility. Wireless telecommunications service facilities shall be as unobtrusive as possible and, if mounted on a business structure, shall be compatible with the style and color of the structure upon which it is located.
 - a) Camouflage. Where a wireless telecommunications service facility extends over the roof height of a business structure on which it is mounted, every

reasonable effort shall be made to conceal the facility within or behind architectural features to limit its visibility from streets and adjacent properties. Facilities mounted on a roof shall be stepped back from the front façade in order to mitigate impact on the building silhouette. Wireless telecommunications service facilities that are side-mounted shall blend with the existing structure's architecture and, if over five (5) square feet, shall be painted or screened with material that is consistent with the design features and materials of the building.

b) Color. Wireless telecommunications service facilities that are side-mounted or top-mounted on business structures shall be painted or constructed of materials to match the color of the building material to which they are attached. All other facilities including towers shall be painted or finished in light gray / blue hue that blends with sky and clouds, shall not be lighted, and shall not be painted with hazard paint.

c) Existing on-site vegetation shall be preserved to the maximum extent practicable.

3. Co-Location. To the extent feasible, licensed carriers and Town communication systems shall co-locate on a single wireless telecommunications service monopole or tower. The Town shall reserve the right to place its communications antenna(s) within the top twenty (20) percent of the vertical height above ground level of any monopole or tower in order to accommodate its communications needs. It shall remain the licensed carrier's responsibility to ensure that the installation or location of other antenna(s) on the monopole or tower does not cause interference with the Town's communications system. Such facility shall be designed insofar as is reasonable to structurally accommodate foreseeable future users. A new tower or monopole facility shall be considered only upon a finding that existing or approved structures or facilities cannot accommodate the equipment planned for the proposed facility.

4. Fencing. Fencing at least eight (8) feet in height shall be erected around the base of any wireless telecommunications service tower or monopole and any equipment shelter sufficient to prevent public entry to the facility. Barbed wire is prohibited.

5. Plantings. A dense hedge of fast-growing, evergreen material shall be planted and maintained around the exterior of required fencing. This material shall not be less than four (4) feet in height when planted. The Board of Appeals may require that evergreen trees and/or other suitable material be planted between a wireless telecommunications tower facility and residential units.

6. Signs. No exterior signs shall be installed on a wireless telecommunications service tower, equipment shelter, surrounding property or fence, except as necessary for security, safety, and to identify the property.

7. Lighting. Lighting of an equipment shelter or a wireless telecommunications service tower is prohibited except insofar as required for security and maintenance purposes at ground story level. Such lighting shall be shielded from adjacent properties by a total cutoff of light at the property line, and foot-candle measurements at the property line shall be 0.0 foot-candles when measured at grade.

8. Noise. Ground-mounted equipment for wireless telecommunication service facilities shall not generate noise in excess of fifty (50) dB at the property line. Roof-

mounted or side-mounted equipment for wireless telecommunications service facilities shall not generate noise in excess of fifty (50) dB at ground level at the base of the building closest to the antenna.

9. **Radio Frequency Radiation (RFR) Standards.** All equipment proposed for a wireless telecommunications service facility shall be authorized in accordance with the FCC Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation.

10. **Fumes and Hazardous Waste.** The generation of noxious fumes and the storage or disposal of hazardous waste on the site of a wireless telecommunications service facility is prohibited.

11. **Access.** Any driveway required to construct and maintain a wireless telecommunications service tower shall not be paved and shall minimize cut and fill and vegetation removal to the maximum extent practicable.

12. **Utilities.** Any utility lines to serve a wireless telecommunications tower facility shall be placed underground.

610.7 Administration

1. **Special Permit Granting Authority.** The Special Permit granting authority shall be the Board of Appeals, which shall review and decide applications for wireless telecommunication service facilities that require the issuance of a Special Permit under Section 610.4 Use Regulations, in accordance with the procedures and standards set forth in Sections 906.2 and 906.4, the requirements and standards of Section 610, and the findings and conclusions of the Planning Board pursuant to Section 615.

2. **Site Plan Approval.** The site plan approval authority shall be the Planning Board, which shall report its findings and conclusions under Section 615, and any regulations it may adopt, to the Zoning Enforcement Officer within twenty-five (25) days of receipt of an application for a building permit for a wireless telecommunications service facility antenna that does not require a Special Permit under Section 610.5. For those wireless telecommunication service facilities that require a Special Permit under Section 610.4, the Planning Board shall report its findings and conclusions under Section 615, and any regulations it may adopt, to the Board of Appeals five (5) days prior to the public hearing on the Special Permit application.

3. **Submission Requirements**

a) An application for a building permit for the installation of a wireless telecommunications service facility antenna that does not require a Special Permit under Section 610.4 shall include for submission to the Zoning Enforcement Officer seventeen (17) copies of a site plan(s) that shall meet the applicable requirements of Section 615, and shall provide such other information as is necessary to show compliance with the applicable provisions and standards of Section 610 and any regulations adopted by the Planning Board. Such plan(s) shall also be submitted by the applicant to the Planning Board.

b) An application for a Special Permit for the construction of a wireless telecommunications service facility shall, in addition to the above submission requirements, include for submission to the Board of Appeals seventeen (17) copies of the following:

- (i) The name, address, telephone number, and original signature of any applicant(s), who shall include a licensed telecommunications carrier.
- (ii) Identification of the subject property by name of nearest ways, street address, assessors map parcel number.
- (iii) A map, to scale, showing lot lines of the subject property, the location of all buildings and accessory structures on all properties within 300 feet of the proposed wireless services facility and within 1000 feet of a proposed tower, property lines of all properties adjacent to the subject property within 300 feet of the subject property line, location of the proposed wireless telecommunication services facility and any equipment shelter, location of any existing ways on the subject property, and any proposed driveway for the wireless telecommunication service facility.
- (iv) Proposed changes to the subject property, including grading, vegetation removal and drainage prepared by a registered civil engineer, and a landscaping plan prepared by a registered landscape architect.
- (v) Plans and elevations, dimensioned and to scale, and specifications of any proposed structure, mount, antennas, equipment shelter, signs, plant material, fencing and buffers, showing location on building façade or roof, height above building roof and existing grade, dimensions, materials, color and camouflage, parking area, and any other construction attendant to the facility.
- (vi) A map showing the anticipated range of coverage for a proposed wireless telecommunications service facility and the location and range of coverage of any existing wireless telecommunications facility within six (6) miles of the subject property.
- (vii) Where a wireless telecommunications tower is proposed, a map showing the farthest point from which the facility will be visible and eight (8) view lines in a one (1) mile radius from the subject property, beginning at True North and continuing clockwise at forty-five (45) degree intervals. Two (2) weeks prior to the public hearing, the Board of Appeals may require the applicant to float a balloon or use a crane test at the location of the facility, at its maximum proposed elevation, to demonstrate its height and visibility from Town ways and neighborhood dwelling units. The balloon shall be at least four (4) feet in diameter. The time and date of this demonstration, and a rain date, shall be advertised in a newspaper of general circulation in the Town one (1) week prior to the test, such advertisement to be paid for by the applicant.
- (viii) An explanation shall be submitted as to the reasons and process used in selecting a site for the construction or installation of a wireless telecommunications service facility and other alternatives explored.
- (ix) Where a wireless telecommunications tower is proposed, a report shall be required for a registered structural engineer on safety aspects. The report shall include manufacturer's specifications for a proposed tower describing the reasons for its design, safety aspects, its capacity for

co-location, including the location, number and type of antennas it can accommodate.

(x) Where there are existing dwelling units within one thousand (1000) feet of a proposed wireless telecommunications tower or monopole, the applicant shall submit sight line graphs or photographic superimpositions showing the appearance of the tower at completion from the three (3) dwellings that are closest or most significantly affected.

(xi) Copies of submittals to all state and Federal agencies pertaining to licensing shall be submitted, and if a tower or monopole is proposed, documentation from the Federal Aviation Administration (FAA) must be submitted stating that it has determined that hazard lighting and paint are not required. Prior to the issuance of a building permit, copies of the FCC license, and any other required Federal or state licenses, shall be submitted to the Zoning Enforcement Officer.

(xii) Any required environmental assessment under the National Environmental Policy Act (NEPA), and/or by the FCC, shall be submitted.

(xiii) Any materials proposed for use within a wireless telecommunications service facility that are considered hazardous under state, Federal, or local laws shall be listed by location, type, and amount, including trace elements.

(xiv) An ambient emissions baseline reading and plan for continuous monitoring and certification by a radio frequency engineer, stating that radio frequency emission measurements are accurate and meet FCC and state guidelines, shall be submitted, as well as the maximum projected range of emissions from any wireless telecommunications facility.

(xv) If lighting at ground-story level is proposed for security and maintenance purposes, the applicant shall indicate the locations and types of lighting proposed and submit a manufacturer's computer-generated, point-to-point printout, indicating the horizontal foot-candles at grade within the site, and twenty-five (25) feet beyond the property lines.

4. Referral. The Board of Appeals shall refer a Special Permit application and all related submittals, plans, and statements to Town boards and commissions for their written comments and recommendations pursuant to Section 906.4.

5. Telecommunications Specialists. The Planning Board and the Board of Appeals may each hire a telecommunications specialist as they deem necessary to assist with their respective reviews of an application for a building permit or Special Permit under this Bylaw. The boards may adopt regulations establishing a fee for such professional services to be paid by the applicant(s).

6. Monitoring and Maintenance. The owner/operator of any wireless telecommunications service facility shall annually, after the issuance of a certificate of zoning compliance by the Zoning Enforcement Officer under Section 904.2, submit calculations of cumulative radio frequency emissions levels to the Zoning Enforcement Officer and Board of Health. The calculations shall be signed and certified by a registered radio frequency engineer and shall include a statement that they meet the

emissions standards of the FCC and Massachusetts Department of Health. The owner/operator shall maintain a facility in good appearance and operating condition including structural repair, painting of the facility and equipment shelter, and maintenance of fencing, screening, and landscaping.

7. Fees.

a) A performance bond equal to the removal cost of the proposed wireless telecommunications service facility and restoration of the site may be required as a condition of approval, such bond to be submitted to the Zoning Enforcement Officer prior to issuance of a building permit, and held by the Town Treasurer.

b) In addition to a building permit fee, a monitoring fee to be determined by the Zoning Enforcement Officer shall be required and used to create and maintain an inventory of all wireless telecommunications service antennas in the Town and to monitor emissions and maintenance.

8. Proof of Continued Operation. The owner/operator or successor shall, prior to January 1 of each year subsequent to the date of issuance of a certificate of zoning compliance for a wireless telecommunications service facility, file a signed affidavit with the Zoning Enforcement Officer and Town clerk stating that the facility is in operation. Failure to do so shall be construed as meaning the facility is no longer in use.

9. Amendment of Special Permit. If at any time after the issuance of a Special Permit, the FAA notifies the owner/operator that hazard lighting and paint are required for a wireless telecommunications service tower, the owner/operator shall notify the Zoning Enforcement Officer and Board of Appeals, and shall file a request for an amendment to the Special Permit. The Board of Appeals shall, after a public hearing, determine whether the Special Permit should be rescinded, or amended to require a reduction in the height of such tower, sufficient for a determination by the FAA that hazard lighting and paint are not required.

10. Abandonment. All wireless telecommunications service facilities and equipment shelters not in use for a period of one (1) year shall be dismantled and removed at the owner/operator's expense following notification by the Zoning Enforcement Officer to the owner/operator. The site shall be restored to its pre-construction condition to the extent practicable, with the exception of landscaping improvements. Absent such removal and restoration after notification, the Zoning Enforcement Officer shall initiate action to dismantle a facility and restore the site.

610.8 Validity

The invalidity of any provision of this section shall not render invalid any other provision of this section.

611 LAND CLEARING AND GRADING REGULATION

611.1

The purposes of this Bylaw are to:

1. Protect the health, safety and property of the residents of the Town by regulating clearing and grading activities associated with land development, preserving

- existing trees and vegetation, preventing erosion and sedimentation of inland and coastal wetlands, ponds and other waterbodies, controlling stormwater runoff, minimizing fragmentation of wildlife habitat and loss of vegetation;
2. Limit land clearing and alteration of natural topography prior to development review;
 3. Protect specimen trees and significant forest communities from damage or removal during site development;
 4. Protect water quality of adjacent wetlands and surface water bodies;
 5. Encourage the use of Best Management Practices that prevent and reduce nonpoint source of pollutants;
 6. Promote land development and site planning practices that are responsive to the Town's scenic character without preventing the reasonable development of land;
 7. Protect archaeological and/or historic resources.

611.2 Definitions

In this Bylaw, the following words have the meanings indicated:

Applicant

Any person proposing to engage in or engaged in any non-exempt clearing of trees or under-story vegetation or grading within the Town.

Best Management Practices (BMPs)

A structural, nonstructural, or managerial technique recognized to be the most effective and practical means to prevent and reduce nonpoint source pollutants. BMPs should be compatible with the productive use of the resource to which they are applied, and should be cost-effective.

Caliper

American Association of Nurserymen standard for measurement of trunk size of nursery stock. Caliper of the trunk shall be taken 6 inches above the ground up to and including 4-inch caliper tree, and 12 inches above the ground for larger sizes.

Certified Arborist

A professional who possesses the technical competence through experience and related training to provide for or supervise the maintenance of trees and other woody plants in the residential, commercial, and public landscape.

Clearing

Removal or causing to be removed, through either direct or indirect actions, trees, shrubs, sand and gravel and/or topsoil from a site, or any material change in the use or appearance of the land. Actions considered to be clearing include, but are not limited to: causing irreversible damage to roots or trunks; destroying the structural integrity of vegetation; and/or any filling, excavating, grading, or trenching in the root area of a tree which has the potential to cause irreversible damage.

Dripline

An area encircling the base of a tree which is delineated by a vertical line extending from the outerlimit of a tree's branch tips down to the ground.

Essential Root Zone

An area located on the ground between the tree trunk and 10 feet beyond the drip-line of a tree which is required for protection of a tree's root system.

Diameter/Diameter-Breast-Height(dbh)

The diameter of any tree trunk, measured at 4.5 feet above existing grade.

Filling

The act of transporting or placing (by any manner or mechanism) material from, to, or on any soil surface or natural vegetation.

Grading

Any excavating, filling, clearing, or the creation of impervious surface, or any combination thereof, which alters the existing surface of the land.

Hazardous Tree

A tree with a structural defect or disease, or which impedes safe sight distance or traffic flow, or otherwise currently poses a threat to life or property.

Landscape Architect

A person licensed by the Commonwealth of Massachusetts to engage in the practice of landscape architecture.

Protected Tree/Vegetation

A tree or area of understory vegetation identified on an approved landscape plan to be retained and protected during construction.

Specimen Tree

A native, introduced or naturalized tree that is important because of its impact on community character, its significance in the historic/cultural landscape or its value in enhancing the effects of wildlife habitat. Any tree with a dbh of 6 inches or larger is eligible to be considered a specimen tree. Trees that have a small height at maturity or are slow growing, such as flowering dogwood or American holly with a dbh of four (4) inches or larger are eligible to be considered specimen trees.

Significant Forest Community

Unfragmented forests including forest types that provide habitat for rare species, unusual ecological processes, highly diverse forest communities, rare forest types, and those forest types which maintain connections between similar or different habitat patches.

Site Alteration Special Permit

A Special Permit issued by the Planning Board authorizing land clearing and grading activities in the Town.

Understory Vegetation

Small trees, shrubs, and groundcover plants, growing beneath and shaded by the canopy of trees.

611.3 Applicability

The Special Permit Granting Authority under Section 611 shall be the Planning Board. No person shall undertake clearing or grading activities of an area greater than 30,000 square feet at any one time or in increments such that the total land area of abutting property within the control of any person graded in a thirty-six (36) month period will exceed 30,000 square feet, without first obtaining a Site Alteration Special Permit from the Planning Board, unless specifically exempted under Section 611.5 of this Bylaw.

611.4 Review and Decision

Upon receipt of a completed application and required plans as described in Section 611.6 below, the Planning Board shall transmit one copy each to the Conservation Commission, Zoning Enforcement Officer, Director of Lands and Natural Resources, and Department of Public Works. Within 45 days of receipt of completed application/plans, these agencies shall submit recommendations to the Planning Board. The Planning Board shall act on applications according to the procedure specified in G. L. c. 40A, sec.9 and Section 906.2 of the Zoning Bylaw.

611.5 Exemptions

The provisions of this Bylaw shall not apply to the following activities:

1. Clearing and grading in conjunction with construction of structures intended for residential habitation if the land area to be cleared or graded is less than 30,000 square feet;
2. Removal of hazardous trees, as defined herein;
3. Routine maintenance of vegetation and removal of dead or diseased limbs and/or trees necessary to maintain the health of cultivated plants, to contain noxious weeds and/or vines in accordance with a Department of Environmental Management (DEM) – approved Forest Management Plan, or to remedy a potential fire or health hazard or threat to public safety;
4. Construction and maintenance of public and private streets and utilities within Town-approved roadway layouts and recorded easements;
5. Work conducted in accordance with a valid earth removal permit issued by the Board of Selectmen under Section 8.1 of the General Town Bylaws;
6. Agricultural activities work conducted in accordance with an approved Natural Resource Conservation Service Agricultural Plan;
7. Construction of roadways, associated infrastructure and related slope and view easements for subdivisions shown on a definitive plan approved and endorsed by the Planning Board in accordance with Duxbury Subdivision Rules and Regulations, or a Planned Development approved by the Board of Appeals in accordance with Article 700 of the Zoning Bylaws;
8. Construction or installation of public utilities; and

9. Construction of structures, roadways, parking lots, and associated activities for nonresidential structures or uses in receipt of a Special Permit from the Board of Appeals or Planning Board.
10. Clearing and grading activities in the Dune Protection District in accordance with plans approved and permitted by local, state and federal agencies.

611.6 Application Requirements

The Planning Board may require the submission of some or all of the information listed as 1 through 9 below. Said determination to be made in relation to the extent of clearing proposed by the applicant. For example, the clearing of 35,000 square feet to create a residential dwelling would not typically require the same degree of information necessitated by a proposal to clear 100,000 square feet of land for a commercial structure.

1. Survey of existing vegetation conducted by an individual qualified through appropriate academic credentials and field experience. A statement of credentials should be submitted with the survey.
 - (a) Major upland vegetational communities located on the site, including trees, shrub layer, ground cover and herbaceous vegetation;
 - (b) Size and height of trees, noting specimen trees and/or forest communities; and
 - (c) Location of any rare and endangered species as mapped by the Massachusetts Natural Heritage Program.
2. Submission of a locus map at a scale of 1" = 500' showing the proposed site in relation to the surrounding area.
3. Submission of a plan at a scale of 1" = 40' of the project site showing existing and proposed contour lines at intervals of not more than 2 feet prepared by a registered land surveyor or a professional engineer.
4. Soil survey or soil logs indicating predominant soil types on the project site, including information on erosion potential from the Natural Resources Conservation Service.
5. Delineation of all bodies of water, including wetlands, vernal pools, streams, ponds, and coastal waters within 100 feet of the project site/limit of work and delineation of the Flood Hazard Areas Overlay District boundaries.
6. Submission of a plan at a scale of 1" = 40' indicating the limit of work. The limit of work shall include all building, parking, and vehicular use areas, and any grading associated with the proposed development. The plan or accompanying narrative shall document the species and quantities of specimen trees and/or other vegetation to be removed or relocated within the project area.
7. Construction schedule that describes the timing of vegetation removal, transplanting or replacement in relation to other construction activities.
8. Plans and/or description of Best Management Practices to be employed in development of the project site.
9. Submission of an erosion and sedimentation control plan at a scale of 1" = 40'.

This plan shall include BMPs for erosion and sediment control (vegetative and/or structural) to prevent surface water from eroding cut and fill side slopes, road shoulders and other areas and measures to avoid sedimentation of nearby wetlands and ponds. The following information shall be submitted on erosion control and sedimentation plans submitted with the project application:

- a) Plans and details of any sediment and erosion control structure drawn at a scale of 1" = 40';
- b) Spillway designs showing calculations and profiles;
- c) Notes and construction specifications;
- d) Type of sediment trap;
- e) Drainage area to any sediment trap;
- f) Volume of storage required;
- g) Outlet length or pipe sizes; and
- h) A description of the sequence of construction activities that specifies the time frame for soil stabilization and completion and any necessary winter stabilization measures.

611.7 Review Standards

The applicant shall demonstrate that the following measures are employed in the clearing or grading of the site:

1. Minimize site alteration/land clearing:
 - a) Site/building design shall preserve natural topography outside of the development footprint to reduce unnecessary land disturbance and to preserve natural drainage channels on the site.
2. Clearing for utility trenching shall be limited to the minimum area necessary to maneuver a backhoe or other construction equipment. Roots should be cut cleanly rather than pulled or ripped out during utility trenching. Tunneling for utility installation should be utilized wherever feasible to protect root systems of trees.
3. Protect hilltops and/or scenic views within Duxbury:
 - a) Placement of buildings, structures, or parking facilities shall not detract from the site's scenic qualities and shall blend with the natural landscape. Building sites shall be directed away from the crest of hills, and foundations shall be constructed to reflect the natural terrain.
4. Protect wildlife habitat:
 - a) Sites shall be designed in such a way as to avoid impacts to rare and endangered species and wildlife habitat on a site, and to maintain contiguous forested areas.
5. Avoid impacts to archaeological resources:
 - a) Applicants shall submit a response from the Massachusetts Historical Commission (MHC) regarding the potential for archaeological or historical resources on the site.
6. Preserve open space and specimen trees on the site:
 - a) In the design of a development, priority shall be given to retention of existing stands of trees, trees at site perimeter, contiguous vegetation with

adjacent sites (particularly existing sites protected through conservation restrictions), and specimen trees.

7. Understory vegetation beneath the dripline of preserved trees shall also be retained in an undisturbed state. During clearing and/or construction activities, all vegetation to be retained shall be surrounded by temporary protective fencing or other measures before any clearing or grading occurs, and maintained until all construction work is completed and the site is cleaned up. Barriers shall be large enough to encompass the essential root zone of all vegetation to be protected. All vegetation within the protective fencing shall be retained in an undisturbed state.
8. Forested areas shall be preserved if they are associated with:
 - a) Significant forest communities as defined herein;
 - b) Wetlands, waterbodies and their buffers;
 - c) Critical wildlife habitat areas; and
 - d) Slopes over 25%.
9. Minimize cut and fill in site development:
 - a) Development envelopes for structures, driveways, wastewater disposal, lawn areas and utility work shall be designated to limit clearing and grading;
 - b) Other efforts to minimize the clearing and grading on a site associated with construction activities shall be employed, such as parking of construction vehicles, offices/trailers, stockpiling of equipment/materials, etc. in areas already planned for permanent structures. Topsoil shall not be stockpiled in areas of protected trees, wetlands, and/or their vegetated buffers;
 - c) Finished grades should be limited to no greater than a 2:1 slope, while preserving, matching, or blending with the natural contours and undulations of the land to the greatest extent possible;
 - d) Employ proper site management techniques during construction:
 - (i) BMPs shall be employed to avoid detrimental impacts to existing vegetation, soil compaction, and damage to root systems, and
 - (ii) The extent of a site exposed at any one time shall be limited through phasing of construction operations. Effective sequencing shall occur within the boundaries of natural drainage areas;
 - e) Protect the site during construction through adequate erosion and sedimentation controls:
 - (i) Temporary or permanent diversions, berms, grassed waterways, special culverts, shoulder dikes or such other mechanical measures as are necessary may be required by the Planning Board to intercept and divert surface water runoff. Runoff flow shall not be routed through areas of protected vegetation or revegetated slopes and other areas. Temporary runoff from erosion and sedimentation controls shall be directed to BMPs such as vegetated swales. Retaining walls may be required where side slopes are steeper than a ratio of 2:1.
 - (ii) Erosion and sedimentation controls shall be constructed in accordance with the Department of Environmental Protection's Stormwater Guidance manual.

(iii) Erosion control measures shall include the use of erosion control matting, mulches and/or temporary or permanent cover crops. Mulch areas damaged from heavy rainfalls, severe storms and construction activity shall be repaired immediately.

(iv) Erosion control matting or mulch shall be anchored where plantings are on areas subject to mulch removal by wind or water flows or where side slopes are steeper than 2:1 or exceed ten (10) feet in height. During the months of October through March, when seeding and sodding may be impractical, anchored mulch may be applied at the Planning Board's discretion.

(v) Runoff from impervious surfaces shall be recharged on the site by stormwater infiltration basins, vegetated swales, constructed wetlands or similar systems covered with natural vegetation. Runoff shall not be discharged directly to rivers, streams, or other surface water bodies. Dry wells shall be used only where other methods are not feasible. All such basins and wells shall be preceded by oil, grease, and sediment traps. The inlets of all catch basins shall be fitted with filter fabric during the entire construction process to minimize siltation or such basins shall be designed as temporary siltation basins with provisions made for final cleaning.

(vi) The applicant shall be required to conduct weekly inspections of all erosion and sedimentation control measures on the site to ensure that they are properly functioning as well as to conduct inspections after severe storm events.

f) Revegetate the site immediately after grading:

(i) Proper revegetation techniques shall be employed using native plant species, proper seedbed preparation, fertilizer and mulching to protect germinating plants. Revegetation shall occur on cleared sites within seven (7) calendar days of final grading.

(ii) A minimum of four (4) inches of topsoil shall be placed on all disturbed surfaces that are proposed to be planted.

(iii) Finished grade shall be no higher than the trunk flare(s) of trees to be retained. If a grade change of six (6) inches or more at the base of the tree is proposed, a retaining wall or tree well may be required.

611.8 Required Security

The Planning Board may require a performance guarantee in a form acceptable to the Town to cover the costs associated with compliance with this Bylaw under a Site Alteration Special Permit.

1. The required performance guarantee in the amount of 150% of the cost of site restoration shall be posted prior to the issuance of a Site Alteration Special Permit for the proposed project.

2. The performance guarantee shall be held for the duration of any prescribed maintenance period required by the Planning Board, and may be reduced from time to

time to reflect completed work. Securities shall not be fully released without a final inspection and approval of vegetation replacement by the Town.

611.9 Monitoring and Inspections

1. Prior to commencement of construction, the applicant, land owner, contractor and construction crew, Director of the Department of Public Works, Zoning Enforcement Officer or their designee and site engineer shall conduct a meeting to review the proposed construction phasing and number and timing of site inspections.
2. Initial site inspection of erosion and sedimentation controls and placement of tree protection measures shall occur after installation of barriers around preserved areas and construction of all structural erosion and sedimentation controls, but before any clearing or grading has begun.
3. Routine inspections of preserved areas and erosion and sedimentation controls shall be made at varying intervals depending on the extent of site alteration and frequency and intensity of rainfall.
4. Effective stabilization of revegetated areas must be approved by the Town before erosion and sedimentation controls are removed. The Town shall complete an inspection prior to removal of temporary erosion and sedimentation controls.

611.10 Enforcement

The Town may take any or all of the enforcement actions prescribed in this Bylaw to ensure compliance with, and/or remedy a violation of this Bylaw; and/or when immediate danger exists to the public or adjacent property, as determined by the Zoning Enforcement Officer. The Town in carrying out any necessary enforcement actions may use securities described in Section 611.8 above.

1. The Zoning Enforcement Officer may post the site with a Stop Work order directing that all vegetation clearing not authorized under a Site Alteration Permit cease immediately. The issuance of a Stop Work order may include remediation or other requirements that must be met before clearing activities may resume.
2. The Town may, after written notice is provided to the applicant, or after the site has been posted with a Stop Work order, suspend or revoke any Site Alteration Special Permit issued by the Town.
3. No person shall continue clearing in an area covered by a Stop Work order, or during the suspension or revocation of a Site Alteration Special Permit, except work required to correct an imminent safety hazard as prescribed by the Town.

615 ADMINISTRATIVE SITE PLAN REVIEW

615.1 Purpose

The purpose of this Bylaw is to promote functional and aesthetic design, construction, and maintenance of certain developments and to minimize any harmful effects on surrounding areas. Such developments include but are not limited to certain multi-

family residential, non-residential or mixed use activities, business and professional offices, government activities, commercial establishments, not-for-profit facilities, medical-service facilities, and public recreational facilities, together with their associated outdoor areas for vehicular movement and parking. Owing to their physical characteristic and the nature of their operations, such developments may affect neighboring properties and adjacent sidewalks and streets. Religious and educational facilities shall be exempt from the provisions of this section of the Bylaw.

The provisions of this section are designed to assure that all development activities regulated by this Bylaw will be carried out so as to provide for and maintain:

1. Protection of neighboring properties against harmful effects of uses on the development site;
2. Convenient and safe access for fire-fighting and emergency rescue vehicles within the development site and in relation to adjacent streets;
3. Convenience and safety of vehicular and pedestrian movement within the development site and in relation to adjacent streets, properties or improvements;
4. Satisfactory methods for drainage of surface water to and from the development site;
5. Satisfactory methods for storage, handling, and disposal of wastewater, refuse, and other wastes resulting from the normal operations of the establishment(s) on the development site;
6. Convenience and safety of off-street loading and unloading of vehicles, goods, products, materials and equipment incidental to the normal operation of the establishment(s) on the development site;
7. Harmonious relationships to the terrain and to existing buildings in the vicinity of the development site; and
8. Resilience and adaptability to future climate change impacts, including increased flooding.

615.2 Scope of Application

1. The provisions of this section shall apply to:
 - a) Any construction, demolition, grading, clearing or other land development activity which would add one thousand (1,000) square feet or more of gross floor area or which would under Section 603 require a total of ten (10) or more parking spaces based upon both existing and new development or any change of use which would under Section 603 require ten (10) or more additional parking spaces based only on new development, even if the parking requirements are or could be reduced by provisions of the Zoning Bylaw or actions by a Special Permit Granting Authority;
 - b) The construction or creation of any new parking lot or the expansion, or redesign of any existing parking lot containing ten (10) or more parking spaces, used or to be used for non-residential purposes; and
 - c) Any use or structure, in any zoning district, for which a Special Permit is required, except as provided for below.

2. The provisions of this section shall not apply to:
 - a) Improvements made as shown on a definitive subdivision plan approved by the Duxbury Planning Board;
 - b) Clearing necessary to accomplish soil test borings, percolation tests and similar site testing and investigation; or
 - c) Any activity related to only a single family residential structure;
 - d) Clearing and grading activities in the Dunes Protection District in accordance with plans approved and permitted by local, state, and federal agencies.

615.3 Approved Site Plan/When Required

1. No building permit or occupancy permit shall be issued for any activity or use within the scope of Section 615 herein unless a Site Plan has been approved therefore, and the site is constructed in accordance with said approved site plan.
2. No activity within the scope of Section 615 herein shall be carried out without an approved Site Plan. Any work done in deviation from an approved Site Plan shall be a violation of this Bylaw, unless such deviation is approved in writing by the Planning Board as being of no significant detriment to the achievement of any of the purposes set forth in Section 615 herein.
3. Approval of a Site Plan under this Section shall not substitute for the requirement of obtaining a Special Permit or other forms of relief as required by the Zoning Bylaw.

615.4 Contents of Site Plan

The Site Plan shall include one or more appropriately scaled maps or drawings of the property, drawn to an engineer's scale, and stamped by a Registered Engineer, Registered Architect, Registered Landscape Architect or Registered Land Surveyor, as appropriate to the work involved. The Site Plan shall clearly and accurately indicate the following information as is/are pertinent to the proposed development activity:

1. Legal description, Assessors' Map and Parcel number and address of the property.
2. Name, address and telephone number of the property owner, and applicant, if different than the property owner.
3. Name, address and telephone number of the developer, contractor, engineer, other design professional and agent or legal representative.
4. Complete property dimensions, area, and zoning classification of property.
5. Existing and proposed topographical contours of the property taken at two-foot (2') contour intervals by a registered engineer or registered land surveyor.
6. The nature, location and size of all significant existing natural land features, including, but not limited to, tree, shrub, or brush masses, all individual trees over ten inches(10") in caliper, grassed areas, large surface rock in excess of six feet (6') in diameter and soil features.
7. Location of all wetlands or waterbodies on the property and within one hundred (100') feet of the perimeter of the development activity.
8. The location, grade, and dimensions of all present and/or proposed streets, ways

and easements and any other paved surfaces.

9. Engineering cross-sections of proposed new curbs and pavements, and vision triangles measured in feet from any proposed curb cut along the street on which access is proposed.

10. Location, height, elevation, interior and exterior dimensions and uses of all buildings or structures, both proposed and existing; location, number and area of floors; number and type of dwelling units; location of emergency exits, retaining walls, existing and proposed signs.

11. Location of all existing and proposed utilities and storage facilities including sewer connections, septic systems, wells, and any storage tanks, noting applicable approvals, if received.

12. Proposed surface treatment of paved areas and the location and design of drainage systems with drainage calculations prepared by a professional engineer, registered in the Commonwealth of Massachusetts.

13. Complete parking and traffic circulation plan, if applicable, showing location and dimensions of parking stalls, dividers, bumper stops, required buffer areas and planting beds.

14. Lighting plan showing the location, direction, and intensity of existing and proposed external light fixtures.

15. A landscaping plan showing the location, name, number and size of plant types, and the locations and elevation and/or height of planting beds, fences, walls, steps and paths.

16. A location map or other drawing at appropriate scale showing the general location and relation of the property to surrounding areas including, where relevant, the zoning and land use pattern or adjacent properties, the existing street system in the area and location of nearby public facilities.

17. Location within a Historical District and any other designation as a Historically Significant property, and the age and type of each existing building and structure on the site, which is more than fifty (50) years old.

18. Location of site with regard to the APOD (Aquifer Protection Overlay District) as shown on the Duxbury Zoning Map.

19. Location of site with regard to the Flood Hazard Areas Overlay District and, if located within the Overlay, all information required under Section 402.20.

Additional information may be required by the Planning Board or their designee, as reasonably necessary, to make determinations required by this section.

615.5 Site Development Standards

1. A reasonable effort shall be made to conserve and protect natural features that are of some lasting benefit to the site, its environs and the community at large.

2. Slopes, which exceed ten percent (10%), shall be protected by appropriate measures against erosion, runoff, and unstable soil, trees and rocks. Measures shall be taken to stabilize the land surface from unnecessary disruption. Such stabilization measures shall be the responsibility of the property owner.

3. The placement of buildings, structures, fences, lighting, and fixtures on each site shall not interfere with traffic circulation, safety, appropriate use and enjoyment of adjacent properties.
4. All development within the Flood Hazard Areas Overlay District shall comply with the regulations in Section 402.
5. All roadway and driveway design shall take into consideration safe sight distances not only at intersections but also along all traveled ways, in accordance with appropriate AASHTO requirements. Clear sight distances shall take into account topography, density of dwelling units and horizontal and vertical alignment.
6. Adequate illumination, in the opinion of the Planning Board, shall be provided to parking lots and other areas for vehicular and pedestrian circulation. In no case shall freestanding illumination devices be installed to a height exceeding fifteen feet (15') in a residential district. All illumination shall be directed and/or shielded so as not to shine beyond the perimeter of the site or interfere with traffic.
7. All areas designed for vehicular use shall be paved with a minimum of either a three inch (3") bituminous asphalt concrete, a six inch (6") Portland cement concrete pavement, or other surface, such as brick, cobblestone or gravel.
8. All parking spaces shall be arranged and clearly marked in accordance with the Parking Lot Design Standards contained in Section 603.5 herein.
9. All utility service transmission systems, including but not limited to water, sewer, natural gas, electrical and telephone lines, shall, whenever practicable, be placed underground, except that within the Flood Hazard Areas Overlay District all utilities shall be located, elevated and constructed so as to minimize or eliminate flood damage, including from future coastal flood hazards due to climate change.
10. All surface water runoff from structures and impervious surfaces shall be collected on site; but in no case shall surface water drainage be directed across sidewalks or public or private ways. In no case shall surface water runoff be drained directly into wetlands or waterbodies. Drainage systems shall be designed, using Best Management Practices, to minimize the discharge of pollutants by providing appropriately designed vegetated drainage channels and sedimentation basins that allow for adequate settling of suspended solids and maximum infiltration. Dry wells, leaching pits and other similar drainage structures may be used only where other methods are not practicable. Oil, grease and sediments traps to facilitate removal of contaminants shall precede all such drainage structures.

615.6 Minimum Parking Lot Design Standards

1. Parking lots shall comply with the standards and requirements of Section 603 of the Zoning Bylaw.

615.7 Required Procedures for Site Plan Review

1. At least seventeen (17) copies are required of all Site Plan sheets, drawings, and written information. Submissions shall be delivered to the Planning Department.
2. Within five (5) working days of receiving a Site Plan, the Planning Director or his/her designee shall distribute copies of the Site Plan to the Planning Board, the

Department of Public Works, the Police Department, the Fire Department, Highway Safety Committee, the Conservation Commission, the Duxbury Bay Management Commission, and the Board of Health. If the proposed activity requires a Special Permit, the Special Permit Granting Authority shall receive a copy of the Site Plan.

3. Upon receipt of a Site Plan from the Planning Director or his/her designee, the agencies as noted in 615.7(2) shall respond in writing as to the propriety of the proposed development, within the context of each agency's jurisdiction. Such response shall be made to the Planning Director or his/her designee within fifteen (15) working days of each agency's receipt of the Site Plan.
4. The Planning Director or his/her designee may solicit the advice of any other Town agency or department he/she deems necessary to properly make the determinations required by this section.
5. Within thirty (30) days after receipt of a completed site plan by the Planning Director, the Planning Board shall review said Site Plan in a public meeting, together with any comments received from Town agencies or departments on said plan. Site Plans shall be reviewed for consistency with zoning and other applicable regulations and standards. Within forty (40) working days of receiving a Site Plan, the Planning Board shall notify the applicant and state reasons for any approval, conditional approval or disapproval.
6. One (1) copy of the approved Site Plan shall be provided each to the applicant , the Department of Inspectional Services, the Department of Public Works, Board of Appeals, Police Department, the Fire Department, the Conservation Commission and the Board of Health. One (1) copy of the approved Site Plan shall remain in the records of the Planning Department.
7. Upon completion of all work, an As-Built plan and a letter of certification, made upon knowledge and belief according to professional standards, shall be submitted to Zoning Enforcement Officer or his/her designee by a Registered Engineer, Registered Architect, Registered Landscape Architect or Registered Land Surveyor, as appropriate to the work involved, that all work has been done substantially in compliance with the approved Site Plan.

616 COMMUNITY-SCALE WIND FACILITIES

616.1 Purpose and Applicability

The purpose of this section is to provide by Special Permit for the construction and operation of Community-Scale Wind Facilities, to generate power for use at municipally owned facilities and to provide standards for the placement, design, construction, monitoring, modification and removal of such Community-Scale Wind Facilities that address public safety, minimize impacts on scenic, natural and historic resources of the Town of Duxbury and to provide adequate financial assurance for operating and decommissioning such Community-Scale Wind Facilities.

This section applies to all Community-Scale Wind Facilities proposed to be constructed after the effective date of this section. It shall apply to any size turbines, regardless of rated nameplate capacity. Any new Community-Scale Wind Facility or physical modifications to existing Community-Scale Wind Facilities that materially alters the type or increases the size of such facilities or other equipment shall require a Special Permit processed in accordance with this section.

Community-Scale Wind Facilities shall be constructed only in the Publicly Owned Land Overlay District (POLOD) and exclusive of the Dunes Protection District and the Wetlands Protection Overlay District.

616.2 Definitions

Community-Scale Wind Facility

A Community-Scale Wind Facility is a Wind Facility where the primary use of the facility is to generate electrical power for use by the Town, inclusive of all equipment, machinery and structures utilized in connection with the conversion of wind energy to electricity. This includes, but is not limited to, transmission, storage, collection and supply equipment, substations, transformers, service and access roads, and one or more Wind Facility.

Height

When referring to a Community-Scale Wind Facility, the height of a Wind Facility will be measured from natural grade to the tip of the rotor blade at its highest point.

Nacelle

The housing around the electrical generator and other systems such as gearboxes and blade controls on a wind turbine. The rotor blades are typically connected to the nacelle.

Rated Nameplate Capacity

The maximum rated output of electric power production equipment. This output is typically specified by the manufacturer with a "nameplate" on the equipment.

Setback

The distance from the base of the Community-Scale Wind Facility tower, measured from the centerline of the Community-Scale Wind Facility tower, to the nearest property line.

Special Permit Granting Authority

The Special Permit Granting Authority shall be the Planning Board.

Wind Monitoring or Meteorological Tower

A temporary tower (Met. Tower) equipped with devices to measure wind speeds and direction used to determine how much wind power a site can be expected to generate.

Wind Facility

A wind turbine device that converts kinetic wind energy into rotational energy that drives an electrical generator. A Wind Facility typically consists of a tower, nacelle body at the top of the tower, and a rotor with two or more blades, also known as a Horizontal- Axis Wind Turbine configuration. However, a Wind Facility could also consist of a Vertical-Axis Wind Turbine configuration. (Refer to Wind Turbine Configurations diagram 616.2a below.)

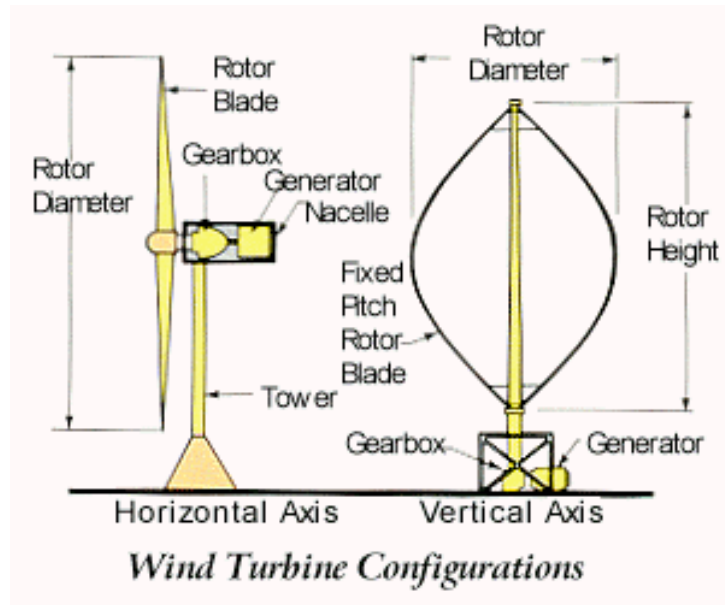


Diagram 616.2a

616.3 Permitting

1. Special Permit Granting Authority. No Community-Scale Wind Facility shall be erected, constructed, installed or modified as provided in this section without first obtaining a Special Permit from the Special Permit Granting Authority (a "Special Permit"). The construction of a Community-Scale Wind Facility shall comply with all requirements set forth in sections 616.3, 616.4, 616.5 and 616.6. All such Community-Scale Wind Facilities shall be constructed and operated in a manner that minimizes any adverse visual, safety, and environmental impacts. A Special Permit may be granted if the Special Permit Granting Authority finds that:

- a) The specific site is an appropriate and approved location for such use;
- b) The use is not expected to adversely affect the neighborhood;
- c) There is not expected to be any appreciable hazard to pedestrians, vehicles or wildlife from the use;
- d) Adequate and appropriate infrastructure will be provided for the proper and safe operation of the Community-Scale Wind Facility; and
- e) The requirements of section 616-3-616.10 are complied with in all respects.

Temporary erection of Wind Monitoring or Meteorological Towers shall also be required to be permitted as a temporary structure subject to issuance of a building permit for a temporary structure for not more than eighteen months. Wind Monitoring or Meteorological Towers shall comply with the minimum height, setback, lighting and signage requirements as set forth in section 616.4.

2. Compliance with Laws, Ordinances and Regulations. The construction and operation of all such proposed Community-Scale Wind Facilities shall be consistent with

all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, environmental, electrical, communications and aviation requirements.

3. Proof of Liability Insurance. The applicant and all appropriate contractors shall provide evidence of liability insurance in an amount and for a duration sufficient to cover loss or damage to persons and structures occasioned by the failure of the facility or reasonably foreseeable events thereat.

4. Site Control. At the time of its application for a Special Permit, the applicant shall submit documentation of actual or prospective control of the project site sufficient to allow for installation and use of the proposed facility. Documentation shall also include proof of control over setback areas and access roads, if required.

5. Contact Data. The applicant or Community-Scale Wind Facility permit holder shall maintain a phone number, email address, and physical address (all to be posted at the facility) and identify a responsible individual person for the public to contact with inquiries and complaints throughout the life of the project. Such persons shall be accessible at all times during normal business hours and for emergencies on a 24 hour a day, every day basis. The Special Permit shall specify the requirements for a contact person(s).

616.4 Certain Specific Requirements

1. Height. Community-Scale Wind Facilities and or Monitoring or Meteorological Towers shall be no higher than 250 feet above the current grade of the land.

2. Setbacks. Community-Scale Wind Facilities and or Monitoring or Meteorological Towers shall be set back a minimum distance equal to 1.1 times the overall height of the Wind Facility from the nearest property line and private or public way and a minimum distance equal to two (2) times the overall height of the Wind Facility from the nearest existing residential or commercial structure not owned by the applicant seeking to permit the Community-Scale Wind Facility and or Wind Monitoring or Meteorological Towers. The setback zone for Community-Scale Wind Facilities and or Wind Monitoring or Meteorological Towers can fall within the limits of Wetlands Protection Overlay and the Flood Hazard Overlay Districts.

3. Color and Finish. The Special Permit Granting Authority shall have discretion over the color of the Community-Scale Wind Facility, although a neutral, non-reflective exterior color designed to blend with the surrounding environment is encouraged.

4. Lighting and Signage. No lighting shall be permitted on Community-Scale Wind Facilities and or Monitoring or Meteorological Towers other than lighting required by the Federal Aviation Administration (FAA). Lighting of other parts of the Community-Scale Wind Facility and or Monitoring or Meteorological Towers, such as appurtenant

structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Unless good cause is shown for an exemption, signs on the Community-Scale Wind Facility and or Monitoring or Meteorological Towers shall comply with the requirements of Duxbury's sign regulations, and shall be limited to:

- a) Those necessary to identify the owner, provide a 24-hour emergency contact phone number, and warn of any danger, whether inherent or perceived;
- b) Educational signs providing information about the facility and the benefits of renewable energy.

Community-Scale Wind Facilities shall not be used for displaying any advertising or signage.

5. Utility Connections. Utility connections from the Community-Scale Wind Facility to the utilities power grid shall be located underground. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

6. Appurtenant Structures. All appurtenant structures to such Community-Scale Wind Facilities shall be subject to reasonable regulations concerning the bulk and height of structures and determining yard sizes, 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 architecturally compatible with each other and shall be contained within the Wind Facility tower whenever technically and economically feasible. Structures shall only be used for housing of equipment for this particular site. Whenever feasible, structures shall be shielded from view by vegetation or fencing and or located in an underground vault and joined or clustered to avoid adverse visual impacts.

7. Support Towers. Monopole towers are the preferred type of support for Community-Scale Wind Facilities and shall be used unless good cause is shown that a substantial economic hardship or safety consideration merits an alternative.

616.5 Emergency Services

The applicant shall provide a copy of the project summary and site plan to the local emergency services entity, as designated by the Special Permit Granting Authority. Upon request, the applicant shall cooperate with local emergency services in developing an emergency response plan. Wind turbines or other structures part of a Community-Scale Wind Facility shall be designed to prevent unauthorized access.

616.6 Specific Environmental Considerations

1. Shadow/Flicker. Community-Scale Wind Facilities shall be sited in a manner that minimizes shadowing or flicker impacts caused by motion of the rotor blades as they pass in front of the sun. The applicant has the burden of proving that this effect does not have significant adverse impact on neighboring or adjacent uses through either

siting or mitigation. It is acknowledged that a degree of shadow/flicker effect results from any wind turbine, and that the existence of some "shadow flicker" alone shall not be cause for the refusal to permit a Community-Scale Wind Facility.

2. Noise. The Community-Scale Wind Facility and associated equipment shall conform with the provisions of the Department of Environmental Protection's, Division of Air Quality Noise Regulations (310 CMR 7.10), unless the Department agrees that those provisions shall not be applicable. A source of sound will be considered to be violating these regulations if the source:

- a) Increases the broadband sound level by more than 10 dB(A) above ambient level, or
- b) Produces a "pure tone" condition, when an octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by three (3) decibels or more.

These criteria are measured both at the property line and at the nearest inhabited residence. Ambient is defined as the background A-weighted sound level that is exceeded ninety percent (90%) of the time measured during equipment hours. The ambient may also be established by other means with consent from the Department of Environmental Protection (DEP). An analysis prepared by a qualified engineer shall be presented to demonstrate compliance with these noise standards.

3. Land Clearing, Soil Erosion and Habitat Impacts. Clearing of natural vegetation shall be limited to that which is reasonably necessary for the construction, operation and maintenance of the Community-Scale Wind Facility and is otherwise prescribed by applicable laws, regulations, and ordinances. Community-Scale Wind Facilities shall be designed to minimize land clearing and fragmentation of open space areas.

616.7 Facility Conditions

The applicant shall maintain the Community-Scale Wind Facility in good condition and as a condition for the Special Permit shall submit with the application a plan for maintaining the Community-Scale Wind Facility in accordance herewith. 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 project owner shall be responsible for the cost of maintaining the Community-Scale Wind Facility and any access road, unless accepted as a public way, and the cost of repairing any damage occurring as a result of operation and construction. All material modifications to a Community-Scale Wind Facility made after issuance of the Special Permit shall require approval by the Special Permit Granting Authority as provided in this section.

616.8 Removal

1. Removal Requirements. Any Community-Scale Wind Facility, Wind Monitoring or Meteorological Tower which has reached the end of its useful life, permit term or has been abandoned shall be removed by the facility owner. When the Community-Scale Wind Facility, Wind Monitoring or Meteorological Tower is scheduled to be decommissioned, the applicant shall notify the Special Permit Granting Authority by certified mail of the proposed date of discontinued operations and plans for removal. The owner/operator shall physically remove the Community-Scale Wind Facility, Wind Monitoring or Meteorological Tower no more than 150 days after the date of discontinued operations. At the time of removal, the Community-Scale Wind Facility, Wind Monitoring or Meteorological Tower site shall be restored to the state it was in before the facility was constructed, or to other less stringent restorative conditions approved by the Special Permit Granting Authority. More specifically, decommissioning shall include provision for:

- a) Physical removal of all wind turbines, Wind Monitoring or Meteorological Tower structures, equipment, security barriers and transmission lines from the site;
- b) Disposal of all solid and hazardous waste in accordance with local and state waste disposal regulations;
- c) Stabilization or re-vegetation of the site as necessary to minimize erosion. The Special Permit Granting Authority may allow the owner to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.

2. Abandonment. Absent notice of a proposed date of decommissioning, the Community-Scale Wind Facility shall be considered abandoned when the facility fails to operate for more than one year without the written consent of the Special Permit Granting Authority. The Special Permit Granting Authority shall determine in its sole discretion what proportion of the facility is inoperable for the facility to be considered abandoned. If the applicant fails to remove the Community-Scale Wind Facility in accordance with the requirements of this section within 150 days of abandonment or the proposed date of decommissioning, the Town shall have the authority to enter the property and physically remove the facility and be indemnified for the costs and all other liabilities associated with the removal.

3. Surety. A performance bond equal to the removal cost of the proposed wind facility and restoration of the site may be required as a condition of approval, such bond to be submitted to the Zoning Enforcement Officer prior to issuance of a building permit, and held by the Town Treasurer.

616.9 Duration

A Special Permit issued for a Community-Scale Wind Facility shall be valid for the projected useful life of the facilities as determined by the Special Permit Granting Authority based on submissions of the applicant, but in any case not more than 25

years, unless extended or renewed. The time period may be extended or the permit renewed by the Special Permit Granting Authority upon satisfactory operation of the facility. Request for renewal must be submitted at least 180 days prior to the expiration date of the Special Permit. Submitting a renewal request shall allow for continued operation of the facility until the Special Permit Granting Authority acts. At the end of that period (including extensions and renewals), the Community-Scale Wind Facility shall be removed as required by this section.

616.10 Application Procedures

1. General. The application for a Community-Scale Wind Facility shall be filed in accordance with section 906 of this Bylaw and the rules and regulations of the Special Permit Granting Authority concerning Special Permits as the same maybe revised from time to time, including such revisions and requirements as may be imposed that are consistent with this section and including the items set forth below. Each application for a Special Permit shall be filed by the applicant with the Duxbury Town Clerk pursuant to Massachusetts General Laws.
2. Required Compliance Documents. The applicant shall provide the Special Permit Granting Authority with seven (7) copies of the application and all required exhibits. All plans and maps shall be prepared, stamped and signed by a professional engineer or surveyor licensed to practice in the Commonwealth of Massachusetts. Included in the application shall be:
 - a) Name, address, phone number and signature of the applicant, as well as all co -applicants or property owners, if any;
 - b) The name, contact information and signature of any agents representing the applicant;
 - c) A textual description of the project, including the names of all contractors and control persons and consent to the publications of such description in the local newspaper;
 - d) Documentation of the legal right to use the Community-Scale Wind Facility site;
 - e) Detailed architectural and structural plans of the proposed Community-Scale Wind Facility including foundation plans and structural calculations;
 - f) Proof of liability insurance that satisfies section 616.3.3;
 - g) Certification of height approval from the FAA;
 - h) A statement that satisfies section 616.6.2, listing existing and maximum projected noise levels from the Community-Scale Wind Facility.
3. Siting and Design. Unless otherwise waived by the Special Permit Granting Authority, the applicant shall provide the Special Permit Granting Authority with a description of the property which shall include:
 - a) Copy of a portion of the most recent USGS Quadrangle Map, at a scale of 1:25,000, showing the proposed facility site, including turbine sites, and the area within at least two miles from the facility. Zoning district designation for the subject parcel and surrounding parcels shall be included;

- b) A one inch (1") equals forty feet (40') site plan of the proposed Community-Scale Wind Facility site, with contour intervals of no more than two feet (2'), showing the following:
- (i) Property lines for the subject parcel and adjacent parcels within 500 feet;
 - (ii) Outline of all existing buildings, including purpose (e.g. residence, garage, etc.) on subject parcel and all adjacent parcels within 500 feet. Include distances from the Community-Scale Wind Facility to each building shown;
 - (iii) Location of all roads, public and private on the site parcel and adjacent parcels within 500 feet, and proposed roads or driveways, either temporary or permanent, including any associated drainage facilities;
 - (iv) Existing areas of tree cover, including average height of trees, on the site parcel and adjacent parcels within 500 feet;
 - (v) Proposed location and design of Community-Scale Wind Facility, including all turbines, ground equipment, appurtenant structures, transmission infrastructure, access, fencing, exterior lighting, etc; and
 - (vi) Location of viewpoints referenced in 616.10.4 of this section.

4. Visualizations. The Special Permit Granting Authority shall select between three (3) and six (6) sight lines, including from the nearest building with a view of the Community-Scale Wind Facility, for pre-and post-construction view representations. Sites for the view representations shall be selected from populated areas or public ways within a two (2)-mile radius of the Community-Scale Wind Facility. View representations shall have the following characteristics:

- a) View representations shall be in color and shall include actual pre-construction photographs and accurate post-construction simulations of the height and breadth of the Community-Scale Wind Facility (e.g. superimpositions of the Community-Scale Wind Facility onto photographs of existing views); and
- b) All view representations will include existing, or proposed, buildings or tree coverage.

5. Landscape Plan. The applicant shall submit a landscape plan indicating all proposed changes to the landscape of the site, including temporary or permanent roads or driveways, grading, vegetation clearing and planting, exterior lighting, screening vegetation or structures. Lighting, other than required by the FAA, shall be designed to minimize glare onto abutting properties and be directed downward with full cut-off fixtures to reduce light pollution.

6. Development, Operation and Maintenance Plan. The applicant shall submit a plan for the development of the Community-Scale Wind Facility (including the specifications for the Community-Scale Wind Facility and the development timeline and process from ground breaking to commissioning), as well as a plan for maintenance of access roads

and storm water controls, and general procedures for operational maintenance of the Community-Scale Wind Facility.

7. Independent Consultants. Upon submission of an application for a Special Permit, the Special Permit Granting Authority will be authorized to hire outside consultants pursuant to Massachusetts General Laws. The applicant shall be required to pay all reasonable costs associated with the consultant reviews required by the Special Permit Granting Authority. Such costs shall be pre-paid by the applicant per the rules and regulations of the Special Permit Granting Authority.

616.11 Right of Appeal

Any person aggrieved by the decision of the Special Permit Granting Authority may take an appeal to the courts in accordance with Massachusetts General Laws.

617 This section was deleted Annual Town Meeting 2018.

618 GROUND-MOUNTED SOLAR PHOTOVOLTAIC INSTALLATIONS OVERLAY DISTRICT

618.1 Purpose and Intent

618.1.1 The purpose of this Section 618: Ground-Mounted Solar Photovoltaic Installations Overlay District ("GMSP Overlay District") is to create a zoning overlay district that allows the installation, operation, maintenance and decommissioning of Ground-Mounted Solar Photovoltaic (GMSP) Arrays as a permitted use in such district, to provide standards for the placement, design, construction, operation, monitoring, modification, maintenance and decommissioning of such installations, to establish the process and procedures for review and approval of an installation, to address public safety, minimize impacts on scenic, natural and historic resources, and to provide adequate financial assurance for the installation, operation, maintenance and decommissioning of GMSP installations.

618.1.2 The requirements set forth in this Section 618 shall establish the set of standards that apply to the construction, operation, maintenance, and decommissioning of GMSP Installations in the GMSP Overlay District and the process and procedures for Site Plan review and approval of an application for a GMSP Installation.

618.1.3 If an Applicant does not receive GMSP Installation Site Plan Review approval or such approval lapses, then all requirements of the underlying district shall apply to the land and this alternative set of standards for the construction, operation, and/or repair of GMSP Installations shall not apply.

618.1.4 The Planning Board is the Site Plan Review Authority (SPRA) for all applications for GMSP Installations in the GMSP Overlay District defined in this article of the Bylaws.

618.1.5 An application for a GMSP Installation shall follow all Planning Board processes and procedures for a Site Plan Review as defined by these Bylaws unless either listed as an exception or modified by this article.

618.2 Applicability

618.2.1 Section 618 shall apply to proposal(s) for Site Plan Review and approval of GMSP Installations and construction of approved GMSP installations in the GMSP Overlay District after the effective date of this Section 618. This Section 618 shall also apply to physical modifications that materially alter the type, configuration, or size of these installations or related equipment over the operational life of the installation.

618.2.2 Location of GMSP Overlay District: The GMSP Overlay District shall be comprised of Town Assessors Map Portions of 155 Mayflower Street, PID 092-500-039 0 Mayflower Street, PIDs 093-400-041 and 093-500-431. The GMSP Overlay District is shown on a map entitled "Ground Mounted Solar Photovoltaic Overlay District," which map is hereby incorporated by reference in and made part of this Zoning Bylaw.

618.2.3 Areas for additional GMSP Overlay Districts may be added from time to time by vote at Town Meeting to amend this Bylaw article.

618.3 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 shall be subject to Solar Photovoltaic Installations Site Plan Review to determine conformance with the Town's Zoning Bylaw. Projects subject to Solar Photovoltaic Installation Site Plan Review that comply with the Town's Zoning Bylaw cannot be prohibited, but can be reasonably regulated by the Site Plan Review Authority.

Ground-Mounted Solar Photovoltaic (GMSP) Installation: A solar photovoltaic system that is structurally mounted on the ground and is not roof-mounted or canopy-mounted, and has a minimum nameplate capacity of 250 kW DC.

Site Plan Review Authority (SPRA): The Duxbury Planning Board is the SPRA for GMSP Installations.

Solar Photovoltaic Installation Site Plan Review: A review and approval by the Site Plan Review Authority to determine conformance with the Town's Zoning Bylaw.

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

618.4 Compliance with Laws, Bylaws and Regulations

618.4.1 The construction, installation operation, maintenance, decommissioning and interconnection with an electricity distribution utility of GMSP Installations shall comply with all applicable local, state and federal requirements, including but not limited to all applicable electrical, construction, noise, safety, environmental and communications requirements. No GMSP Installation shall be constructed, installed or modified without first obtaining a building permit.

618.4.2 Solar Photovoltaic Installation Site Plan Review: Prior to obtaining a building permit, construction, installation or modification, GMSP Installations shall undergo Solar Photovoltaic Installation Site Plan Review by the SPRA as provided below. In accordance with Section 22(c) of the Massachusetts Green Communities Act, Solar Photovoltaic Installation Site Plan Review shall be expedited and no decision shall be rendered more than one (1) year after the date of filing of a complete application, as determined by the SPRA.

618.5 Application and Plan Requirements

618.5.1 Subject to submittal requirements detailed in the Planning Board's "Site Plan Review Application Package," a completed application for Solar Photovoltaic Installation Site Plan Review shall be filed with the SPRA. Along with receipt of an application, the SPRA may engage, at the Applicant's cost, professional and technical consultants, including legal counsel, to assist the SPRA with its review of the application, in accordance with the requirements of G.L. c.44, §53G. The SPRA may direct the Applicant to deposit funds with the SPRA 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 valid grounds for denying the application. Upon approval of the application, any excess amount attributable to the application processing by the SPRA, including any interest accrued, shall be refunded to the Applicant.

618.5.2 Site Plan Review

The Applicant shall follow the Site Plan Review policies and procedures as defined by Article 600 Section 615 of these Zoning Bylaws and the "Site Plan Review Application Packet, Planning Board of the Town of Duxbury, Massachusetts" except as may be

modified by this Section 618. The SPRA has the authority to reduce or waive the application fee.

a. The following shall be specifically included in the Site Plan in addition to those required in Section 615.4:

- i. Name/Description of project
- ii. North arrow;
- iii. Location, size of any existing landscaping;
- iv. Lighting type.

b. Plans or drawings of the GMSP Installation prepared by a Registered Professional Engineer licensed in the Commonwealth of Massachusetts, showing the proposed layout of the system and any potential shading from nearby structures or vegetation.

c. One or three line electrical diagram detailing the Ground-Mounted Solar Photovoltaic Installation, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and overcurrent devices.

d. Documentation of the major system components to be used, including the photovoltaic panels, mounting system, and inverter(s).

e. Documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed installation.

f. An operation and maintenance plan (see also "Operation & Maintenance Plan" Section 618.7).

g. Signature of the Applicant(s) and property owner(s), if the Applicant is not the property owner. If the Applicant is not the property owner, a statement, signed by the property owner, authorizing the Applicant to proceed is required.

618.5.3 Application Submission: The application packet must comply with Article 600 Section 615 of the Duxbury Zoning By-Law and the Duxbury Planning Board's Rules and Regulations concerning Site Plan Review.

618.6 Construction

618.6.1 The Solar Photovoltaic Installation Site Plan Review Application must detail the proposed GMSP Installation's resistance to extreme wind, temperature snow, ice, rain, and humidity conditions.

618.6.2 Glare shall be mitigated at the Applicant's expense by the placement of fencing, vegetation or other means as reasonably required by the SPRA.

618.6.3 The GMSP Installation shall be enclosed by suitable fencing, access gates and/or other barriers to prevent unauthorized access and shall contain closed circuit cameras and motion detectors for security if required by the SPRA.

618.6.4 All utilities connections to the external electricity distribution network and lighting system shall be underground. This requirement may be partially or completely waived by the SPRA if the SPRA finds that this requirement is impractical for a specific installation.

618.7 Operation & Maintenance Plan

The Applicant shall submit as part of the Solar Photovoltaic Installation Site Plan Review Application an operation and maintenance plan for the Ground-Mounted Solar Photovoltaic Installation, which shall include measures for maintaining safe access to the installation, storm water controls, as well as general procedures for operational maintenance of the installation.

The Operation and Maintenance Plan shall include without limitation the following:

618.7.1 Plans for replacing damaged or inoperative array panels.

618.7.2 Plans for replacing panels that have deteriorated in efficiency in excess of the manufacturer's warranty.

618.7.3 Measures to ensure that the panels are kept clean including plans for snow/ice removal.

618.7.4 Measures to ensure that the structure and brackets that support the panels shall be maintained such that no major rust or corrosion is visible for the life of the installation.

618.7.5 Measures to ensure that all buildings, enclosures, fences and other facilities that are part of the installation shall be maintained in a manner that they retain the original appearance and operational function, reasonable wear and tear excluded, including but not limited to paint, shingles, siding, roofing, roadways, gates, access panels, etc.

618.8 Dimension and Density Requirements

618.8.1 Structures: GMSP Installations and all appurtenant structures shall, to the extent not otherwise covered in this Section 618, be subject to the restrictions

concerning the bulk and height of structures, lot area, setbacks, open space, and building coverage requirements set forth in this Zoning Bylaw for the zoning district in which the GMSP Overlay District is located, provided that only one parking space shall be required per GMSP Installation and the GMSP Installation may cover up to 70% of any lot, provided other setback requirements are met.

618.8.2 The maximum height from grade to the top of the Ground-Mounted Solar Photovoltaic Installation shall not exceed 15 feet for each individual solar panel.

618.8.3 All appurtenant structures, including but not limited to, equipment shelters, storage facilities, transformers, and substations, shall be architecturally compatible with each other. The SPRA may require that structures be screened from view by vegetation and/or joined or clustered to avoid adverse visual impacts.

618.9 Design Standards

618.9.1 Lighting: 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 Ground-Mounted Solar Photovoltaic Installation shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

618.9.2 Signage: Signs on Ground-Mounted Solar Photovoltaic Installations shall comply with this Zoning Bylaw. A sign that identifies the owner and/or operator and provides a 24-hour emergency contact phone number shall be required. Ground-Mounted Solar Photovoltaic Installations shall not display any advertising. Advertising does not include signs providing reasonable identification of the owner, manufacturer or operator of the installation.

618.9.3 Utility Connections: Electrical lines for utility interconnections shall be routed underground unless found to be impractical by the SPRA or otherwise required by the interconnecting utility.

618.9.4 Color: The GMSP panels, including all replacement panels, which make up the GMSP Installation, shall each have similar color, reflectivity and tone. The SPRA may in its discretion grant a case-by-case exception.

618.10 Safety and Environmental Standards

618.10.1 Emergency Services: The Ground-Mounted Solar Photovoltaic Installation owner or operator shall provide a copy of the project summary, electrical schematic and approved site plan to the Duxbury Fire Chief and Police Chief. The owner and operator shall cooperate with local public safety and emergency services in developing an emergency response plan. All means of shutting down the installation shall be clearly marked. The owner or operator shall identify a responsible person for public inquiries

throughout the life of the installation. Access capability (lock keys, combinations, entry codes, etc.) shall be provided by the owner and/or operator to these public safety officials.

618.10.2 Land Clearing, Soil Erosion and Habitat Impacts: Clearing of natural vegetation shall be limited to what is necessary for the construction, operation and maintenance of the GMSP Installation or otherwise prescribed by applicable local, state and federal laws and regulations.

618.10.3 GMSP Installation on Landfill: If the GMSP Installation will be located on a landfill, it may be required to obtain a Post-Closure Use Permit from the Massachusetts Department of Environmental Protection pursuant to 310 CMR 19.143. The SPRA may defer action on any application until such Post-Closure Use Permit is obtained or evidence is provided by the Applicant that a Post-Closure Use Permit is not required.

618.11 Monitoring and Maintenance

618.11.1 GMSP Installation Conditions: The GMSP Installation owner or operator shall maintain the facility in good condition and repair. Maintenance shall include, but not be limited to, painting, structural repairs, and integrity of security measures, buildings, roadways, access gateways, structural integrity, and elimination of rust and/or corrosion. Site access shall be maintained to a level acceptable to the Duxbury Fire Chief and other public safety officials. The Town may continue to maintain driveways and parking areas that exist at the time of the application. The owner, operator or property owner shall be responsible for the cost of maintaining the installation and any access road(s) installed by such party, unless accepted as a public way.

618.11.2 Modifications: To the extent that modifications deviate from the approved site plan, modifications to a GMSP Installation made after issuance of the required building permit shall require review by the SPRA.

618.11.3 Monitoring and Reporting: The operator or owner of the GMSP Installation shall monitor the facility for correct and efficient operation and to detect degradation, incorrect operation or other anomalies.

618.11.4 Clearing of Vegetation and Trees: The owner/operator of the GMSP Installation shall be responsible for maintaining the immediate area around the GMSP Installation by keeping vegetation, trees and any other growth trimmed for the operational life of the GMSP Installation. For the purpose of this section, trimming means:

- a. Grass or other ground vegetation no higher than two (2) feet.

b. Trees and bushes shall be maintained to eliminate additional solar shading, to ensure safe access, to prevent damage caused by weather (wind, rain, snow, etc.) if a tree or bush is in danger of falling across an array and to present a clean and professional aesthetic appearance.

618.12 Abandonment and Decommissioning

618.12.1 Removal Requirements: Any GMSP Installation that has reached the end of its useful life or has been abandoned consistent with Section 618.12.2

“Abandonment” shall be removed by the owner or operator. The owner or operator shall physically remove the installation no more than 150 days after the date of discontinued operations. The owner or operator shall notify the SPRA by certified mail of the proposed date of discontinued operations and plans for removal. Decommissioning shall consist of:

- a. Unless requested otherwise by the property owner, physical removal of all structures, equipment, security barriers and transmission lines associated with the GMSP Installation from the site.
- b. Disposal of all solid and hazardous waste associated with the decommissioning of the GMSP Installation in accordance with local, state, and federal waste disposal regulations
- c. Stabilization or re-vegetation of the site of the GMSP Installation as necessary to minimize erosion. The SPRA may allow the owner or operator to leave landscaping or designated below-grade foundations and conduit in order to minimize erosion and disruption to vegetation.

618.12.2 Abandonment: Absent written notice by the owner or operator to the SPRA of a proposed date of decommissioning or written notice by the owner or operator requesting an extension due to extenuating circumstances, the GMSP Installation shall be deemed abandoned when it fails to operate or operations are discontinued for more than one (1) year without the written consent of the SPRA.

Section 619: Facilities for Marijuana Not Medically Prescribed

619.1 Intent

On November 8, 2016, the voters of the Commonwealth approved, but the Town of Duxbury did not support (56% voted in opposition), a law regulating the cultivation,

processing, distribution, possession and use of marijuana for personal use (new G.L. c. 94G, Regulation of the Use and Distribution of Marijuana Not Medically Prescribed). The personal use of marijuana raises planning and public safety issues, such as, but not exclusively: a lack of specific measures to define toxic levels of marijuana use and determine impaired driving limits, which are not consistent with the purpose of the zoning bylaw, which is to protect the health, safety and general welfare of all inhabitants of the Town including the preservation of natural resources.

619.2 Definitions

“Marijuana Cultivator”, an entity licensed to cultivate, process and package marijuana, to deliver marijuana to marijuana establishments and to transfer marijuana to other marijuana establishments, but not to consumers.

“Marijuana Establishment”, a marijuana cultivator, independent testing laboratory, marijuana product manufacturer, marijuana retailer or any other type of licensed marijuana-related business.

“Marijuana Product Manufacturer”, an entity licensed to obtain, manufacture, process and package marijuana and marijuana products, to deliver marijuana and marijuana products to marijuana establishments and to transfer marijuana and marijuana products to other marijuana establishments, but not to consumers.

“Marijuana Products”, products that have been manufactured and contain marijuana or an extract from marijuana, including concentrated forms of marijuana and products composed of marijuana and other ingredients that are intended for use or consumption, including edible products, beverages, topical products, ointments, oils and tinctures.

“Marijuana retailer”, an entity licensed to purchase and deliver marijuana and marijuana products from marijuana establishments and to deliver, sell or otherwise transfer marijuana and marijuana products to marijuana establishments and to consumers.

619.3 Prohibition

Marijuana Establishments are prohibited in all zoning districts in the Town in accordance with General Laws chapter 94G, section 3.

Section 620: Medical Marijuana Overlay District

620.1 Purpose

To provide for the placement of Medical Marijuana Treatment Centers (each an "MMTC") in accordance with M.G.L. Chapter 94I ("Chapter 94I") and all regulations which have or may be issued by the Department of Public Health and/or the Cannabis Control Commission ("CCC"), including, 935 CMR 501.00, as may be amended hereafter, which will minimize adverse impacts of an MMTC on adjacent properties, residential neighborhoods, schools, playgrounds, public beaches and other locations where minors congregate and which will regulate the siting, design, security, monitoring, and removal of an MMTC.

620.2 Establishment and Applicability

The Marijuana Overlay District ("MOD") is established as an overlay district within the Town of Duxbury [location to be established through the public hearing process], the boundaries of the MOD are shown on the Zoning Map on file with the Town Clerk and shall comprise the following parcels, as set forth on the maps of the Town Board of Assessors:

MMTC Overlay District	
Parcel ID	Address
Portion of 015-782-001	638 Summer Street
Portion of 015-782-002	632 Summer Street
Portion of 015- 502-056	0 Summer Street
062-752-015	127 Tremont Street
Portion of 062-752-014	296 Parks Street
110-772-034	8 Chestnut Street
110-772-045	5 Chestnut Street
110-772-134	10 Washington Street
119-762-102	433 Washington Street
Portion of 119-762-918	0 Washington Street
Portion of 118-762-101	457 Washington Street
Portion of 118-761-142	0 Mattakeset Court
Portion of Private ROW 119-761-115	441 Washington Street
106-742-060	266 St. George Street
106-742-006	289 St. George Street
106-742-005	285 St. George Street
106-742-003	277 St. George Street
106-742-002	30 Railroad Avenue
106-742-004	50 Railroad Avenue
Portion of 106-034-000	114 Alden Street
104-732-042	1474 Tremont Street

Within the MOD, all requirements of the underlying zoning district remain in effect, except where this Bylaw provides an alternative to such requirements. Land within the MOD may be used for (1) a MMTC; or (2) a use allowed in the underlying district, in which case the requirements of the underlying district shall apply. If the provisions of the MOD are silent on a zoning regulation, the requirements of the underlying district shall apply. If the provisions of the MOD conflict with the requirements of the underlying district, the requirements of the MOD shall control.

620.3 Definitions

Where not expressly defined in these Zoning Bylaws, terms used in the MOD Bylaw shall be interpreted as defined in Chapter 94I, 935 CMR 501.00, and any regulations issued by the CCC implementing M.G.L. Chapter 94I, and otherwise by their plain language.

“Medical Marijuana Treatment Center” or “MMTC” means an entity formerly and validly registered under 935 CMR 501.100, that acquires, cultivates, possesses, processes (including development of related products such as edible MIPs, tinctures, aerosols, oils, or ointments), transfers, transports, sells, distributes, dispenses, or administers marijuana, products containing marijuana, related supplies, or educational materials to registered qualifying patients or their personal caregivers. An MMTC refers to the site(s) of dispensing, cultivation, and preparation of marijuana.

620.4 Location and Dimensional Controls

1. An MMTC may not be located within 1,000’ feet (measured in a straight line from the nearest point of the property line of any of the following uses to the nearest point of the property line of the MMTC) of the following pre-existing uses:

- (a) Public or private school providing education in pre-school, kindergarten and/or grades 1 through 12;
- (b) State-licensed Child Care Center, as defined in M.G.L. Chapter 15D; or
- (c) Library, playground, public park, public beach, religious facility, youth center; or similar facility in which minors commonly congregate for a particular purposes in a structured and scheduled manner.

2. Cultivation and processing facilities located within the MOD shall be separated from adjacent property lines by a 100-foot buffer strip, unless the applicant can demonstrate, and the SPGA (defined in Section 620.5) finds, that adequate buffering can be provided in a narrower buffer strip.

3. An MMTC shall be located only in a permanent building and not within any mobile facility. All sales shall be conducted either within the building or by home delivery pursuant to applicable state regulations.

4. Unless expressly stated otherwise in this Bylaw, an MMTC shall conform to the dimensional requirements applicable to non-residential uses in the underlying district.

620.5 Special Permit and Site Plan Requirements

1. Procedure: An MMTC may be permitted in the MOD pursuant to a Special Permit and Site Plan Approval by the Planning Board which shall be the Special Permit Granting Authority ("SPGA") under this MOD Bylaw and shall conduct Site Plan Approval for an applicant for a MMTC, the Special Permit application and time standards of G.L. c.40A, §9 shall also apply to applications for Site Plan Approval under this Section.

2. A Special Permit for an MMTC shall be limited to one or more of the following uses:

(a) Cultivation of Marijuana for medical use.

(b) Processing and packaging of Marijuana for medical use, including Marijuana that is in the form of smoking materials, food products, oils, aerosols, ointments, and other products.

(c) Testing of Marijuana for medical use.

(d) Sale or distribution of medical use Marijuana.

(e) Wholesale sale of medical Marijuana to other MMTCs located in the Town or another municipality in Massachusetts.

(f) Medical Marijuana transportation or distribution.

3. Application: The application for an MMTC shall include the following:

(a) The name and address of each owner of the MMTC. If the Applicant is a business organization, a statement under oath disclosing all of its owners, shareholders, partners, members, managers, directors, officers, or other similar parties, representatives and entities and their addresses. If any of the above are entities rather than persons, the Applicant must provide the same disclosure in writing under oath for all of such entities.

- (b) Copies of all required licenses and permits issued to the Applicant by the Commonwealth of Massachusetts and any of its agencies for the MMTC, together with a copy of all materials (including surety bonds or other guarantees) submitted to CCC in connection with the licensing and permitting of an MMTC;
- (c) A description of the proposed use;
- (d) Evidence of the Applicant's right to use the site for an MMTC, such as a recorded deed, fully executed lease or fully executed purchase and sale agreement;
- (e) A certified list of all parties in interest entitled to notice of the hearing for the Special Permit and Site Plan Approval application, taken from the most recent tax list of the Town and certified by the Town Assessor;
- (f) Evidence that the Applicant has entered into a fully executed Host Community Agreement with the Town;
- (g) A detailed floor plan of the site of the proposed MMTC that identifies the square footage available and describes the functional areas of the facility;
- (h) A detailed site plan that includes:
 - 1. Compliance with the requirements for parking and loading spaces, lot size, frontage, yards and heights and coverage of buildings, signage and all other provisions of this MOD Bylaw and other applicable provisions of the Duxbury General Bylaws;
 - 2. Design for convenience and safety of vehicular and pedestrian movement on the site and access to and from the site which must be located on a public way or approved private way;
 - 3. Design and appearance of proposed buildings, structures, screening and landscaping;
 - 4. Adequacy of water supply, drainage, waste water conveyance and treatment plant capacity; and
 - 5. Adequacy of any on-site septic system, if applicable, as approved by the Board of Health.
- (i) A Security Plan that shall include the details of all security measures for the site and transportation of marijuana and marijuana products to and from off-site premises to ensure the safety of employees and the public and to protect the site from theft or other criminal activity. The Security Plan shall be submitted to the Fire Department and

Police Department for approval with such terms and conditions as determined by such departments. This report shall remain confidential as required by applicable law.

(j) An Operation and Management Plan that shall include: Organizational Structure, Location, Property Description, Hours of Operation and Staffing, Cultivation Practices, Processing Practices, Distribution Practices, Employee Safety, Fire Prevention, Sanitation Requirements, Electrical System Overview, Ventilation System and Air Quality and Waste Refuse Chemical Remediation Plan. The plan shall be submitted to the Building Department, Board of Health, Water and Sewer Department, Water and Sewer Advisory Board, Police Department, Fire Department, DPW Director, Conservation Commission and Board of Selectmen for review and comment.

(k) An Emergency Response Plan. All owners and senior managers of an MMTC shall meet with the Police Department and Fire Department to discuss and identify emergency/contingency plans for the site, and a written Emergency Response Plan shall be filed with and approved by the Police Department and Fire Department as a condition of the Special Permit and Site Plan Approval.

(l) The SPGA, in its discretion, may retain the services of consultants as to any matter contained in the application, the expenses of which shall be the responsibility of the Applicant.

4. The SPGA shall refer copies of the application to the Board of Selectmen, Building Department, Fire Department, Police Department, Board of Health, Conservation Commission, Water and Sewer Department and such other departments, boards and commissions as determined by the SPGA. These boards/departments shall review the application and shall submit the written recommendations. Failure to make recommendations within 45 days of referral of the application shall be deemed lack of opposition.

5. Mandatory Findings: The SPGA shall not issue a Special Permit for an MMTC unless it finds that after notice and public hearing in accordance with G.L. c. 40A, § 11 and consideration of application materials, consultant reviews, public comments, and the recommendations of other town boards and departments:

(a) The MMTC is designed to minimize any adverse visual or economic impacts on abutters and other parties in interest, as defined in M.G.L. C. 40A, Section 11;

(b) The MMTC is fully permitted by all applicable agencies of the Commonwealth of Massachusetts and is in compliance with all applicable state laws and regulations and;

(c) The Applicant has satisfied all conditions and requirements of this MOD Bylaw.

6. Special Permit Conditions on an MMTC: Conditions which are reasonably appropriate to improve site design, traffic flow, and public safety, to protect water quality, air quality, and significant environmental resources, to preserve the character of the surrounding area and to otherwise serve the purposes of this MOD Bylaw may include, but not be limited to:

(a) Hours of Operation of an MMTC for sale or distribution to consumers and/or wholesalers shall be limited to 7:00 a.m. – 7:00 p.m., unless otherwise modified by the SPGA.

(b) The use shall be limited to the permitted use and shall not generate outside odors from the cultivation or processing of marijuana and marijuana products. No use shall be allowed in the MOD which creates a nuisance to abutters or to the surrounding area, or which creates any hazard, including but not limited to, fire, explosion, fumes, gas, smoke, odors, obnoxious dust, vapors, offensive sound or vibration, flashes, glare, objectionable effluent or electrical interference.

(c) The permit holder shall provide to the Zoning Enforcement Officer/Building Inspector, Board of Health, Chief of the Fire Department, Chief of the Police Department, Town Manager, and the SPGA the name, telephone number and electronic mail address of all managers and key holders who can serve as a contact person if such person needs to be contacted at any time, including after regular business hours, to address any problems or urgent issues. Such contact information shall be kept updated by the permit holder.

(d) An MMTC may not operate, and the Special Permit and Site Plan Approval will not be valid, until the applicant has obtained all licenses and permits issued by the Commonwealth of Massachusetts and any of its agencies for the facility and the Applicant has entered into a Host Community Agreement with the Town with respect to the facility.

(e) The Special Permit and Site Plan Approval shall lapse and will not be valid if a substantial use thereof has not commenced within two (2) years of issuance, except for good cause, and not including any time as is required to pursue or await a determination of an appeal from the grant thereof.

(f) A Special Permit and Site Plan Approval granted under this Section shall have a term limited to the earlier of the (i) duration of the permit holder's ownership of the MMTC, (ii) change in ownership of the permit holder (other than a change in, in the aggregate, of not more than 10 (ten)% ownership interest), including any transfer of ownership voluntarily, involuntarily or by operation of law, or (iii) the expiration or termination of the permit holder's license by the CCC for use of the site as an MMTC. A Special Permit and Site Plan Approval under this Section may be transferred only with

the approval of the SPGA in the form of an amendment to the Special Permit and Site Plan Approval decisions.

(g) The permit holder shall notify the Zoning Enforcement Officer/Building Inspector, the Board of Selectmen and the SPGA in writing at least 48 hours prior to the cessation of operation of the MMTC and immediately upon expiration or termination of the permit holder's license with the CCC.

(h) An Annual Report shall be filed with the SPGA, the Board of Selectmen and Board of Health no later than January 31st of each year, providing a copy of all applicable state licenses and renewals thereof required under Chapter 94I and 935 CMR 501.00, together with the then current Compliance Inspection report from the CCC and evidence of compliance with all ongoing conditions of the Special Permit and Site Plan Approval.

620.6 Abandonment or Discontinuance of Use

An MMTC shall be required to remove all material, plants, equipment, signs and other paraphernalia at the time of surrendering its state-issued licenses or permits in accordance with any requirements of the CCC and a written discontinuance plan submitted to the SPGA, the Board of Selectmen, and the Board of Health. A MMTC shall be required to provide surety in a form acceptable to and approved by the Town Treasurer, in an amount determined by the SPGA, to cover the costs for cleaning the facility and the removal of all materials, plants, equipment, signs and other paraphernalia in the event the MMTC fails to do so. In no event shall the surety exceed more than 125 percent of the estimated cost of removal and compliance. The applicant shall submit a fully inclusive estimate of the costs associated with cleaning and removal at prevailing wages, which estimate shall be prepared by a qualified licensed contractor authorized to undertake such work. The SPGA may, in its discretion, request cost estimates from not more than two additional qualified licensed contractors in order to accurately determine the amount of the surety. Surety is required to be posted at time of grant of permit by the Town.

620.7 Prohibition Against Nuisances

No use shall be allowed in the MOD which creates a nuisance to abutters or to the surrounding area, or which creates any hazard, including but not limited to, fire, explosion, fumes, gas, smoke, odors, obnoxious dust, vapors, offensive sound or vibration, flashes, glare, objectionable effluent or electrical interference, which may impair the normal use and peaceful enjoyment of any property, structure or dwelling in the area.

620.8 Severability

The provisions of this Bylaw are severable. If any provision, paragraph, sentence, or clause of this Bylaw or the application thereof to any person, establishment, or circumstances shall be held invalid by a court of competent jurisdiction, such invalidity shall not affect the other provisions or application of this Bylaw.

620.9 Rules and Regulations

The SPGA shall have the authority to adopt rules and regulations for purposes of implementing this Bylaw.

ARTICLE 621 Solar Photovoltaic Facilities

621.1. Purpose

The purpose of this bylaw is to facilitate and appropriately regulate the creation of solar photovoltaic facilities (SPVF) by providing standards for the placement, design, construction, operation, monitoring, modification and removal of such facilities that address public safety, minimize impacts on environmental, scenic, natural and historic resources and to provide adequate financial assurance for the maintenance, repair and eventual decommissioning of such facilities.

621.2. Applicability

This Section 621 applies to all large-scale and small-scale solar photovoltaic-electric facilities and modifications of existing facilities which are located in the Residential Compatibility, Planned Development, or Neighborhood Business zoning districts; however, this Section does not apply to solar photovoltaic-electric facilities in the Ground Mounted Solar Facilities Overlay District.

In instances where restrictions specific to overlay districts are also applicable, the more restrictive regulations shall apply, unless specifically called out otherwise in this Section 621.

When a proposed ground mounted solar photovoltaic facility is located in the Wetlands Protection Overlay District and would be subject to a special permit per Section 404.10 of the Zoning By-law for such use, the Planning Board will serve as the Special Permit Granting Authority, and shall weigh the criteria in Section 404, in the consideration of any special permit as may be issued under its authority as the Special Permit Granting Authority per this Section 621.

If a proposed non-accessory ground mounted solar facility is subject to a special permit from the Planning Board for Land Clearing and Grading per Section 611 of the Zoning By-law, for such use the Planning Board shall weigh the criteria of Section 611 in the

consideration of its Administrative Site Plan Review, or special permit consideration if applicable, per this Section 621.

621.3. Compliance with Applicable Laws and Regulations

The construction, operation, use, maintenance, repair, modification and removal of all SPVF shall be subject to and comply with all applicable local, state and federal statutes, rules, regulations, bylaws and requirements, including, and without limitation, all Town of Duxbury General and Zoning By-laws, including those concerning design criteria, the bulk and height of buildings and structures, lot area, setbacks, open space, parking and building coverage requirements as applicable for the zoning district, whether or not specifically stated in, and in addition to, this Section 621.

621.4. Definitions

Accessory Solar Photovoltaic Facility: Solar Photovoltaic Facility with a nameplate capacity of less than 50 kWDC (kilowatts of direct current), provided that the facility is sized so that the electricity generated by the facility as measured by the Rated Nameplate Capacity is no more than 125% of the load used by the principal use on the lot where the facility is located, and is incidental and subordinate to the principal use on the lot.

Solar Photovoltaic Facility (SPVF): shall mean and include all devices, equipment, structures and structural design features used for, as part of, or in connection with, the collection, storage, generation, and/or distribution of solar energy, and all appurtenant facilities, structures and equipment thereto.

Ground mounted SPVF: any Solar Photovoltaic Facility that is structurally mounted on the ground, is not roof mounted, or is mounted as permitted by the Planning Board.

Ground mounted Canopy SPVF: any ground mounted Solar Photovoltaic Facility that is elevated above a parking area, pool or other use incidental to the principal use on the lot as may be allowed in the zoning district.

Roof mounted SPVF: any Solar Photovoltaic Facility that is affixed to the roof of a building.

Rated Nameplate Capacity: the maximum rated output of electric power production of the photovoltaic facility in direct current (DC). Such capacity shall mean and include the aggregate capacity of all SPVF located on any lot.

621.5. Use Requirements

- a. No SPVF shall be constructed without a Building Permit.
- b. Except for off-grid systems, no building or other permit or approval for an SPVF shall be issued unless the applicant has provided satisfactory evidence that the utility

company has been informed of the owner or operator's intent to install the SPVF and that the utility company has agreed to interconnect the SPVF to the electric power grid.

- c. Roof-mounted Accessory SPVF in the RC, PD and NB districts, and systems or parts of a SPVF located interior to a primary or accessory structure, shall be permitted As-of-Right provided they meet the requirements of this Section 621.
- d. All Ground mounted Accessory SPVF and Ground mounted Canopy SPVF, whether Accessory or non-accessory, in the NB districts shall require Administrative Site Plan review and approval per Section 615 of the Zoning By-law, and shall also submit with the application the information requested per Section 618.5.2 Ground Mounted Solar Photovoltaic Installations Overlay District.
- e. Ground mounted SPVF are not permitted in the RC and PD districts.
- f. Ground mounted Canopy SPVF are not permitted in the RC and PD districts.

621.6. General, Safety and Environmental Requirements

SPVF shall be subject to the following restrictions:

- a. All SPVF shall require a sign on the SPVF that identifies the owner and operator of the SPVF and provides a 24-hour emergency contact telephone number. Said sign shall not display any advertising.
- b. Roof mounted SPVF may not protrude higher than the highest point of the roofline. The Planning Board may, by special permit, authorize a protrusion of up to six feet upon a finding by the Planning Board that the requested waiver is in the public interest and is consistent with the purpose and intent of the Town of Duxbury Zoning Bylaws. No waiver shall be granted if the height of the structure measured to the highest point of the SPVF will exceed thirty five feet.
- c. All Ground mounted SPVF must be fenced in a manner consistent with Section 305 Barrier Requirements of the International Swimming Pool and Spa Code , to the satisfaction of the Building Commissioner to prevent injury;
- d. All Ground mounted SPVF shall not cast a shadow upon an abutting lot;
- e. All Ground mounted Canopy SPVF must be designed so that the bottom of the lowest horizontal structure is not lower than 8 feet in order to prevent injury.
- f. All Ground mounted SPVF and Ground mounted Canopy SPVF:
 - (i). May not exceed a height of twenty feet, and must provide for stormwater treatment in accordance with the Zoning Bylaw;
 - (ii). Lighting shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Where feasible, lighting shall be directed downward and shall incorporate cutoff fixtures to reduce light pollution;
 - (iii). Shall use panels that each have a similar color, reflectivity and tone, including all replacement panels; however, this requirement may be waived by the Planning Board under Administrative Site Plan Review if the Planning Board finds that this requirement is impractical for a specific installation on a case-by-case basis;

- (iv). Shall be included in any calculation of the maximum building coverage percentage requirement if applicable, as provided in this Duxbury Zoning Bylaw; and
- (v). Shall install utilities connections to the external electricity distribution network underground; however, this requirement may be waived by the Planning Board under Administrative Site Plan Review if the Planning Board finds that this requirement is impractical for a specific installation.
- g. Where a Ground mounted SPVF abuts a residential use or public way (excluding Ground mounted Canopy SPVF), there must be increased consideration for mitigating impacts to the residential use or public way. The Planning Board may require items such as, but not limited to, increased setbacks, visual screening such as plantings, or sound buffering as part of the Administrative Site Plan Review.

621.7. Required Security

A cash security for all SPVFs in the Neighborhood Business Districts shall be required in the amount equal to 150% of the cost of site cleanup and restoration, and shall be adjusted on an annual basis to reflect the changes in the Consumer Price Index.

621.8. Monitoring, Maintenance and Reporting

- a. Owner and operator shall maintain the SPVF in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, inspections, and integrity of security measures.
- b. Ground mounted SPVF access and security shall be maintained at a level acceptable to the Fire Chief and shall provide for access through a lockbox or other acceptable measure for emergency response.
- c. Annual reporting for all Ground mounted SPVF and Ground mounted Canopy SPVF shall be submitted to the Building Inspector demonstrating and certifying compliance with the Operation and Maintenance Plan, and such conditions as may be included in a special permit for such facilities. Said reporting shall include information on the maintenance completed during the year, documentation of continued liability insurance, and the amount of electricity generated by the facility. Copies of the reporting shall be submitted to the Planning Board and to any other Town permitting agencies who have issued permits for the SPVF (such as the Fire Department, Conservation Commission, or other local town authority). All annual reporting shall be submitted within 45 days of the end of the calendar year.
- d. Annual reporting for Roof mounted SPVF in the NB District shall be submitted to the Building Inspector demonstrating and certifying regular inspections as may be required, and the amount of electricity generated by the facility, on an annual basis within 45 days of the end of the calendar year.

621.9. Abandonment and Decommissioning

a. Removal Requirements

Any SPVF which has reached the end of its useful life or has been abandoned shall be removed. The owner shall be responsible for ensuring that the SPVF is physically removed within 150 days after the date of discontinued operations. The owner or operator shall notify the Building Inspector by certified mail of the proposed date of discontinued operations and plans for removal.

Decommissioning shall consist of physical removal of all components of the SPVF, including but not limited to structures (for Ground mounted SPVF), foundations (for Ground mounted SPVF), equipment, security barriers and above-ground transmission lines, as well as associated off-site utility interconnections if no longer needed.

Disposal of all solid and hazardous waste must be in accordance with local, state and federal waste disposal regulations.

Restoration of the site to its natural pre-existing condition shall be completed within thirty days after removal of the SPVF, including stabilization or re-vegetation of the site as necessary to minimize erosion.

b. Enforcement by the Town.

If the owner fails to remove a Ground mounted SPVF in the NB Districts in accordance with this Section 621, the security set forth in Section 621.7 shall be forfeited to the Town, and the Town may take further enforcement action as provided in this Zoning Bylaw, including seeking injunctive relief from the courts.

ARTICLE 700 - DESIGN STANDARDS FOR PLANNED DEVELOPMENTS

701 PURPOSE

This section of the Bylaw establishes standards for the design and review of a development application for a planned development. Guidelines are stated under which considerable design flexibility and evaluation can be exercised. Further, general municipal regulations governing the improvements on the site are identified to establish a basis upon which modifications may be substantiated.

702 UNDEVELOPABLE LAND

702.1 Classifications

Certain lands shall be classified as undevelopable as being in the Wetlands Protection Overlay District, and specifically located on the site and identified upon the Land Classification Map under Section 807.3.3. Applicants are encouraged to include the wetlands and waterbodies within the open space; however, they do not count towards the open space requirement.

702.2 Use Restrictions

The utilization of such undevelopable land shall be restricted and preserved in the manner provided as follows:

1. Common Open Space.
2. Concept and Implementation Method
Common open space shall be preserved by a method approved by the Board of Appeals (such as public donation, conservation or historical easement or restriction, covenants or deed restriction in conjunction with a trust or homeowners' or residents' association), whereby both the Town and the residents of a planned development are granted enforceable rights with respect to such preservation.
3. Maintenance Fees.
A fee structure for the preservation, improvement and maintenance of common open space shall be approved by the Town and contained in an agreement filed with the Town. The maximum and minimum fees shall be specified. Under no circumstances shall fees reflect the cost of land acquisition, improvements shown in the common open space analysis, or facilities for which public use is permitted on a regular basis.
4. Open Space Maintenance.
In the event that the organization established to own and maintain common open space shall fail to maintain it in reasonable order and condition, the Board

of Selectmen may serve written notice of such failure upon such organization or upon the residents within or owners of the planned development and shall include a demand for correction within thirty days and shall state the date, time and place of a hearing thereof which shall be held within fourteen days of the notice. If the deficiencies are not corrected or the Board's demand modified, the Town, acting through the Board of Selectmen, may enter upon the common open space and maintain the same for a period of one (1) year. Before the expiration of the year, a second public hearing shall be called by the Board at which time the organization or the residents shall show cause why such maintenance should not continue for a succeeding year. If the Board determines that the need of Town maintenance no longer exists, the Board shall cease to maintain the common open space. All costs incurred by the Town shall be assessed against the properties within the planned development and shall become a lien on those properties which may be collected and enforced in the manner fixed by law for the collection and enforcement in the manner fixed by law for the collection of taxes. Notice of lien shall be recorded in the Registry of Deeds.

702.3 Planning Requirements

Access shall be provided to undevelopable lands by means of trails or paths installed by the developer. Only land uses that are inseparable from waterfront locations and that do not diminish the present or prospective value of surface water for supply, recreation, land use policy for marshes, flood and water storage, wildlife habitat and fish spawning grounds shall occupy undevelopable lands subject to the Wetlands Protection Overlay District regulations. Land uses that do not diminish operation of the primary roles of marshes include recreation, cranberry bogs and certain other agricultural uses. Cranberry bogs along with associated ponds shall be included as natural elements in the open space system calculations. The aquifer or water-bearing stratum shall be protected and managed. All precautions shall be undertaken to accomplish these goals. Steep slopes, for reasons of erosion, are unsuitable for development and shall remain in their natural state when determined to be in the public interest by the Town. No paving shall be located on undevelopable land.

702.4 Nature Center

Nature centers requiring the establishment of permanent fixtures designed for use by the public may be installed on undevelopable land, provided this use has been indicated on the Open Space and Community Facilities Map and in the reports filed, and is consistent with the provisions of Article 400. A detailed plan of proposed improvements shall be filed indicating the manner in which the center shall be operated and funded. No paving shall be located on undevelopable land.

703 COMMUNITY CONSIDERATIONS

The following considerations shall be made in favor of the Town.

703.1 Buffer Widths

An open space buffer shall be preserved along boundaries of the site as follows:

1. Separating proposed detached single-family dwellings from a street line or land developed for residential uses at density (dwelling units/acre) twenty-five percent (25%) or more below that proposed: seventy-five (75) feet wide.
2. Separating other proposed structures or their parking areas from any use (including undevelopable land) other than common or public open space or other developments in the same category of use: one hundred and twenty-five (125) feet wide.
3. In the case of a residential or institutional structure in existence prior to March 13, 1973, on a tract of land zoned planned development district, a buffer shall be provided extending a distance of three hundred feet measured in all directions from the sides of such existing structure, except those areas in a neighborhood business district. Within this protective buffer, residential and institutional development shall be allowed as permitted in a residential compatibility district under the provisions of this Bylaw. This buffer may be reduced or waived upon the written recommendation of the Planning Board, which shall consider any unique historic, architectural, or visual qualities of that structure in determining the necessity for protection. At other locations, none are required.
4. Requirements for buffers adjacent to existing roads may be reduced, following the written recommendations of the Planning Board, if the surrounding area has been previously developed, and the existing character of the neighborhood will be retained.

703.2 Buffer Materials

1. Preferred landscaping is retained natural woodlands. Grass and mounds shall be approved buffer material provided suitable indigenous shrubs and other plant material are used for screening. Lands used for buffer may be maintained either as common open space or as private open space subject to a suitable deed restriction.
2. On sites in which insufficient land is available for a landscaped buffer of the full width required, fences may be used in conjunction with a reduced width of landscaped area, provided the fencing material selected is compatible with the vicinity.

703.3 Setbacks

Buildings shall be setback from the property line by the buffer zone plus a distance equal to the height of the building. In the neighborhoods that are presently developed, the setbacks of new buildings may be reduced to conform to front yard and rear yard

setbacks of existing buildings. Setback areas may be utilized for paving and non-structural community facilities.

703.4 Building Height

New buildings located beyond two hundred feet of existing buildings shall not exceed thirty-five (35) feet in height. New buildings located within two hundred (200) feet of existing buildings shall not exceed the roofline plane as increased by an angle of ten degrees at a point two hundred (200) feet from the lot boundary to a maximum of thirty-five (35) feet of building height. On development sites of less than ten acres, which are located in developed areas, the allowable building heights shall not exceed those shown to be typical of the neighborhood. In no case shall a planned development use type exceed thirty-fives (35) feet in height or two and one-half (2.5) stories. If any part of any floor level is more than four feet (4) above finished grade, it shall be considered as one story.

703.5 Neighborhood Access

No development site shall reduce vehicular access to an existing neighborhood. The extension of existing cul-de-sac streets to serve a planned development shall not be permitted.

703.6 Building Character

The proposed development shall be designed to retain and reflect certain characteristics of the neighborhood in which it is to be located. Design characteristics shall be stated in the development application and shall include, but not be limited to: building materials, architectural design, street furniture and site and building landscaping.

704 RESIDENTIAL BUILDINGS

704.1 Single-Family Buildings

Single-family buildings shall have individual entrances. Each dwelling unit shall have its own front and rear yard. At least one yard shall be thirty-five (35) feet in width consisting of landscaped open space. No detached building shall be closer than its height to any other building.

704.2 Semi-Detached Buildings

Semi-detached buildings shall be designed around a common party wall. The separation between exterior building walls shall be a minimum of ten (10) feet if there are no windows or the building location of the adjacent buildings is changed by a minimum of eighty degrees. All other spacing shall be at least equal to the average height of the buildings. An architectural theme shall be carried out by use of common building materials, color, exterior detailing, bulk and/or roof lines. Rigidity in design

shall be avoided by variations in building location, landscaping, planting and building coverage.

704.3 Three- and Four-Family Buildings

Three- and four-family buildings shall have a common rear yard of at least twenty (20) feet in depth. Direct access to a parking area shall be provided.

704.4 Multifamily Buildings

Multifamily buildings shall have a landscaped front yard as determined under Section 703. It is preferred that multifamily housing shall be only one dwelling unit deep or that each dwelling unit extend through the building.

704.5 Breaks In Multifamily Buildings

Attached buildings and multifamily buildings shall have breaks in both the roof line and the front and rear building walls as specified below. Breaks shall be utilized so as to minimize earth moving and removal or impacting due to cut or fill on adjacent existing vegetation.

1. Vertical Breaks

A total break footage of four vertical feet in minimum increments of eighteen inches shall be included in every one hundred and sixty horizontal building feet or within three firewalls.

2. Horizontals Breaks

A total break footage of eight (8) horizontal feet in minimum increments of three feet shall be included in every one hundred sixty (160) horizontal building feet or within three firewalls. In addition, angles in the building wall of twenty-two degrees or more shall be considered equivalent to a five-foot break. However, no building shall exceed one hundred sixty (160) feet in length. Breaks in walls shall be varied by a change in building texture provided a common architectural theme is carried out by means of consistent exterior detailing, materials and colors.

704.6 Bedroom Count

In any planned development, no dwelling unit in any building of two or more dwelling units shall be designed, constructed or altered to have more than two bedrooms. For the purpose of this provision, each room in excess of three rooms, exclusive of bathrooms, closets or other small service rooms of less than sixty-eight (68) square feet, shall be considered a bedroom. Adjacent enclosed floor areas separated by any common party partition exceeding four percent (4%) of their common dimension shall constitute separate rooms. In any cluster development, if a special permit has been granted as of July 1, 2001, the allowable number of bedrooms as defined above shall not exceed three times the number of dwelling units proposed, unless a larger number is authorized upon determination by the Board of Appeals, following recommendation by the Planning Board, that either visual overcrowding will be avoided and Town school

facilities will not be unreasonable burdened, or that the larger number of bedrooms is appropriate in order to serve an important housing need.

704.7 Residential Use Types

A minimum of three different residential uses shall be required in any special permit application for a planned development. Residential use types are defined as (1) single-family detached building, (2) single-family attached building, semi-attached building or townhouse, and (3) multifamily or garden apartments. In no case shall there be any more than seventy percent (70%) of the total number of dwelling units in any residential use type in any planned development. In Planned Development Districts 1 and 2, detached single-family dwellings shall be at least five percent (5%) of the required mix.

705 NONRESIDENTIAL BUILDINGS

705.1 Office

Office buildings shall be designed with a parking area and access to a public way separate from that provided for residential buildings. A common architectural theme shall be reflected by means of building materials, architectural style and/or color coordination. No lighting system shall create a glare on adjacent residential buildings. No manufacturing or retail sale of goods shall be permitted, except those pertinent to office operations such as news-stands or cafeteria. No building shall exceed thirty-five (35) feet or two and one-half (2.5) stories in height.

705.2 Community Facilities

Community facilities involving a building or structural coverage of thirty-five hundred (3,500) square feet or greater shall have a parking area and access to a public way separate from that provided for residential buildings. A separate pedestrian and/or bikeway access shall be provided to connect with common open space. Lighting shall be so designed that no glare extends onto residential buildings. Entrances and areas adjacent to residential buildings shall be landscaped with plantings. A common architectural theme shall be reflected by means of building materials, architectural style and/or color coordination.

706 COMMON OPEN SPACE

706.1 Land Qualities

Land credited towards meeting common open space requirements shall either be land which, because of its resource value to the Town, should be preserved in an undeveloped state, or land which has qualities making it useful to residents of the development for either passive or active recreation, and will be "developed" to serve that purpose, or land which serves an important visual role in separating the

development from existing public ways or from other existing or potential developments, or which is of value in dividing the development into coherent sub-areas.

706.2 Location

Common open space shall be located so as to serve the qualities cited immediately above, and also so that all dwellings are close to, if not abutting, common open space and residents can reach it without long distances along streets, so that pedestrian and/or bikeway access separate from the street system interconnects all significant portions of the development, so that a major portion of the common open space is in one or two large areas of substantial depth rather than being fragmented and largely linear, and so that those large areas have public visibility.

707 DESIGN RATIOS

Design ratios are intended to provide a guide for the preparation of a development application and as a means of evaluation of a development application.

707.1 Coverage Ratio

The amount of impervious coverage shall depend on the land classification and evaluation standards as specified in Article 800. Maximum coverage by density shall be defined:

Use District	Maximum Allowable Coverage/Site	Maximum Allow./Coverage Site (Residential Cluster Devel. Only if a special permit has been granted as of July 1, 2001)
Residential Compatibility	15%	10%
Planned Development 1	20%	14%
Planned Development 2	28%	17%
Planned Development 3	35%	20%

707.2 Common Open Space Ratio

The amount of common open space shall depend upon the residential category specified by Sections 708 and 807.3.3. Minimum common open space required shall be:

	Standard No. Persons Per Unit	Minimum Square Feet of Common Open Space Per Person
Single-family detached	3.5	1,000
All other single-family and multi-family	2.0	1,000

In no case shall the common open space be less than twenty-five (25%) percent of the total site. The minimum common open space required herein shall be deed restricted against future structural development and shall be held in common open space uses pursuant to one of the methods of holding common open space land set forth in definitions in Section 725.

707.3 Nonresidential Parking Ratio

The amount of parking for nonresidential uses shall depend upon the type of nonresidential land use intended for the site. The Planning Board may recommend adjustments in the paved area requirements except that the areas for the required spaces must be reserved and not included in any open space calculations. In case the actual use indicates that the reserved parking spaces are needed, the developer shall be responsible to improve those areas to the same character as the exiting parking spaces. Maximum nonresidential parking space ratios shall be:

Parking Spaces per 1,000 Square Non-Residential Use	Feet of Floor Area
Office	4
Community Facility	2 per 1,000 square feet or 20 spaces, whichever is greater

707.4 Residential Parking Ratio

Minimum residential parking space ratios shall be:

Residential Use	Parking Space Per Unit
Single-family detached:	
With 4 or more bedrooms	3.0
With 2 or 3 bedrooms	2.0
Multifamily and attached:	
With 2 bedrooms	2.0
With 1 bedroom	1.5

708 USE INTENSITY AND LOCATIONAL STANDARDS

Use intensity and location standards are intended to provide a guide for the preparation of a development application and as a means of evaluation of a development application.

708.1 Use Intensity Standards

The use intensity shall be the maximum number of dwelling units permitted per gross acre excluding Wetland Protection Overlay District land. This intensity shall depend upon the residential land use category specified in Section 708. Maximum use intensity shall be:

Residential Land Use	Dwelling Units per 40,000 Sq. Feet and 60,000 Sq. Feet if in an Aquifer Protection Overlay District	Dwelling Units per 40,000 Sq. Feet and 60,000 Sq. Feet if Outside the Aquifer Protection Overlay District
Cluster Development (if a Special Permit has been Issued as of July 1, 2001)	1	1
Planned Development 1	1	1 to 2.5
Planned Development 2	1	1 to 4
Planned Development 3	1	1

708.2 Single-Family Detached Building Lot Standards

Single-family detached building lots shall be designed so that the depth shall be no less than one and one-half or more than three times the frontage at the building setback line. All lots shall have direct access only to ways classified as local streets.

708.3 Building Location Standards

Buildings shall be located substantially as indicated on the site plan as approved by the Board of Appeals. If departure is necessitated by site conditions not known at the time of approval, the building may be relocated or reoriented no more than ten feet in any direction from the location indicated on the approved site plan, in accordance with applicable dimensional requirements, following approval of the Zoning Enforcement Officer and consultation with the Design Review Board.

Building location and orientation shall reflect:

1. Relationship to the street line and to other buildings in the development if in close proximity, in order to protect privacy and create visual coherence.
2. Views, solar access, and access to open space, in order to reflect occupant's interest.
3. Organization of large developments into recognizable sub-areas in order to provide scale and identity.
4. Avoidance of topographic change and removal of native trees and vegetation, in order to protect the environment.
5. Reduction of visual intrusion into abutting premises, in order to protect existing character.

1. Avoidance of flood hazard areas, in order to protect safety and prevent damage.

708.4 Road Location Standards

Roads shall be designed to converge traffic flows at convenient access points. Road design shall minimize traffic flows in residential areas. Gridiron arrangements shall not be allowed. To facilitate traffic flow at major intersections turning lanes shall be installed at offices and community centers and may be required at other impacted intersections. Specified construction regulations for ways are contained in Section 709.

709 WAYS

709.1 Existing Regulations

Where regulations for ways are not prescribed by this section, the requirements in the subdivision regulations of the Planning Board shall be used unless otherwise modified by the Board of Appeals.

709.2 Paved Width

The minimum width of paving for a new or improved local or feeder street shall depend on projected traffic use as interpreted by the Planning Board. Minimum width of paving shall be as follows:

Traffic Projection (ADT)*	No Park	Parallel Park One Side	Parallel Park Two Sides
Under 1,000	20 feet	26 feet	36 feet
1,000 or over	22 feet	28 feet	38 feet

*(ADT) Average Daily (24-hour) Traffic

Traffic Projection (ADT)*	45-Degree Park-One Way	90-Degree Park, One side	90-Degree Park, Two sides
Under 1,000	44 feet	42 feet	62 feet
1,000 or over	46 feet	44 feet	64 feet

*(ADT) Average Daily (24-hour) Traffic

709.3 Right-of-Way Width

The minimum width of a right-of-way for a new local or feeder street shall depend on the paved width and road classification. Minimum widths shall be as follows:

Paved Width	Local Street	Feeder Street	Parkway
Under 26 feet	40 feet	50 feet	100 feet
26 feet or greater	50 feet	60 feet	120 feet

709.4 Grades

The maximum grade for a new local or feeder street shall depend on the road classification. Maximum grades shall be as follows:

Local Street – 12% Feeder Street - 6%

709.5 Sight Distance

The minimum sight distance for a new or improved local or feeder street shall depend on the design maximum speed. Minimum sight distances shall be based on the standards established by the American Association of State Highway Officials (AASHO) or seven times the design speed whichever is greater.

709.6 Cul-de-Sac Length

The maximum length of a cul-de-sac street shall not exceed five hundred (500) feet, subject to the discretion of the Planning Board under unusual conditions.

709.7 Cul-de-Sac Turnaround

The minimum outside radius of a cul-de-sac turnaround shall depend on whether parking is provided. Minimum radii shall be as follows:

	Paved With Radius	Right-of-Way Radius
With parking	65 feet	75 feet
Without parking	50 feet	60 feet

The interior portion of a turnaround may be left unpaved and improved as a landscaped area.

709.8 Construction

All ways shall be constructed according to the requirements in the subdivision regulations of the Planning Board or as otherwise modified by the Board of Appeals.

709.9 Floodplains

Within the Flood Hazard Overlay District, see Section 402.18 for additional development standards.

710 INTERSECTIONS

710.1 Existing Regulations

The Planning Board subdivision regulations or as otherwise modified by the Board of Appeals shall apply to development applications submitted under this Bylaw except for intersections between local and/or feeder streets. Regulations for these streets shall be as prescribed in this section.

710.2 Clear-Sight Triangles

Clear-sight triangles shall be provided at all street intersections. Within such triangles, no vision-obstructing object shall be permitted which exceeds a height of thirty inches above or projects below ten feet above the elevation of the intersecting streets. The required dimensions of the sides of the clear-sight triangle shall depend on the maximum design traffic approach speed and the movement restrictions and shall be as follows or as established by the AASHO, whichever is greater:

Classification	Controlled Intersection	Uncontrolled Intersection
45 mph*	135 feet	200 feet
35 mph	105 feet	150 feet
25 mph	75 feet	110 feet

*mph = miles per hour

710.3 Grades

Intersections shall be approached on all sides by a straight leveling area of at least fifty feet from the nearest intersection right-of-way line, the maximum grade shall be determined by the design traffic approach speed, subject to the discretion of the Board of Appeals under unusual conditions. The maximum grades shall be five percent (5%) or as established by the AASHO, whichever is greater.

710.4 Separation

Intersections shall be separated from other road intersections on the same or opposite side by a minimum distance which shall be determined by the maximum design traffic approach speed and the type of intersection. Minimum distances shall be as follows and maximum speed classification at a mixed speed intersection shall govern:

Classification	Full or "T" Intersection
45 mph	400 feet
35 mps	300 feet
25 mps	150 feet

710.5 Angle of Intersection

Both feeder and local streets shall intersect at an angle not to exceed one hundred (100) degrees not less than eighty (80) degrees.

710.6 Arcs

Street intersections shall be rounded by tangent arcs with a minimum radius

determined by the road classification. Radii depend on traffic speed and road width. In

any event design radii shall permit the largest fire vehicle to negotiate any intersection freely with a car stopped in the opposite lane. Minimum radii shall be as follows:

Classification	Radii
Local and local	25 feet
Local and feeder	35 feet
Feeder and feeder	45 feet

711 UTILITIES

All utilities shall be placed underground. Common trenches shall be utilized where practical. The minimum easement width shall be ten feet and shall be within the street right-of-way lines. Care shall be taken to avoid excessive clearing and to maintain control of grading.

711.1 Building Setback

Buildings shall be set back twenty feet from all utility easements except those providing direct service. Setbacks from natural gas transmission lines shall be fifty (50) feet.

711.2 Construction

All utilities shall be constructed according to the applicable requirements of the department or board charged with their maintenance.

711.3 Sanitary Sewage

The regulations of the Board of Health and, where other applicable, the State Sanitary Code, Title 5, shall apply to all on-site disposal systems. The Board of Appeals, or the Board of Health, may impose additional requirements to protect the Town's water resources and wetlands.

711.4 Other Utilities

The construction regulations of the public utilities or governmental agencies charged with the maintenance of the utility to be provided shall be applicable.

711.5 As-Built Drawing

As-Built drawings showing the location of utility easements shall be required upon completion of the development for submission to the appropriate Town department or board.

712 STORM DRAINAGE

712.1 Use of Existing Facilities

Existing storm sewers maintained by the Town shall be utilized in those instances where they are reasonably accessible and have available capacity. New facilities interconnecting with existing ones shall be constructed according to the requirements of the Town and in conformity to the Master Drainage Plan as interpreted by the Department of Public Works Director.

712.2 Natural Systems

The use of existing natural drainage systems shall be employed providing that the discharge into adjacent properties at the point of discharge shall not be increased nor create measurable damage. To facilitate the retention of stormwater, to protect against siltation and to prevent measurable damage, on-site improvements such as retention basins, diversion ditches, sodded swales or rubble swales may be required by the Board of Appeals under Section 807.4.5.

712.3 Streets

All streets shall be designed to provide for the discharge of surface water from the paved areas and shoulders. Provisions to accommodate stormwater runoff shall be designed to meet the needs of the site. Swales shall be constructed to meet the requirements of the Town as interpreted by the Department of Public Works Director. Sodded swales may be substituted for curbs provided a gravel base is extended to prevent pavement deterioration, on-street parking is prohibited and scouring velocity will not be reached.

712.4 Erosion Controls

Proposed methods of controlling erosion during construction shall be incorporated into the appropriate documentation submitted with the development application. This may include temporary improvements such as the use of grass or ground cover or impounding basins for erosion control both during and after construction.

713 RIGHT-OF-WAY IMPROVEMENTS

713.1 Curbs

Curbs or berms, if provided, shall be installed along both sides of ways. Construction shall meet the requirements in the subdivision regulation of the Planning Board or as otherwise modified by the Board of Appeals.

713.2 Bikeways and Walkways

A pedestrian access system shall be provided along side streets as shown under Section 807.3.5 or preferably in common open space under Section 807.3.7. Walkways shall be constructed in accordance with the specifications in the subdivision regulations of the Planning Board or as otherwise modified by the Board of Appeals and shall be at least four (4) feet in width. Bikeways shall be at least ten (10) feet in width; land and improved trails shall be at least five (5) feet in width. Pedestrian access shall be provided to all community facilities and recreation areas. All bikeways and walkways shall be separated from a way by a minimum ten (10) feet.

713.3 Fire Hydrants

Fire hydrants shall be installed within five hundred feet (500') of all proposed buildings at locations determined by the Fire Department and installed in a manner approved by the Duxbury Water Department. Locations shall be specified in the utilities map as described in Section 807.3.6.

In areas where no municipal water supply is available, a municipal water supply shall be provided by the developer.

713.4 Street Lights

Street lights shall be installed at appropriate locations in an approved manner as specified on the road and parking map as described in Section 807.3.5. Lighting fixtures shall be approved by the Board of Appeals and the electric utility company. Care shall be taken to insure uniform illumination, to avoid glare and to respect the quality of the Town.

713.5 Shade Trees

Shade trees shall be planted at appropriate locations along all ways when required so that the number shall not be less than one (1) tree for each forty (40) feet of road edge. Locations shall be specified on the road and parking map as described in Section 807.3.5. Required planting may be reduced where existing trees are fully protected and retained.

714 IDENTIFICATION

714.1 Concept

The regulations of this section shall apply to identification signs for the development. Other Town regulations shall remain in force for other sign locations within the development.

714.2 Entrance Signs

An approved sign or symbol may be permanently affixed at all entrances to the development. Such signs or symbols may be attached to a building or may be freestanding. No sign or symbol shall exceed twenty-five (25) square feet per face and shall be in a character respecting the quality of the Town.

714.3 Street Names and Housing Numbers

Street names shall not conflict or be mistaken for existing street names in the Town unless a new street is a logical extension of an existing street. The numbering system shall be in accordance with the General Bylaws of the Town. Proposed street names shall be referred to the Town Historian for comment and recommendation.

714.4 Other Identification

Any development may utilize special symbols particularly related to the development on street posts, lights and approved traffic signs. Logos and other symbols must be approved by the Board of Appeals.

715 GRADING

715.1 Drainage

All land adjacent to buildings or paved areas shall be graded to secure proper drainage away from the improvement and to prevent the undesirable collection of stormwater near buildings. Free movement shall not be impaired.

715.2 Excavation

No excavation shall be made with a cut face steeper than the natural angle of repose for the material of the area unless a structurally sound and properly engineered wall is provided to support the face of the excavation.

715.3 Fill

No fill shall be deposited which creates any exposed surface steeper than a two on one slope unless a structurally sound and properly engineered wall is provided to support the face of the fill. Fill shall be placed in even lifts of six inches to twelve inches for stability and compacted to within ninety-five percent (95%) of its maximum density, optimum moisture content.

Top soil shall not be used except as top dressing. Vegetative materials and/or refuse may be used to create mounds or other improvements above natural grade provided they are intermixed with clean sub-soil and covered with a minimum of twelve inches of top soil. Fill shall not be spread over existing natural vegetation. Trees shall be protected with an adequate tree well as required.

716 PARKING

716.1 Spaces

No off-street parking space shall have a stall depth of less than twenty (20) feet nor a width of less than nine and one-half (9.5) feet. Parallel parking shall have a minimum depth (length) of twenty-two (22) feet. All spaces shall have a minimum of one hundred ninety (190) square feet.

716.2 Setbacks

All off-street parking areas shall be separated from vehicular paved areas by a minimum landscaped setback of two (2) feet.

716.3 Stops

All off-street parking spaces adjacent to an open area shall be provided with a parking stop or bollard. No vehicle shall overhang an open area.

716.4 Planting

A minimum of twenty percent (20%) of the interior of a parking area shall be maintained as open space with indigenous plantings or by the retention of existing trees. All planting shall be protected with curbs, bumpers, or bollards as shown in the road and parking map.

716.5 Location

The required parking spaces under Section 707.3 and 707.4 shall be located within a radius of a building entrance depending on the use as follows:

Classification	Parking Radius
Residential	150 feet
Office	300 feet

717 DRIVEWAYS

717.1 Common Driveways

No more than two single-family units shall be served by a common driveway.

718 INCLUSIONARY HOUSING REQUIREMENTS

The provisions of Section 560 of the Zoning Bylaw shall, so far as applicable, apply to Planned Developments.

725 DEFINITIONS

In this Bylaw, the following terms shall have the following meaning in relation to planned developments permitted under Article 700 and Article 800. Words used in the singular include the plural and words used in the plural include the singular. Words used in the present include the future.

Buffer

An open space, landscape strip, earth mounds or natural woodlands utilized to separate uses or to separate planned developments site from all boundary uses.

Building, Attached

A dwelling unit connected on both sides to an adjacent unit by a common or party wall with a separate exterior entrance for each unit.

Building, Detached

A dwelling unit which stands alone and has not party walls or walls in common with an adjacent building except for a garage or other appropriate accessory attachment.

Building, Multifamily

Three or more dwelling units within a building with a unit contained on one floor and with units sharing an exterior door.

Building, Semi-Detached

A dwelling unit connected on one side to an adjacent unit by a common or party wall with a separate exterior entrance for each unit.

Coverage Ratio

The maximum proportion of impervious ground coverage permitted in a planned development, inclusive of all buildings and pavement, determined by design ratios set forth in Article 700.

Developer

The person, persons, corporation, trust, firm or partnership or other legal entity who shall be responsible for the development of land and/or structures or is charged with the execution of a planned development under this Bylaw.

Development Schedule

A schedule of the rate of construction of housing, business units and improvements required under a special permit granted for a development application.

Home Owners' or Residents' Association

A legal organization approved by this Bylaw composed of all resident owners in a planned development responsible for owning or maintaining common property, providing for compulsory membership for each resident, equitable voting rights and effective participation opportunities.

Impervious Coverage

Referring to the condition in which portions of a lot are rendered impervious by structures which cover previously natural or undeveloped land area, therefore, potentially altering natural drainage and groundwater recharge characteristics.

Nonresidential Uses

Uses other than residential intended to be utilized in conformance with an approved planned development application.

Open Space

Land area which is not covered by any building or other impervious structure.

Open Space, Common

A restricted parcel or parcels of land or an area of water, or a combination of land and water within a site, designed and intended for the common use and enjoyment of the residents of a planned development, exclusive of rear, side and front yards, and owned or controlled by the residents or an organization controlled thereby, the Town or other public agency or charitable organization.

Open Space Ratio, Common

The minimum number of square feet of open space required per resident in a planned development.

Parking Perimeter Radius

The maximum distance from a principal entrance in which the required number of parking spaces shall be located.

Planned Development

A plan under this Bylaw for a number of dwelling units and accessory uses which is prepared in conformance with preliminary qualification and site analysis requirements and processed as a development application through the special permit procedure administered by the Board of Appeals.

Preliminary Qualifications

The determination of the suitability of a site, landowner, developer, and conditions for the submission of a development application for a planned development.

Site

A land area submitted for planned development.

Site Analysis

The determination of the use intensity, restricted development areas, public improvements and protected areas for a planned development.

Town

Town of Duxbury

Use Intensity

The maximum number of housing, business units per acre overall or that portion of a site allocated for that purpose.

Use Restriction

A qualification placed upon any or all parts of a site which shall define the uses permitted on the land.

Way

Any public way or private way shown in a plan approved under the provisions of the Subdivision Control Law or any way in existence when the provisions of said Subdivision Control Law became effective in the Town, having in the opinion of the Planning Board suitable width, suitable grades and adequate construction to provide for the needs of vehicular traffic in relation to the purposed use of land abutting thereon or served thereby and for the installation of municipal services to serve such land for the buildings erected or to be erected thereon.

Yard

The minimum width of open space required adjacent to a building.

ARTICLE 800 - PROCEDURES AND REGULATIONS FOR PLANNED DEVELOPMENT

801 GENERAL

No Planned Development shall be undertaken without a Special Permit granted by the Board of Appeals as provided for in Section 906.2 and in accordance with the standards, procedures and requirements enumerated in this Bylaw.

Actions undertaken by a developer under the Planned Development sections of this Bylaw shall be interpreted as voluntary with the understanding that applicable zoning regulations would have remained in effect had not the developer elected to pursue the terms of the applicable sections of this Bylaw. Acceptance of gifts, grants or bequests by the Town from public or private sources under this Bylaw shall be interpreted as within the rights of the Town under applicable Massachusetts law and shall not be interpreted as requiring certain considerations in return.

802 INFORMATION TO BE MAINTAINED BY THE TOWN

To assist in the preparation and review of such developments, the Town will maintain and provide access to certain information and data identified in this section.

802.1 Graphic

- i. Map(s) showing the conservation areas of the Town defining the wetlands and public lands.
- ii. Map(s) showing the slopes, hydrologic soil groups, and vegetation/cover including definition of prime timber stands (coniferous or deciduous)
- iii. Map(s) showing an analysis of prime areas of visual impact.
- iv. Map(s) showing the Town water system including individual pipes by size and location, source of water and storage facilities.
- v. Map(s) showing the traffic circulation patterns, including road classification, peak hour (AM and PM) traffic and accident data to nearest two (2) year period.
- vi. Map(s) showing the existing land use including all historic sites to nearest two (2) year period.
- vii. Map(s) showing Town zoning and describing the Comprehensive Plan.

802.2 Report

1. Projected occupancy by number of persons by type of dwelling unit.
2. Projected school age children based on present generation by type of dwelling unit.
3. Projected peak hours of vehicular traffic generated by type of dwelling unit.
4. Projected septic output by type of dwelling unit (gal/day/unit).

5. Projected water demand by type of dwelling unit (gal/day/unit).
6. Required number of parking spaces by type of dwelling unit.
7. Present capacity of the school system, the capital and operating costs per student to provide educational facilities and programs, the portion of the operating income generated by real estate taxes and the current number of children presently attending schools.
8. Current assessed valuation of all property in the Town, the current tax rate, the tax levy by types of land use and the total number of residents.

803 PROCEDURES FOR THE PRELIMINARY QUALIFICATION AND SITE ANALYSIS

803.1 Notification

An applicant for a Special Permit to undertake a Planned Development shall notify the Zoning Enforcement Officer of his intent. The Zoning Enforcement Officer shall notify the Board of Appeals of such intent within ten (10) days.

803.2 Information to be Submitted

In order for the Board of Appeals to establish the appropriateness of the applicant's proposal for a special permit, the applicant shall submit the information required in Section 804, Preliminary Qualification, and Section 805, Site Analysis, to the Board of Appeals. A partial submission will not be accepted.

803.3 Review by the Planning Board

The Board of Appeals shall forward the submitted information to the Planning Board to conduct a review of the proposal.

803.4 Distribution Data

The Planning Board shall, at a regularly scheduled meeting, notify the applicant as to the completeness of this data submission. When the information is considered complete, the Planning Board shall distribute to other town committees and boards such appropriate data as deemed necessary for their reviews and reports to the Board.

803.5 Report of the Planning Board

The Planning Board shall schedule meetings, at least two (2) of which shall be with the applicant, to review the submitted data. A report with recommendations shall be made not later than one hundred twenty (120) days from the meeting of the Planning Board at which the submission is determined to be complete. The report to the Board of Appeals shall be in written form and shall identify any specific and general standards in this Bylaw not fully complied with. The report shall include findings related to the Preliminary Qualification of the site, its eligibility, its consistency with the Town's goals and the standards herein, the suitability of the developer and the initial suitability of the

proposed development for a Development Application. The report shall also include a Site Analysis and findings on the allowable use intensity range; the classification of the land; the capacity of the site to accommodate streets, sanitary sewage or waste disposal systems, public water supply, stormwater drainage, floodplains, and other natural and/or municipal service systems. A preliminary schedule of improvements, both off-site and on-site, required by the development shall be a part of the report. Copies of the report with its findings and recommendations shall be made available to the applicant and filed in the Office of the Town Clerk.

Upon receipt of the Planning Board's report, the Board of Appeals shall place said report on file pending receipt of a Development Application for the site under the provisions of this Bylaw. The applicant shall have one hundred eighty (180) days to proceed with the filing of a Development Application using the preliminary qualification and site analysis submission and the report of the Planning Board. The applicant is encouraged to meet at least twice with the Planning Board during this period.

803.7 Development Application Requirements for Small Developments

Provided that a special permit has been granted as of July 1, 2001 and limited only for applications of a residential cluster of development of twenty (20) acres or less, or twenty (20) dwelling units or less, on a planned development in a PD-1 or PD-2 District with twenty-five (25) or less dwelling units and no Neighborhood Business uses, the Board of Appeals may accept only those requirements pertinent to the application based on the scope of that application, the size of the proposed project and the limited community impact due to that size. This section is designed for the small landowner in a confined location. In no instance shall this provision be applied to Development Applications for small areas under the same ownership that can be combined into a larger parcel or for small parts of a larger parcel subdivided on a section by section basis. All design standards in Article 700 and all administrative procedures of Articles 800 and 900 shall still apply.

804 PRELIMINARY QUALIFICATION

804.1 Time of Submission

The applicant shall submit a Preliminary Qualification, and shall prepare and submit to the Board of Appeals the following information, which is designed to provide a basis for an initial review concerning the property, developer and ownership requirements, at least ten (10) days before a regularly scheduled meeting.

804.2 Submission Standards

Information shall be submitted in a spiral bound or three-ring, loose-leaf report on 8-1/2" x 11" paper, vertical format. The scale of maps for sites less than fifty (50) acres

shall be at least one (1) inch to one hundred (100) feet; for sites larger than fifty (50) acres the scale shall be at least one (1) inch to two hundred (200) feet.

804.3 Site Information

The information shall include: location, zoning classification, size, natural characteristics including floodplains, utilization of land adjacent thereto, and the existing buildings on the site.

804.4 Existing Buildings and Adjacent Uses

If the retention of existing buildings or the extension of facilities or utilities which now serve adjacent uses is contemplated, these facts shall be further documented.

804.5 Developer Information

The information shall include:

1. Ownership – The applicant shall have a property interest in the site which shall consist of a fee simple title, or an option to acquire a fee simple title within a specified time period, or a leasehold interest in excess of thirty (30) years, or a substantial interest in a joint venture agreement, real estate investment trust or other real estate syndication which has or can obtain a fee simple title, or a marketable title subject to certain restraints which will not substantially restrict its development within a reasonable time or shall show a copy of a purchase and sales agreement.
2. Existing Mortgages, Liens and Judgments – All mortgages including purchase money mortgages, all easements restricting land use, all liens, all judgments which affect the site and a proposed method of notifying, where necessary, all affected parties of the intention to submit a development application for a Planned Development shall be identified.

804.6 Development Information

The information shall include:

1. Existing and proposed non-residential land uses by types in acres.
2. Preliminary information as to the type of construction proposed and the projected mix of housing by number, type and size of dwelling units, general layouts with dimensions and numbers of rooms in each, and any unusual procedures by which conformance to building and housing codes may be determined.
3. Projected construction schedule to include the number of dwelling units and business units to be constructed and the duration of the building time, said schedule to be in accordance with any existing development estimate based upon projected demand and service capabilities and accepted by the Board of Appeals to guide development growth.

4. The roads and utility lines to connect into the proposed development providing all public and private streets and utilities have the existing capacity to absorb the amount of development which is projected.
5. The projected impact of the development on the roads, utility lines and other service systems both on-site and off-site.

805 SITE ANALYSIS

805.1 Time and Form of Submission

The applicant shall prepare and submit the following information concerning the proposed development site at the same time and in the same form as the Preliminary Qualification information.

805.2 Submission Requirements

The information shall include:

1. A topographical map of the site with contours at a minimum of ten (10) foot intervals.
2. A soils map based on data maintained by the Town.
3. A map of the site with Flood Hazard Areas Overlay District boundaries.
4. A vegetation and special features map showing all woodlands and significant individual or group tree masses, rock outcroppings, existing building, roads and trails, flowing streams, drainage ways and ponds.
5. A map of the neighborhood showing the site in relationship to the surrounding areas, all proposed points on interconnecting access to existing roads, storm sewer interceptors, and public water lines, and access to local schools.
6. A report providing information about the present use and design capacities of existing roads and other service systems at the points of intersection or use, including twenty-four (24) hour average daily traffic counts or peak hour traffic counts, calculations of existing stormwater runoffs for a fifteen (15) and one hundred (100) year frequency storm and estimates of the present available water pressures, type of sewage disposal system and the calculations of impact of said water pressures and the disposal system on the site and neighborhood.
7. A sketch plan showing the general location, type and number of units in residential structures, the general location and types of non-residential structures, the general location and size of common open space, and the location and width of ways.

806 PROCEDURES FOR A DEVELOPMENT APPLICATION

806.1 Development Application Submission

806.2 An applicant for a Special Permit to undertake a Planned Development shall, ten (10) days prior to a regularly scheduled meeting, submit to the Board of Appeals a

Development Application which would include all information required by this Bylaw. A partial submission will not be accepted. Planning Board Review

The Board of Appeals shall, upon receipt of the submission, forward it to the Planning Board who, with other appropriate bodies of the Town, shall review the Development Application and the accompanying documentation. The Planning Board shall schedule at least two (2) meetings with the applicant during the review period. Within thirty-five (35) days of its receipt by the Board of Appeals, the Planning Board shall submit a report of its findings to the Board of Appeals. Said findings shall be prepared from an evaluation based on the zoning classification and the natural characteristics of the site, the impacts of the required municipal services for the site and the general and specific requirements of this Bylaw. The evaluation shall also determine the capacity of the site in relationship to the following types of services available and to be supplied. The purpose of the evaluation at any stage in the preparation of a Development Application is to determine the individual and overall impacts of the proposed Application on the capacity of the existing systems within the Town, which will serve the site and on the capacity of the site to accept the proposed development.

Road Capacity – The findings shall specify the allowable maximum use intensity based on the capacities of the ways serving the site. The closest major intersection of the public ways to be used by the development shall be evaluated to determine:

1. present traffic usage;
2. projected traffic usage;
3. effective design capacity;
4. improvements proposed to increase capacity;
5. redesign capacity; and
6. other non-intersection problems affecting road capacity. An estimated cost of the proposed improvements shall be included.

Septic Disposal Capacity – The findings shall specify the allowable maximum use intensity based on the capacity of the site to meet adequate disposal standards in this Bylaw including the requirements of Title 5 of the State Sanitary Code. Further, the findings shall be related to the natural characteristics of the site, the neighborhood soils and the underlying geology which would receive the effluent from the sewage disposal facility. This finding shall give special attention to major aquifers and to recharge and storage areas which would be affected by the effluent.

Public Water Capacity – The findings shall specify the allowable maximum use intensity based on the capacity of the public water system available to and serving the site. All existing waterlines shall be evaluated at the point of intersection to determine:

1. present line size;
2. estimated peak hour capacity;
3. present peak hour utilization; and
4. other problems affecting water capacity.

In the event that the site is located in such a manner as to provide connections to more than one (1) water line, the required data shall be determined for each. Any necessary redesign of the capacity of the public water facilities and an estimated cost of the required improvements shall be included.

Stormwater Drainage Capacity – The findings shall specify the allowable maximum use intensity of the site based on the capacity of the site to handle stormwater runoff. All existing facilities to accommodate the flow of stormwater shall be evaluated at the point of proposed discharge to determine:

1. Present line size on storm channel;
2. Estimated capacity at flood or back-up stage;
3. Alternative drainage possibilities; and
4. Improvements to increase capacity.

All calculations required to determine the capacity of existing and proposed systems shall be prepared for both a fifteen (15) and one hundred (100) year frequency storm. In the event that the site is located in such a manner as to provide connections to more than one drainage basin, the required data shall be determined for each. The findings shall also include an estimate of the potential effect of the site design upon the surface runoff and groundwater recharge of the major aquifers in the vicinity of the site, an analysis of the impact of the proposal upon existing flood plain and wetland areas and estimates of any potential increase in the flooding of these areas. Any necessary redesign of the capacity of the drainage facilities and an estimated cost of required improvements shall be included.

Further, said findings shall include detailed statements on the subject matter of Section 803.5 and shall, in addition, respond to the:

1. Relationship to and compliance with the Town's Comprehensive Plan statements and map.
2. Adequacy of the provisions for open space.
3. Adequacy of the considerations given to the existing natural systems including but not limited to:
 - a. Steep slopes;
 - b. Field areas;
 - c. Wetlands and floodplains, including areas suitable for future coastal wetland migration and future coastal flood hazard areas;
 - d. Aquifer recharge areas;
 - e. Significant physiographic features;
 - f. Visual corridors;
 - g. Existing water bodies; and
 - h. Areas of high pollutability.
4. Adequacy of the provisions for public services including but not limited to:
 - a. Water supply and capacity; including available and acquired fire code requirements;
 - b. Traffic hazards and road capacity;

- c. Schools; and
 - d. Fire and police.
5. Adequacy of the relationship with the surrounding neighborhoods.
 6. Adequacy of the improvement and development schedules.

The report with its findings and a recommendation to approve, disapprove or approve with conditions shall be formally submitted at the public hearing on the Development Application.

806.3 Use Intensity Ranges

The permissible density of any site is to be based on the Town's Comprehensive Plan and is determined by its land classification, the maximum use intensity standards in Section 708.1, and the findings and service capacities established in Section 806.2.

807 DEVELOPMENT APPLICATION

The applicant shall prepare and submit a Development Application, including the following information, in the form and in the manner prescribed in this section and in regulations adopted by the Board of Appeals.

807.1 Inclusions

All Preliminary Qualification and Site Analysis documentation shall be included with the Development Application. Any report, findings and/or recommendation from the review of this documentation may also be included.

807.2 Submission Standards

Information shall be submitted in a spiral bound or three ring loose leaf report on 8-1/2" x 11" paper, vertical format. The scale of maps for sites in excess of fifty (50) acres shall be at least one (1) inch to two hundred (200) feet. Maps for sites of less than fifty (50) acres shall be at least one (1) inch to one hundred (100) feet. The number of maps and reports to be submitted shall be specified by the Planning Board in the Preliminary Qualification and Site Analysis stage but shall not exceed twenty-five (25). All maps shall be reduced to 17" x 22" for inclusion in the report and shall be accompanied by a written report fully discussing the map in addition to the applicable reports under Section 807.4.

807.3 Graphic Submissions

1. Regional Location Map – The site shall be identified showing its interrelationship to the community on a regional map at a scale of one (1) inch to eight hundred (800) feet. The name and location and the distance in road miles to the following facilities servicing the site shall be shown:

- Elementary school(s)
- Secondary School(s)

- Fire Station
- Police Station
- Arterial and limited access highways
- Recreation areas
- Shopping areas
- Industrial areas
- Churches and public buildings
- Public transportation routes and major stations

2. Adjacent Property Owner Map – The names of all property owners from the most recent tax list within five hundred (500) feet of the development site shall be shown on an appropriate property line map.

3. Land Classification Map – All lands within the site shall be illustrated by the appropriate category as determined by Section 702.1. The acreage and corresponding proportion of the total site represented by each category shall be stated in the map legend.

4. Land Evaluation Map – The natural limitations of the land on its use and development shall be summarized and shall include the following analysis as related to the Development Application proposals;

- a) Slopes – building and way location and drainage system;
- b) Vegetation and special features – integration into the Application;
- c) Soil quality – relation to the utilities to be provided and building precautions; and
- d) Water table – relation to primary and secondary aquifers and septic tank disposal and drainage systems.
- e) Floodplains – relation to the Flood Hazard Areas Overlay District.

Each of the natural limitation categories affecting site use and development shall be discussed showing how these factors were incorporated into the Development Application. Where public funds for housing are to be used, an A-95 Environmental Impact Study shall be filed. Information not appropriately included on the Map shall be in the Report required by Section 807.4.1.

5. Road and Parking Map – All roads and parking areas shall be identified on a map. The following information pertaining to ways and driveways shall be shown:

- a) Rights-of-way widths for ways;
- b) Street widths for all ways for motor vehicle use;
- c) Typical road construction showing base and sub-base and clear sight triangle dimensions for all major intersections;
- d) Finished grade profiles (centerline) including elevations of high and low points for all ways;
- e) Location of paved paths or bikeways;
- f) Location and definition of trash removal system;

- g) Location and definition of office and community facilities delivery areas and systems;
- h) Location of Flood Hazard Areas Overlay District;
- i) Identification by function of limited access highways, distribution loops, feeder streets and local streets; and
- j) Street cross-section on the map for each category and in the report including a typical cul-de-sac turnaround and divided roadway and major street intersections involving turning lanes or rotary traffic flow.

The following information pertaining to parking locations shall be shown:

- a) Paved areas for all parking locations;
- b) Landscaped areas contained within parking locations;
- c) Estimates for the number of residential units or gross traffic flow and the number of parking spaces for each location; and
- d) Cross-section on the map showing dimensions for a typical parking space and access road(s) and indicating type of parking stop, bollard or curb to be installed.

6. Utilities Map – The following information pertaining to utilities shall be shown:

- a) Location of individual sewage disposal systems;
- b) Location of all common sewage treatment facilities;
- c) Location of major water distribution facilities and fire hydrants;
- d) Location of all existing and proposed pipelines and transmission lines showing easements;
- e) Location of any form of water treatment or distributing facility other than lines and fire hydrants;
- f) Location of Flood Hazard Areas Overlay District;
- g) Cross-section of a typical common service trench showing easements and dimensions and the placement of each utility; and
- h) General distribution systems for gas, electric, telephone and cable TV as applicable.

7. Open Space and Community Facilities Map – The following information shall be shown:

- a) All land dedicated or deed restricted for public or common use showing major trails, area acreage and proposed use;
- b) Location of all playfields, tot-lots, or other recreational facility indicating type and general area of concentrated use;
- c) Location of all buildings intended for community, school, religious or institutional use indicating approximate building coverage in square feet;
- d) Location of all existing buildings, historical areas and scenic areas to be preserved;
- e) Location of Flood Hazard Areas Overlay District; and

- f) Listing on the map the number, by type, of the following community facilities or other optional facilities:
- Ball fields (baseball, football, soccer)
 - Basketball and tennis courts
 - Park, pavilion and shelters
 - Picnic grounds
 - Ponds and lakes
 - Swimming and wading pools, and
 - Tot-lots.
8. Land Coverage and Drainage Map – The following information shall be shown:
- a) All areas of the site to be covered by paving and/or building shall be identified with the amount of area in square feet; and the proportion of each as related to the total site shall be indicated on the map and shown by watershed as existing on and off-site prior to proposed development.
 - b) All areas of the site in which the natural vegetative cover will be altered shall be identified and the proportion by type of change with the amount of area in acres and the proportion of each as related to the total site shall be indicated on the map.
 - c) All drainage areas which occupy five (5) percent or more of the site shall be identified with the amount of area in acres and the proportion of each as related to the total site shall be indicated on the map.
 - d) All natural drainage swales and all streams and their off-site watershed shall be identified with the maximum area shown to be covered by water resulting from a rainfall of fifteen (15) and one hundred (100) year frequency storms.
 - e) All improvements including retention basins, ponds, culverts, dams and storm water pipes in excess of six (6) inches shall be located on the map by type.
9. Land Use Map – The following information shall be shown:
- a) Number and location of single family detached units;
 - b) Number and location of single family semi-detached or attached units;
 - c) Number and location of multi-family units by type;
 - d) Location of office buildings;
 - e) Location of community facilities; and
 - f) Location of Flood Hazard Areas Overlay District.
10. Dwelling and Other Buildings and Structures – The following information shall be shown:
- a) General Layout of each type of dwelling unit showing building dimensions and rooms and general layout of non-residential buildings and structures showing dimensions and uses.
 - b) Building elevations and/or renderings to graphically illustrate the

architectural design and character of the proposed dwelling or non-residential building or structure. The elevations shall be drawn to an appropriate architectural scale and include information describing use of materials, color and all accessory items such as awnings or signage of the proposed dwelling or non-residential building or structure.

11. Topographical Map – A topographical map of the site with contours at a minimum of two (2) foot intervals.

12. Site Plan – One sheet summarizing the proposal, showing existing and proposed topography, floodplains, buildings, parking, drives, walls and trails, recreation facilities, landscaping, building uses, any major drainage and utilities elements such as detention areas.

807.4 Report Submission

1. Land Evaluation Report – This report shall contain all of the information required by Section 807.3.4 not otherwise appropriately included on the Land Evaluation Map.

2. Population and Economic Impact Evaluation Report – This report shall contain the following information including a summary of these factors in the text and an analysis of their relationship to the development proposals.

a) Population characteristics:

- projected total population
- projected population of each section
- projected population by age groups: 0-4, 5-13, 14-18, 19-35, 36-50, 51-65, 65 plus
- projected population by dwelling unit type
- projected family characteristics (head of household, wife, children under eighteen [18] years of age)

b) Economic characteristics:

- projected work force
- probable employment by location
- estimated disposable family income
- probable retail shopping by location
- projected permanent jobs created by the proposed development

This report shall also contain an analysis indicating the projected marketability of the dwelling units in the development with respect to effective demand specifically relating the site to the Town. Public and/or subsidized housing shall be identified and an explanation of the assistance program and the number of units affected shall be included.

3. Traffic Impact Evaluation Report – This report shall be summarized in text form with an analysis related to the development proposals:

- a) Projected number of motor vehicle trips to enter or leave the site for an average day and for a peak hour;
- b) Projected traffic flow patterns as related to the Road and Parking map including vehicular movements at all major existing and proposed intersections; and
- c) Evaluation of the impact of this traffic upon existing streets in relation to capacities using both current and redesign criteria.

4. Utilities Impact Evaluation Report – This report shall contain an analysis of the provisions for gas, electricity, telephone, mail service, sewage disposal, and refuse storage and collection.
- a) Construction processes shall be specified to include common trenches where feasible. The probable impact from utility needs shall be determined and shall include:
 - The estimated daily and peak hour volume of public water demand;
 - Evaluation of the estimated impact of water demands upon existing service facilities in relation to defined sewage disposal and public water capacities;
 - Description of proposed sewage treatment facility or disposal system including type and design capacity;
 - Evaluation of the estimated impact of effluent from individual sewage disposal systems of common sewage treatment facilities in terms of quality and quantity on soil conditions, groundwater levels and other relevant natural site characteristics; and
 - Description of manner or method by which proposed sewage disposal facility shall be maintained and operated.
5. Drainage Impact Evaluation Report – This report shall contain an analysis of all drainage improvements including off-site conditions to facilitate the flow of stormwater as identified in the Land Coverage and Drainage Map. Construction processes shall be specified for each drainage system.
- a) The projected maximum volumes at the collecting point for each drainage basin for fifteen (15) and one hundred (100) year storms; and
 - b) The estimated impact of stormwater upon existing service facilities in relation to existing stormwater capacities.
6. Common Open Space Analysis Report – This report shall contain an explanation of how the common open space shall be maintained including an estimate of additional charges or costs to be paid by each housing unit. The method by which citizen participation is to be provided in the maintenance of these facilities shall be specified. All improvements to be placed on the land shall be described. A statement of conformance or lack thereof to the requirements of Section 707, Design Ratios, shall be included. The probable utilization of the common open space in the development shall be discussed including:
7. Schedule Report – If the development of the site will take place over more than one year, the developer shall supply development and improvement schedules. This report shall contain the following information:
- a) The construction of any public improvements explaining how these improvements are to be integrated with the development;

- b) The number of dwelling units and the number of square feet of non-residential uses to be constructed each year and their estimated values; and
- c) The guarantee which shall be provided to the Town to assure construction of specified improvements.

8. Supplemental Information – The Board of Appeals and/or its review body, the Planning Board, may request additional or supplemental information as may be deemed necessary to make a thorough and proper review and evaluation of and decision on the development application.

807.5 Decision

1. The Board of Appeals shall act within ninety days following a public hearing. This time period may be voluntarily extended upon agreement of the Town and the applicant. The decision shall be filed with the Town Clerk together with all plans appropriate to the decision. The Board of Appeals shall state in writing reasons for its decision and in the case of disapproval specifically the sections of this Bylaw which have not been met by the applicant in his development application submission. Two (2) copies of the decision shall go to the Planning Board and one (1) copy to the applicant. One (1) transparent mylar copy of the approved development application shall be filed with the Board of Appeals within sixty (60) days of such approval.
2. No Special Permit granted by the Board of Appeals shall take effect until the decision together with the plan relating thereto are recorded with the title of the land or lot in the Plymouth Registry of Deeds and until a certified copy of said recording is received by the Board of Appeals. The owner of the land in question shall pay for and be entirely responsible for filing the decision of the Board of Appeals.
3. The granting of a Special Permit does not constitute the issuance of a building permit, which must be obtained by application to the Zoning Enforcement Officer as provided in this Bylaw.

ARTICLE 900 – ADMINISTRATION

901 ENFORCEMENT

This Bylaw shall be enforced by the Board of Selectmen, either directly or by a Zoning Enforcement Officer or agent appointed by the Board. No person shall erect or externally alter a building or other structure in the Town without a permit from the Board or Zoning Enforcement Officer upon a form prescribed by the Board. No person shall occupy a building, structure, or premises without a certificate of occupancy.

902 STOP ORDER

902.1 Scope

A Stop Order shall be issued for any violation of the provisions of this Bylaw in unauthorized sale or lease; construction in deviation from approved plans; subsequent actions contrary to the stated activities and uses permitted by approved plans; failure to adequately maintain common open space; or inadequate or insufficient construction of improvements.

902.2 Notice

A Stop Order shall be issued by the Zoning Enforcement Officer and delivered to the owner of any property or his agent. Delivery shall be construed to include mailing of such Order, postage prepaid, to said owner or posting on the property. Copies of such Order shall be maintained by the Town.

- a. Contents – The Stop Order shall be in writing and shall state the nature of the violation and conditions under which work or use may continue. A time limit, not to exceed five (5) days, shall be permitted to allow for the necessary correction of the violation.
- b. Unlawful Continuance – Any person who shall continue in violation of the Stop Order shall be in violation of this Bylaw and shall be subject to the enforcement provisions of this Bylaw.
- c. Failure to Issue – The failure of the Town to obtain a Stop Order for any reason whatsoever shall not be interpreted as an estoppel against the Town from pursuing any other legal remedy permitted under law.

903 BUILDING OR USE PERMIT

903.1 Issuance

No building or structure shall be used, constructed, relocated, added to or demolished without a building permit having been issued by the Zoning Enforcement Officer. No such permit shall be issued until such construction, alteration, or use, as proposed complies in all respects with the provisions of this Bylaw or with a decision rendered or Special Permit granted by the Board of Appeals, or any other Special Permit Granting Authority authorized under this Bylaw.

903.2 Planned Developments

Prior to issuance of a building permit to construct an exterior alteration or addition to an existing structure or dwelling in a Planned Development, application shall be made to the Zoning Enforcement Officer in the usual manner. The Zoning Enforcement Officer shall forthwith forward the application along with all plans and specifications to the Design Review Board and the development's Homeowners' Association for their review and recommendation. In both instances, the recommendation shall be forwarded to the Zoning Board of Appeals and the Zoning Enforcement Officer within twenty-one (21) days. Failure to make such recommendation within twenty-one (21) days of the receipt of the referral shall be deemed to constitute approval. Once the recommendations have been received by the Zoning Board of Appeals and the Zoning Enforcement Officer, or said twenty-one (21) days have elapsed, an appointment at the next administrative meeting of the Board will be scheduled. At that time, the Zoning Board of Appeals shall determine whether the proposed alteration or addition exceeds the terms of the Special Permit under which the development was constructed and requires an amendment to said Special Permit. If the Board of Appeals determines that an amendment is not required, it shall notify the Zoning Enforcement Officer and a building permit may be issued.

904 OCCUPANCY PERMIT

904.1 Permanent Occupancy

No premises and no building or structure erected, altered or in any way changed as to construction or use, under a permit or otherwise, shall be occupied or used without a Certificate of Zoning Compliance signed by the Zoning Enforcement Officer. Such certificates shall not be issued until the premises, building or structure, and its proposed uses and accessory uses comply in all respects with this Bylaw. A record of all

applications and occupancy permits shall be kept on file by the Zoning Enforcement Officer.

A Certificate of Zoning Compliance shall be conditional on the maintenance of full compliance with the provisions of this Bylaw in effect at the time of issuance or with a decision of, or Special Permit granted by the Board of Appeals or any other Special Permit Granting Authority authorized by this Bylaw and shall lapse if such compliance fails.

904.2 Applications

Applications for Certificate of Zoning Compliance shall be granted or denied in writing within ten (10) days of receipt by the Zoning Enforcement Officer.

905 PLOT PLAN ACCOMPANYING APPLICATION

905.1 Minimum Requirements

Any application for a building or use permit or a certificate of occupancy shall be accompanied by a plot plan, in triplicate, accurately drawn to a scale of one (1) inch equaling forty (40) feet, showing the actual shape, area and dimensions of the lot to be built upon, the exact location and size of any buildings or structures already on the lot, the location of proposed alterations to and enlargements of existing buildings or structures, driveways, the location of new buildings or structures to be constructed, together with the lines within which all buildings or structures are to be erected or enlarged, the existing and intended use of each building or structure and all streets and ways on or adjacent to the lot, delineation of any Wetlands Protection Overlay District, Flood Hazard Areas Overlay District or Aquifer Protection Overlay District areas located within the lot, or include a statement on the plan stating, "No part of lot is within zoned Wetlands Protection Overlay District, Flood Hazard Areas Overlay or Aquifer Protection Overlay District" and such other information as the Zoning Enforcement Officer may determine is necessary. In the case of a building or use permit for an interior improvement to a building or structure, a plot plan shall not be required.

905.2 Additional Requirements

In addition, for all new buildings and structures and all existing buildings and structures to be externally enlarged or expanded in ground area to an extent greater than thirty (30) percent of internal floor area or ground coverage, or six hundred (600) square feet, whichever is larger, plot plans shall show existing and approved abutting street grades, the proposed elevation of the top of the foundation of existing and proposed buildings or structures, existing and proposed topography, existing septic disposal

systems, private wells, wetland boundary delineation as approved by the Conservation Commission, Flood Hazard Areas Overlay District boundaries, gas, water and other public utilities in the abutting street and the zoning classification of the abutting properties. Plot plans shall also show such other information as may be necessary to provide for the verification of compliance with the applicable provisions and the enforcement of the Bylaw, including, but not limited to, off-street parking, screening and fencing. Plot plans shall be certified by a registered professional engineer or land surveyor. A record of all applications, plans and permits shall be kept on file by the Zoning Enforcement Officer.

906 BOARD OF APPEALS

A Board of Appeals is hereby established which shall have all of the powers of a Board of Appeals under G. L. c. 40A. The Board of Appeals shall consist of five (5) members appointed by the Selectmen, one (1) of which shall be an attorney, and one (1) who shall conform to the requirements under the State Building Code with terms so arranged that no two (2) members' terms shall expire in one (1) year. The Board of Selectmen shall also appoint at least two (2) associate members annually. No member or associate member shall act on any appeal in which he/she has a personal or financial interest. In case of absence of any regular member, his/her place shall be taken by an associate member.

Said Board of Appeals shall exercise the authority and powers and perform the duties set for in G. L. c. 40A, in this Bylaw and the following:

906.1 Appeals from the Zoning Enforcement Officer or Other Administrative Official

An appeal to the permit-granting authority as the zoning ordinance or Bylaw may provide, may be taken by any person aggrieved by reason of his/her inability to obtain a permit or enforcement action from any administrative officer under the provisions of this chapter, by the regional planning agency or by any person, including an officer or board of the Town, or of an abutting city or town aggrieved by an order or decision of the Zoning Enforcement Officer, or other administrative official, in violation of any provisions of this chapter or any ordinance or Bylaw adopted thereunder.

906.2 Special Permits

To hear and decide applications for Special Permits as provided in this Bylaw, subject to any general or specific rules therein contained, and including authority to impose appropriate terms, conditions and safeguards in its decisions.

Applications shall be approved only upon the Board's written determination that the proposal's benefits to the Town will outweigh any adverse effects for the Town or vicinity after consideration of the following, among other things, were germane:

1. Suitability of the proposed location for this proposal, taking the following into consideration:
 - a) Nearby land uses, and whether they would be supported by or damaged by having the proposed use nearby.
 - b) Uses of the site which would be displaced by or preempted by this use.
 - c) Adequacy of roads, water, drainage and other public facilities serving the location.
 - d) Whether the site is more sensitive than are most similarly zoned sites to environmental damage from the proposal such as: flooding, erosion, siltation, potential groundwater or surface water contamination, especially if affecting public or private water supplies, habitat disturbance or loss of valuable natural vegetation.
 - e) Contribution to cumulative impact upon municipal water supplies, including consideration of nitrate-nitrogen loading, if within a defined Aquifer Protection Overlay District.
2. Activity type, mix and intensity, taking the following into consideration:
 - a) Whether the proposal contributes to the diversity of services available locally;
 - b) Seasonal consequences, including addition to peak period congestion;
 - c) Service to local, in preference to regional, markets;
 - d) For business developments, likelihood of employment opportunities being created for residents, and the quality of those opportunities; and
 - e) For residential developments, how substantially, if at all, the proposal contributes to housing diversity.
3. Building and site design, including consideration of the following:
 - a) Whether scenic views from public ways and developed properties have been considerately treated;
 - b) Whether compatibility with neighborhood character has been considerately treated;
 - c) Whether reasonable efforts have been made to minimize visibility of parking and service areas from public streets;
 - d) Whether any traditional public access to or along shoreline has been maintained;
 - e) Whether resilience or adaptability to long-term coastal climate change impacts has been incorporated; and
 - f) Compliance with the criteria of Section 424.4 and/or Section 615 under Site Plan Approval.
 - g) Compliance with Section 404.20 entitled, "Determination of Suitability of Piers."
 - h) Compliance with Section 402.6 entitled, "Variances Related to

Community Compliance with the National Flood Insurance Program (NFIP)."

A Special Permit granted under this authority shall lapse within a two (2) year period, or a shorter period if so provided, and if a substantial use thereof has not sooner

commenced except for good cause or if construction has not begun within the period except for good cause.

The Planning Board, when acting as a Special Permit Granting Authority, is authorized to appoint associate members to the Planning Board for the purpose of acting on special permit applications, in accordance with the following procedures:

- 1) The Planning Board may, by a majority vote, appoint up to two (2) associate members at a public hearing after such positions have been publicly advertised;
- 2) The Chair of the Planning Board may designate an associate member to sit on the board for the purposes of acting on a special permit application in case of absence, inability to act, or conflict of interest, on the part of any member of the Planning Board or in the event of a vacancy on the board.

906.3 Variances

To grant upon appeal or upon petition with respect to particular land or structures a variance including a use variance from the terms of this Bylaw where the Board of Appeals specifically finds that, owing to circumstances relating to the soil conditions, shape or topography of such land or structures and especially affecting such land or structures but not affecting generally the zoning district in which it is located, a literal enforcement of the provisions of this Bylaw would involve substantial hardship, financial or otherwise, to the petitioner or appellant, and that desirable relief may be granted without substantial detriment to the public good and without nullifying or substantially derogating from the intent or purpose of this Bylaw.

906.4 Referral

In addition to those applications for a Special Permit which require site plan approval under Section 615, the Special Permit Granting Authority shall refer a Special Permit application to the Board of Appeals, Board of Health, Conservation Commission, Duxbury Bay Management Commission, Planning Board, Water Advisory Board and Design Review Board for written comments and recommendations before taking final action on said Special Permit application. In addition to the above noted Boards, the Special Permit Granting Authority may refer a Special Permit application to any other Town agency/board/department for comments and recommendations if it so desires before taking final action on said Special Permit application. A public hearing on said referral shall not be required.

Any such board or agency to which applications are referred for comment shall make its recommendations and send copies thereof to the Special Permit Granting Authority and the applicant within thirty-five (35) days of receipt of the referral request by said board

or agency or the referral request by said board or agency or there shall be deemed no opposition or desire to comment. The Special Permit Granting Authority shall not act upon said Special Permit until either comments from referred boards or agencies have been received, or said thirty-five (35) days have elapsed, whichever is sooner. Applications referred to more than one (1) board or agency may be reviewed jointly by said boards or agencies.

906.5 Application Requirements and Determinants for Special Permits from the Board of Appeals:

A. Requirements:

With each application for a Special Permit, except as otherwise provided for a development application, three (3) copies of a site plan shall be submitted to each of the following boards: the Board of Appeals, Planning Board, Board of Health, Conservation Commission and Department of Public Works. One (1) copy of the application shall be submitted to each of the Zoning Enforcement Officer and the Design Review Board. To the extent to which the following information is necessary to delineate and describe site conditions related to the proposed use for which the Special Permit is requested, said site plan shall show among other things: all existing and proposed buildings, structures, parking spaces, driveways, driveway openings, service areas, and other uses, existing and proposed contours at two-foot intervals, proposed clear sight distances at all driveway openings, existing and proposed ways, existing and proposed water sources and volumes of use, existing traffic counts (from town data) and estimated future traffic volumes, land uses, abutting and across the street from the site, the zoning districts within one thousand (1,000) feet of the site perimeter, desirable existing and proposed trees on the premises, all facilities for refuse storage, sewerage, refuse and other waste disposal and for surface water drainage or retention, all principal landscape features, such as fences, walls, planting areas and walks on the lot, and the limits of any defined Flood Hazard Areas Overlay District area. Said plan shall also illustrate public and private water supply wells within the site boundaries and on adjacent properties, and where applicable, the limits of any defined aquifer protection district area as specified in Section 406 of this Zoning Bylaw. Signs and lighting shall also be included. Said plan shall be prepared by a registered engineer and/or land surveyor at an appropriate scale to show clearly dimensions, legends and all other information deemed necessary to describe the site and its conditions.

B. Determinants:

In approving a site plan as part of the Special Permit, the Board of Appeals shall assure to a degree consistent with a reasonable use of the site for a purpose permitted within the district in which it is located:

- Protection for adjoining premises against detrimental or offensive use on the site;
- Adequacy of space for vehicular access to and off-street parking and loading/unloading on the site;
- Convenience and safety of vehicular and pedestrian movement within the site and in relation to adjacent ways and land;
- Adequacy of water supplies and distribution for domestic uses fire protection;
- Adequacy of the methods of storage and disposal for sewage, refuse and other wastes resulting from the uses permitted on the site and the methods of drainage or retention of surface water;
- Adequacy of protection from flood hazards for occupants, first responders, or property;
- Maintenance and promotion of dispersed shade on paved areas through the effective use of established and/or new trees;
- Conformance to sign regulations in Section 601.

907 APPEAL OF BOARD OF APPEALS DECISION

Any person aggrieved by a decision of the Board of Appeals or any other special permit granting authority may take an appeal to the courts in accordance with G. L. c. 40A.

908 ADMINISTRATION OF DEVELOPMENT APPLICATIONS

908.1 Duties and Responsibilities

The Board of Appeals shall be responsible for the administration of the Planned Development Special Permit procedures and for scheduling, advertising and conducting all public hearings, the taking and evaluating of testimony and the approval with or without conditions or the denial of a Development Application.

908.2 Designated Review Body

The Board of Appeals shall designate the Planning Board as the review body for Special Permit procedures dealing with Planned Development.

908.3 Duties and Responsibilities of the Review Body

The Planning Board shall administer the review of information required by this Bylaw; shall assign to the appropriate Town committees, commissions and boards including, but not limited to, the following: Board of Selectmen, School Committee, Board of Health, Water Commissioners, Conservation Commission, Historical Commission, Department of Public Works, Finance Committee, Fiscal Advisory Committee, Town Assessors, Fire Chief and Open Space and Recreation Committee and Design Review Board, and the review of data particular to each of these bodies; shall set time limits for the review and reports consistent with the provisions herein; shall conduct meetings; shall prepare written findings; and shall give testimony to the Board of Appeals.

909 DESIGN REVIEW BOARD

909.1 Establishment and Membership

A Design Review Board is hereby established. Said Board shall consist of five (5) members and two (2) alternate members who shall be appointed by the Board of Selectmen in the manner prescribed herein. Members shall include, where possible in order of preference, an architect, a landscape architect, a designee of the Planning Board, a lawyer, a realtor, a nominee of any of the local historical societies or a contractor. Members shall serve for three (3) years or until their successors are appointed, except that of the five members first appointed one shall serve for three (3) years, two (2) shall serve for two (2) years and two (2) shall serve for one (1) year each. Members may be removed for cause by the Board of Selectmen following written charges and a properly advertised public hearing. A vacancy shall be filled forthwith by appointment by the Board of Selectmen for the unexpired term. Two (2) alternate members of the Board shall be appointed each year by the Board of Selectmen for a term of one (1) year in accordance with the order of occupation preference designated herein.

909.2 Organization and Proceedings

The Design Review Board shall elect a chairman from among its members to serve for a term of one (1) year. The Board shall adopt such guidelines as may be considered necessary to the conduct of its duties and responsibilities. The Board shall keep records of its proceedings, any plans, photographs or other drawings or documents pertaining to each matter reviewed by the Board and a statement of its recommendations and the reason therefore.

909.3 Duties and Procedures

The Design Review Board shall assist the Planning Board and Zoning Board of Appeals in reviewing development applications with respect to those matters referred to it by the respective Boards. It shall also make recommendations on such other plans and applications as the Zoning Board of Appeals, Planning Board and Zoning Enforcement Officer may submit to it. The Design Review Board shall submit written reports within twenty-one (21) days of the date of submittal for review. All recommendations and reports of the Design Review Board shall be done with the concurrence of at least three (3) members. The Zoning Board of Appeals may modify any recommendations of the Design Review Board. Any such request for modification shall be dealt with by the Zoning Board of Appeals as an administrative matter.

910 REPETITIVE PETITIONS

910.1 Bylaw Amendments

No proposed change in this Bylaw which has been unfavorably acted upon by the Town Meeting shall be considered by the Town Meeting within two (2) years after the date of such unfavorable action unless adoption of the proposed change is recommended in the final report of the Planning Board to Town Meeting.

910.2 Board of Appeals Decision

No appeal, application or petition which has been unfavorably and finally acted upon by the Board of Appeals shall be acted favorably upon within two (2) years after the date of final unfavorable action unless all but one (1) of the members of the Planning Board first find specific and material changes in the conditions upon which the previous unfavorable action was based and consent to a re-hearing and unless the Board of Appeals finds such changes in conditions warrant such favorable action.

911 PENALTIES

911.1 Conditions

Any person violating any of the provisions of this Bylaw shall be fined not more than fifty dollars (\$50.00) for each offense. Each day that any violation is permitted to exist after written notification thereof by the Zoning Enforcement Officer shall constitute a separate offense. The Town shall be the beneficiary of all fines paid including the costs of prosecuting any legal action if allowable by law.

911.2 Applicability

The penalty provisions of this Bylaw may be imposed upon the developer, and owner, general agent, tenant architect, any contractor or builder, or any person having an identifiable property interest including a mechanic's lien, mortgage or other attachment against the property.

911.3 Non Criminal Disposition

In addition to the procedure of enforcement as described above, the provisions of this Bylaw may also be enforced by the Zoning Enforcement Officer, by non criminal complaint pursuant to the provisions of MGL Chapter 40, Section 21D. The penalty for violation of any provision of this bylaw shall be twenty-five dollars (\$25.00) for the first offense; fifty dollars (\$50.00) for the second offense; one hundred dollars (\$100.00) for the third offense; and two hundred dollars (\$200.00) for the fourth offense and each subsequent offense.

912 AMENDMENT

912.1 Authority

This Bylaw may be amended from time to time in accordance with the provisions of G. L. c. 40A. An amendment may be initiated by submitting a proposed change to the Board of Selectmen, by the Board of Selectmen, the Board of Appeals, an individual owning land in the Town, registered voters of the Town pursuant to G. L. c. 39, sec. 10, the Planning Board and the Metropolitan Area Planning Council, within fourteen (14) days of the receipt of a proposed change, the Board of Selectmen shall submit it to the Planning Board for review, a public hearing and a report.

912.2 Public Hearing

The Planning Board shall hold a public hearing on any proposed amendment, first causing notice of the time, place of such hearing and sufficient identification of the subject to be discussed in the manner prescribed in G. L. c. 40A.

912.3 Report

The Planning Board shall, after hearing all testimony regarding any proposed amendment, submit a final report with its recommendations to the Town Meeting in accordance with and subject to the provisions of G. L. c. 40A.

913 SEVERABILITY

The provisions of this Bylaw shall be severable, and if any of its provisions shall be held to be unconstitutional, the validity of any of the remaining portions of this Bylaw shall not be affected.

914 EFFECTIVE DATE

An amendment to this Bylaw shall take effect on the date on which such amendment was adopted by a favorable two-thirds vote of Town Meeting subject to the publications requirements as provided in G. L. c. 40A, sec. 5.

915 CONFLICT WITH OTHER LAWS AND REGULATIONS

This Bylaw shall not interfere with or annul any Bylaw, rule, regulations or permit provided that, unless specifically excepted where this Bylaw is more stringent, it shall control.

AMENDMENTS SINCE MARCH 2003

**ALL AMENDMENTS LISTED BELOW HAVE BEEN INCORPORATED
INTO THE October 2019 Printing of the Zoning Bylaw**

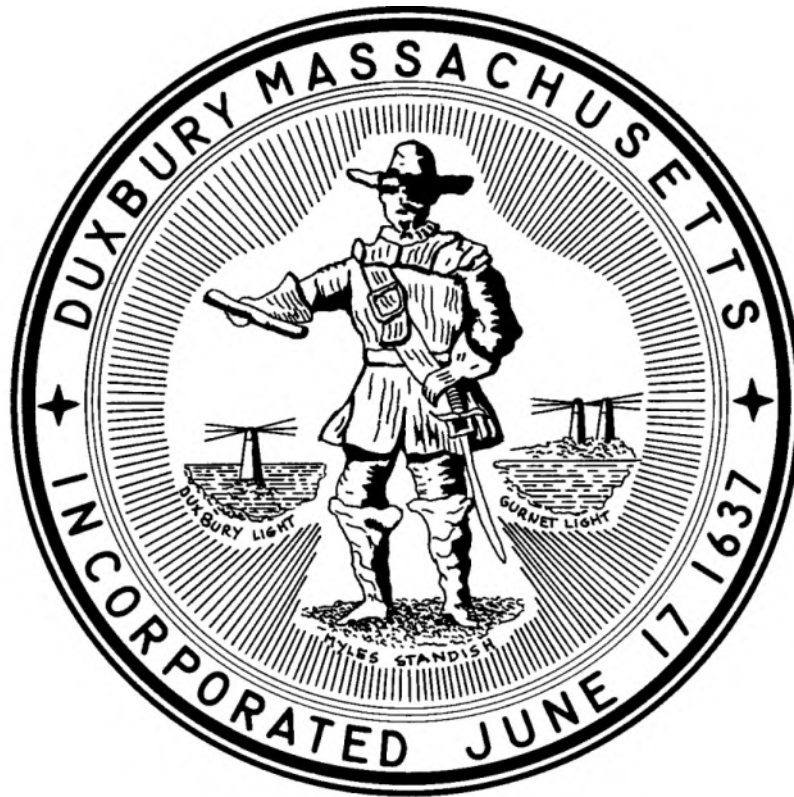
<i>ANNUAL TOWN MEETING DATE</i>	<i>TOWN MEETING ARTICLE #</i>	<i>SECTION(S)</i>	<i>SUBJECT</i>	<i>ATTORNEY GENERAL APPROVAL</i>	<i>PUBLIC NOTICE OF ATTORNEY GENERAL APPROVAL</i>
November 24, 2003	7	425	Correct Typographical Error	December 2, 2003 February 20, 2004	February 20, 2004 Posted by Constable
March 13, 2004	14	560	Inclusionary Housing	June 30, 2004	July 14 & 21, 2004 Duxbury Clipper
March 13, 2004	16	201	Waterfront Scenic Area Overlay District	June 30, 2004	July 14 & 21, 2004 Duxbury Clipper
March 13, 2004	17	200, 300, 400, 900	Piers	June 30, 2004	July 14 & 21, 2004 Duxbury Clipper
March 13, 2004	24	202.2	Zoning Map	June 30, 2004	July 14 & 21, 2004 Duxbury Clipper
March 13, 2004	25	906.2	Associate Member	June 30, 2004	July 14 & 21, 2004 Duxbury Clipper
March 13, 2004	29	560	Correct Typographical Error	June 30, 2004	July 14 & 21, 2004 Duxbury Clipper
March 15, 2005	24	404.8, 615.7(2), 906.4	Bay Management Commission	May 17, 2005	June 1 & 8, 2005 Duxbury Clipper
March 15, 2005	30	202.2, 402	FIRM Maps	May 17, 2005	June 1 & 8, 2005 Duxbury Clipper
March 14, 2006	36	202.1, 410, 420, 430	Zoning Map	April 3, 2006	April 26 & May 3, 2006 Duxbury Clipper
March 12, 2007	27	202.1, 410, 420, 430	Zoning Map	April 23, 2007	May 16 & May 23, 2007 Duxbury Clipper
March 12, 2007	29	803.2, 804.1	Planned Development Submission	April 23, 2007	May 16 & May 23, 2007 Duxbury Clipper
March 12, 2007	33	404.20	Piers	April 23, 2007	May 16 & May 23, 2007 Duxbury Clipper
March 11, 2008	32	570.00	Affordable Housing Bylaw	April 29, 2008	May 7 & May 14, 2008 Duxbury Clipper
March 11, 2008	33	560.11	Payment Schedule - Fees in Lieu of Affordable Housing	April 29, 2008	May 7 & May 14, 2008 Duxbury Clipper
March 14, 2009	42	202.1, 410, 420, 430	Zoning Map	April 7, 2009	May 6 & May 13, 2009 Duxbury Clipper

March 14, 2009	43	403.5, 404.6, 410.3, 421.4, 422.3, 610.4, 610.5	Wireless Telecommunications (WPOD)	April 7, 2009	May 6 & May 13, 2009 Duxbury Clipper
March 13, 2010	17	421.3.7, 302	Green Communities	June 30, 2010	July 7 & July 14, 2010 Duxbury Clipper
March 13, 2010	18	616 (new)	Community-Scale Wind Facilities Administrative Site Plan Review - Remove	June 30, 2010	July 7 & July 14, 2010 Duxbury Clipper
March 13, 2010	19	615	Religious & Educational	June 30, 2010	July 7 & July 14, 2010 Duxbury Clipper
March 12, 2011	33	302	Definition Accessory Structure	July 5, 2011	July 20 & July 27, 2011 Duxbury Clipper
March 12, 2011	35	410.6	Accessory Apt. Alteration 5-yr to 1- yr	July 5, 2011	July 20 & July 27, 2011 Duxbury Clipper
March 12, 2011	37	302, 410.3	Change "Guest House" to "Bed & Breakfast"	July 5, 2011	July 20 & July 27, 2011 Duxbury Clipper
March 8, 2014	24	617	Medical Marijuana Moratorium	April 7, 2014	April 16 & April 23, 2014 Duxbury Clipper
March 14, 2015	35	560.5	Payments for Fees in Lieu of Construction of Affordable Housing	June 19, 2015	July 1 & July 8, 2015 Duxbury Clipper
September 19, 2016	2	202.1, 202.2, 402 (new)	Floodplain Districts	December 21, 2016	January 4 & January 11, 2017 Duxbury Clipper
March 11, 2017	15	401.4.4 (new)	One Dwelling per Lot	July 20, 2017	August 18, 2017 Duxbury Clipper
March 11, 2017	16	530.2	RCC Special Permit Applicability	July 20, 2017	August 18, 2017 Duxbury Clipper
March 11, 2017	35	202.1, 202.2, 618 (new)	Ground Mounted Solar Overlay District	July 20, 2017	August 18, 2017 Duxbury Clipper
March 2018 TM	15	New 619	Ban Recreational Marijuana	June 4, 2018	August 1 and 15, 2018 Duxbury Clipper
March 2018 TM	32	New 621	Solar Photovoltaic Facilities	August 9, 2018	August 13 and 27, 2018 Duxbury Clipper
March 2018 TM	33	Amend 404.6 and 404.10	Solar Photovoltaic Facilities SPGA Planning Board in WPOD	July 9, 2018	August 1 and 15, 2018 Duxbury Clipper
March 2018 TM	16	Delete 617	Expired moratorium Medical Marijuana Facility	July 9, 2018	August 1 and 15, 2018 Duxbury Clipper
September 2018 Special	6	410.3 special permit use RC	add Veterinary Hospital	Pending from TC	Pending from TC
September 2018 Special	7	200 and 400	Create new NB LIGHT District	Pending from TC	Pending from TC
March 2019 Annual	12	Add 620	Create new Medical Marijuana Zoning Overlay District	Pending from TC	Pending from TC

March 2019 Annual	28	425	Correct Scrivener's error NB1 and NB2 front setback		
March 2019 Annual	25 & 26	609	Demolition Delay 12 months, with transferability, expiration after 2 years and clarified review schedule	Pending from TC	Pending from TC



F-2 Subdivision Rules and Regulations



TOWN OF DUXBURY

MASSACHUSETTS

RULES AND REGULATIONS

GOVERNING THE SUBDIVISION OF LAND

DUXBURY PLANNING BOARD

MARCH 2005

**RED LINES BY WOODS HOLE GROUP
FOR THE DUXBURY CLIMATE CHANGE VULNERABILITY ASSESSMENT AND
ADAPTATION PLAN**

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MARCH 2005

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**HISTORY OF REVISIONS TO
SUBDIVISION RULES AND
REGULATIONS**

<u>YEAR</u>	<u>SECTION(S)</u>	<u>BOOK</u>	<u>PAGE</u>
1954	Established Planning Board under Acts of 1947, MGL Chapter 41, Sec. 81A	2330	175
1954	1950 R&Rs amended through 1953	2330	176-202
1959	1959 R&R's	2813	56-88
1959	1959 R&R's	3614	629-672
1970	1970 R&R's	3742	261-296
1974	March 20, 1974 R&R's	3975	462-528
1974	May 15, 1974 Sec. 12	3988	292-295
1974	May 15, 1974 Sec. 4A	4130	778
1974	May 15, 1974 Sec. 12	4141	62
1978	March 1978 Sec. 13 & 14	4278	343
1981	Nov. 23, 1981 Sec. 5B	5086	293
1982	March 10, 1982 Sec. 7A	5131	90
1982	May 26, 1982 Sec. 5B, 4 & 7	5157	26
1982	December 6, 1982 Sec. 4A & 12A	5256	151
1985	February 20, 1985 Sec. 5B Grades	6028	267

<u>YEAR</u>	<u>SECTION(S)</u>	<u>BOOK</u>	<u>PAGE</u>
1985	September 19, 1985 Sec. 4A	6343	293
1986	July 16, 1986 Sec. 5A	7126	140
1986	August 20, 1986 Sec. 5H, 2-6		
1988	March 8, 1988 Cul-de-Sacs	9130	114
1988	November 2, 1988 Sec. 3A	9490	160
1988	November 2, 1988 Sec. 2C	9490	161
1989	March 8, 1989 Sec. 5B	9532	345
1989	November 9, 1989 Sec. 2C & 3A		
1991	August 7, 1991 Sec. 2D, 3A & 4A	10467	264
1991	August 21, 1991 Sec. 6		
1994	March 1994 Sec. 2A & 3C		
1996	December 1996, Comprehensive Revision	14849	30
2002	October 2002, Minor Revisions Throughout	23023	1-96
2005	March 2005, Minor Revisions Throughout	30259	1-101

1.0 AUTHORITY AND PURPOSE

The original Rules and Regulations for the Subdivision of Land and the Construction of Ways therein were adopted by the Duxbury Planning Board (The Board) on August 18, 1950 pursuant to the provisions of Massachusetts General Laws (M.G.L.), Chapter 41, Section 81. For matters not covered by these Subdivision Rules and Regulations, reference is made to the provisions of M.G.L., Chapter 41, Sections 81-K to 81-GG, inclusive.

Applicants submitting plans to subdivide land are directed to review the Duxbury Protective Bylaw (Bylaw), the Regulations of the Duxbury Conservation Commission, Water Department and Board of Health, including other applicable state and federal laws.

These Subdivision Rules and Regulations have been enacted for the purpose of protecting the safety, convenience and welfare of the inhabitants of the Town by regulating the laying out and construction of ways in subdivisions providing proper access to the several lots therein, but which have not become public ways, and ensuring sanitary conditions, in subdivisions and in proper cases, parks and open areas. The powers of the Board under these Subdivision Rules and Regulations shall be exercised to:

Provide adequate access to all lots in a subdivision by ways that are safe and convenient for travel;

Lessen congestion in such ways and in adjacent public ways;

Reduce danger to life and limb in the operation of motor vehicles;

Secure safety in case of fire, flood, panic and other emergencies;

Ensure compliance with the Protective Bylaw;

Secure adequate provision for water distribution, underground utility service, sewerage, drainage, protection of natural water sources, erosion control, flood plains, and wetlands;

Protect, promote and enhance the natural beauty, and rural and historical character of the Town; and

Coordinate the ways in a subdivision with each other, with public ways in the Town and with ways in neighboring subdivisions.

2.0 DEFINITIONS

APPLICANT - "Applicant" shall include an owner or his agent, representatives or his assigns.

APPROVAL - Approval of a plan submitted in accordance with Section 4.0 of these Subdivision Rules and Regulations and M.G.L. Chapter 41, Sections 81-S, 81-T, 81-W, 81-U and 81-V.

BEST MANAGEMENT PRACTICES (BMP) - A structural device or practice designed to mitigate the effects of storm water runoff easing flooding, reducing erosion and pollution. BMP's shall conform to the guidelines described in the "Performance Standards & Guidelines for Storm Water Management in Massachusetts" published by the Department of Environmental Protection.

BOARD - Planning Board of the Town of Duxbury

CUL-DE-SAC – A dead end street culminating in a circular turnaround.

DEAD END STREET – A road where egress and ingress are one and the same, including cul-de-sacs.

DEVELOPER - The person, persons, corporation, trust, firm or partnership or other legal entity who will be responsible for the development of land and/or structure(s). The developer will be responsible for submitting qualifications of his development team.

DRAINAGE BASIN -

DETENTION - A man-made basin, diked area, depression and/or related structure for the purpose of slowing the rate at which storm water is discharged from the site, and which may involve temporary backup of water during and immediately following a storm event.

RETENTION - A man-made basin, diked area or depression and/or related structure for the purpose of retaining or impounding storm water on a site which has no free flowing outlet, e.g. a pipe or weir, to allow storm water from small storm events to be discharged to a natural water course or wetland. Leaching pits or similar ground discharge structures shall not constitute an outlet.

DRT - Development Review Team consisting of the Duxbury Planning Director, Conservation Administrator, Inspectional Services Director, DPW Director, Director of Lands and Natural Resources, Representatives of the Board of Health and Fire and Police Departments and others as necessary.

DWELLING UNIT – A building or a portion of a building providing living quarters for a single-family having a single set of kitchen facilities (a stove plus

either or both a refrigerator and sink) not shared with any other unit; or quarters for up to six persons in a lodging house, dormitory, congregate housing, or similar group dwelling.

EASEMENT – A grant by a property owner to the use of land by the public, a corporation, or persons for specific purposes such as the construction of utilities, drainage ways and roadways.

ENDORSEMENT - Certified by or endorsed by a Planning Board, as applied to a plan or other instrument required or authorized by the Subdivision Control Law to be recorded, shall mean bearing a certification or endorsement signed by a majority of the members of the Planning Board, or by its chairman or clerk or any other person authorized by the Board to certify or endorse its approval or other action and named in a written statement to the Register of Deeds and Recorder of the Land Court, signed by a majority of the Board.

FRONTAGE - The boundary of a lot coinciding with a street line providing rights of access across that boundary to a potential building site, measured continuously along one street line between side lot lines or in the case of a corner lot, the midpoint of any radius.

LOOP ROAD – Prohibited. A single point of access/egress off a through street leading to a circular shaped roadway design that turns into and reconnects with its main axis.

LOT - A parcel of land used or set aside and available for use as the site of one or more buildings and buildings accessory thereto or for any other definite purpose, in one ownership and not divided by a street, not including any land within the limits of a public or private way upon which such lot abuts, even if the fee to such way is in the owner of the lot.

MUNICIPAL SERVICES Fire and police services and public utilities furnished by the Town of Duxbury, such as water, sewerage and drainage.

OWNER - The owner of record as shown by the records in the Plymouth County Registry of Deeds or Land Registration Office.

PARCEL – A tract or plot of land of any size that may or may not be subdivided or improved.

PERSON - An individual, or two or more individuals, or a group or association of individuals having common or undivided interests in a tract of land, a partnership or a corporation.

PLAN, DEFINITIVE - A plan of a proposed subdivision submitted in accordance with Section 5.3 of these Subdivision Rules and Regulations.

PLAN, PRELIMINARY - A plan of a proposed subdivision submitted in accordance with Section 5.2 of these Subdivision Rules and Regulations.

PROFILE - A vertical section of a street along its centerline , showing existing and proposed grades, storm drainage and sanitary sewer facilities.

RECORDED - Recorded in the Registry of Deeds of the county or district in which the land in question is situated, except that, as affecting registered land, it shall mean filed with the Recorder of the Land Court.

REGISTERED MAIL - Registered or certified mail as provided by US Postal Service.

REGISTRY OF DEEDS - The Registry of Deeds of Plymouth County, including when appropriate, the Recorder of the Land Court.

RIGHT-OF-WAY (R.O.W.) - The area of land designated for the construction of a way or street.

ROADWAY - The paved portion of the R.O.W. including berms and curbs.

SECURITY - Funds deposited to ensure performance of subdivision approval.

SIDEWALK - A way within the R.O.W. generally parallel to the street designed for use by pedestrians.

STREET, LOCAL - A way that provides access to abutting lots only, serves three (3) or less lots and is not a through street. The R.O.W. layout shall have a width of fifty (50) feet. (See Section 7.3.10)

STREET, MINOR - A way that provides access to abutting lots only, serves ten (10) or less lots and is not a through street. The R.O.W. layout shall have a width of fifty (50) feet. No second means of access required.

STREET, PRINCIPAL - A way that carries or is designed to carry through traffic between parts of Town or between Duxbury and other Towns. Principal streets shall have a R.O.W. layout width of sixty (60) feet.

STREET, SECONDARY - A way that carries or is designed to carry through traffic to abutting lots and provides access to local and minor streets. Secondary streets provide access to eleven (11) or more lots or is a through street. Secondary streets shall have a R.O.W. layout width of fifty (50) feet.

STRUCTURE - Any construction, erection, assemblage or other combination of materials upon or beneath the land, including but not limited to, either by pilings, footings or a foundation for attachment and/or installation within the land, including swimming pools and septic systems.

SUBDIVISION - The division of a lot, tract or parcel of land into two (2) or more lots for the purpose of sale or development, including re-subdivision, and when appropriate, shall relate to the process of subdividing or to the land or territory subdivided; provided, however, that the division of a tract of land into two (2) or more lots shall not be deemed to constitute a subdivision within the meaning of the Subdivision Control Law if, at the time when it is made, every lot within the tract so divided has frontage on (a) a public way, or a way which the town clerk certifies is maintained and used as a public way, or (b) a way shown on a plan approved and endorsed in accordance with the Subdivision Control Law, or (c) a way in existence prior to August 18, 1950 when the Subdivision Control Law became effective in the Town of Duxbury, having, in the opinion of the Board, sufficient width, suitable grades and adequate construction to provide for the needs of vehicular traffic in relation to the proposed use of the land abutting thereon or served thereby, and for the installation of municipal services to serve such land and the buildings erected or to be erected thereon. Such frontage shall be of at least such distance as is presently required by the Protective By-Law in the Town of Duxbury.

WAY - Any public way or private way shown on a plan approved under the provisions of the Subdivision Control Law or a way in existence when the provisions of said Subdivision Control Law became effective in the Town, having in the opinion of the Board suitable width, grades and adequate construction to provide for the needs of vehicular traffic in relation to the proposed use of land abutting thereon or served thereby and for the installation of municipal services to serve such land and the buildings erected or to be erected thereon.

WETLAND - Wetlands as defined in Massachusetts General Law 131, Section 40 (310 CMR 10.0) and Town of Duxbury General Bylaw, Chapter 9.

3.0 APPLICATION OF SUBDIVISION CONTROL LAW

3.1 Approved Definitive Plan Required Prior to Construction

No person shall make a subdivision of any tract, parcel, or lot of land into two (2) or more lots in such a manner as to constitute a "subdivision" within the Town of Duxbury, or proceed with the improvement or sale of lots in a subdivision, or the construction of ways, or the installation of municipal services therein, unless and until a definitive plan of such subdivision has been submitted to and granted final approval and endorsement by the Board as hereinafter provided, and has been recorded at the Registry of Deeds.

3.2 General

The Board will not approve a subdivision unless the plan is in compliance with these Subdivision Rules & Regulations and with all applicable zoning, other local regulations/bylaws, and laws of the Commonwealth of Massachusetts. All proposed subdivisions shall comply with the intent of these Subdivision Rules and Regulations as previously set forth in Section 1.0 AUTHORITY AND PURPOSE and shall adhere to the principles of environmentally sensitive land use planning and accepted engineering practice.

3.3 Waivers of Compliance

In accordance with the provisions of M.G.L. c. 41 s. 81-R, the Board reserves the right to waive strict compliance with these Subdivision Rules and Regulations when, in the judgment of the Board, such action is in the public interest and consistent with the intent and purpose of these Subdivision Rules and Regulations and the Subdivision Control Law. All requests for waivers of compliance shall be in writing and shall specify the section of these Subdivision Rules and Regulations for which a waiver is requested.

Variation from the requirements of these Subdivision Rules & and Regulations may be permitted when, in the opinion of the Board, topography, environmental impacts, public safety or other considerations necessitate such variation. The Board shall make a finding that said variation from these Subdivision Rules and Regulations is in the public interest and shall vote to approve each specific request for variation from these Subdivision Rules and Regulations. In the event any of these Subdivision Rules and Regulations do not fully cover a special or unforeseen or unique circumstance arising from a proposed subdivision, the Board may make a reasonable determination, interpretation or extension of its Subdivision Rules and Regulations, using commonly accepted standards to resolve unusual circumstances.

3.4 Applicant's Responsibility

The action of the Board to approve a subdivision does not affect any rights of others pertaining to the land to be subdivided, nor does it grant any rights to the applicant to perform work on land owned by others. The Board assumes that any

plans submitted for its approval or consideration to be correct, unless valid written evidence is presented to the contrary. The acquisition of necessary rights and presentation of complete and accurate information by engineers and surveyors to the Board are the responsibilities of the applicant; the failure to do so, including failure or inability to obtain all necessary state or local permits, licenses, releases or rights may constitute a reason for the disapproval or the rescission of approval of a subdivision.

3.5 One Dwelling Unit Per Lot

Not more than one building designated or available for use as a dwelling unit shall be erected or placed or converted to such use on any lot in a subdivision pursuant to the Protective Bylaw Section 502 Schedule of Intensity and Dimensional Regulations, or without the proper authorization of the Board of Appeals.

3.6 Severability

In the event that any section, paragraph, sentence, clause or provision of these regulations shall be adjudged not valid, the adjudication shall apply only to the specific section affected, and the remainder of these Subdivision Rules and Regulations shall be deemed valid and enforceable.

3.7 Invalidation by State Law

Any part of these Subdivision Rules and Regulations subsequently invalidated by State law or amendment of an existing State law shall automatically be brought into conformity with the new or amended law, and shall be deemed effective immediately, without recourse of public hearing and the customary procedures for amendment and repeal of such Subdivision Rules and Regulations.

3.8 Effect of Prior Recording of Plan

The recording of a plan of a subdivision at the Registry of Deeds prior to the effective date of the Subdivision Control Law in the town of Duxbury (August 18, 1950) shall not exempt the land within such subdivision from the application and operation of these Subdivision Rules and Regulations except as specifically exempted by M.G.L. c. 41, s. 81.

4.0 GENERAL PROCEDURES FOR PLAN SUBMISSION, ACTION AND AMENDMENTS

4.1 Pre-Submission Meeting

Applicants are encouraged to meet with the Planning Director prior to submitting any type of plan for Board Approval. The applicant should have a conceptual or study plan for discussion and a listing of his development team's qualifications. The Planning Director will explain the special account requirements under M.G.L. c. 44, s. 53-G and be available to answer questions on procedures, Subdivision Rules and Regulations and applicability of other state and local regulations.

4.2 Plan Submission - General

At the time of submission of a Preliminary or Definitive plan, the applicant shall submit an application form, funds to establish the special account for the project and eighteen (18) sets of plans, two full-size, 17 half-size, and supporting documents as shown on the Definitive Plan Checklists in Appendix F, that comply with all requirements specified in Section 5.0 REQUIREMENTS. Incomplete applications will be grounds for denial. (See Section 6.0 FEES, PERFORMANCE SECURITIES AND SPECIAL ACCOUNTS for determining fees and special accounts. The exact amount required must be verified by the Planning Director prior to submission).

The Planning Director will distribute plans to the various Town Departments except for the Board of Health, which is the applicant's responsibility, for review and comment and schedule a Development Review Team (DRT) meeting. A public hearing date will be scheduled as soon as possible following the DRT meeting. The applicant shall be responsible for paying the cost of advertising the Public Hearing notice in a newspaper of general circulation. At least three (3) weeks before the Public Hearing, the applicant shall meet with the Planning Director for a pre-hearing meeting. Discussion will focus on comments from the Board's consulting engineer, DRT, and the Planning Director's comments on the plan. The Planning Director will make a report to the Board summarizing the DRT comments.

4.3 Board Action

When all issues raised by the Board, various Town Departments, abutters, the Board's consultants and the Planning Director have been resolved to the satisfaction of the Board, the Board will act on the plan. Following action of the Board to approve, approve with conditions, or disapprove a Preliminary or Definitive subdivision plan, the Planning Director shall notify the Town Clerk and the applicant. The applicant shall be notified by certified mail.

4.4 Modifications or Amendments to Approved Plans

When an applicant proposes changes to an approved definitive plan , the same requirements shall apply as for filing a Definitive Plan. (See Section 5.3 Definitive Plan Requirements). Any modification is subject to the Subdivision Rules and Regulations in effect at the time of application. Only the area of modification need be shown if the proposed modification or amendment is a lot development change or utility change. Should the proposed modification or amendment be directly related to a larger component (i.e.: drainage, street layout etc) then the entire site must be shown on a modification plan.

4.5 Public Hearing Notices

All Public Hearing Notices will prepared by the Planning Director as outlined in M.G.L. c. 41 s. 81-T. The Planning Director will submit the notice to the Town Clerk with a copy sent to a newspaper with local circulation for advertisement. The cost of advertisement shall be the responsibility of the applicant.

Abutter notification shall be made by the Planning Director using a list of abutters from the latest tax listing and pre-addressed stamped envelopes, all provided by the applicant.

In the event a Public Hearing is continued either three (3) times or for more than three (3) months, the applicant shall be responsible for the costs of re-notifying abutters and re-advertising the legal notice.

5.0 PLAN REQUIREMENTS

5.1 Approval Not Required Plans (ANR)

Any person who intends to record a plan of land at the Plymouth County Registry of Deeds or file a plan at the Land Court and believes that the plan does not require approval under the Subdivision Control Law (M.G.L. c. 41, s. 81-P) shall submit the mylar and nine (9) prints of the plan to the Planning Director during office hours accompanied by the appropriate fee and application form. The applicant shall forward the application to the Town Clerk who shall date-stamp the application form, thus establishing the date of submission. The applicant shall provide a copy of the date-stamped application form to the Planning Director. All ANR plans must contain the information listed in the ANR checklist shown in Appendix F.

5.1.1 Fees for Approval Not Required Plans

The plans and application form must be accompanied by an appropriate filing fee. Checks shall be payable to the Town of Duxbury (See Section 6.0, FEES, PERFORMANCE SECURITIES AND SPECIAL ACCOUNTS).

5.1.2 Board Determination

Plans meeting the requirements set forth above and, in the opinion of a simple majority of the Board do not constitute a subdivision, shall be endorsed without a public hearing. The Board shall act within 21 days of receipt of application by the Town Clerk. Following approval, the mylar copy shall be returned to the applicant for recording at the Registry of Deeds or Land Court. If the Board determines that the plan constitutes a subdivision, no endorsement will occur. The Board shall notify the Town Clerk and the applicant shall be notified by certified mail.

5.2 Preliminary Plans

5.2.1 Preliminary Plan Requirements

A Preliminary Plan may be submitted for residentially zoned land to the Board for action prior to the submission of a Definitive Plan. The submission of a Preliminary Plan will enable the applicant, the Board, other municipal agencies, owners of property abutting the subdivision and any interested parties to discuss and clarify potential problems of the subdivision before a Definitive Plan is prepared. A Preliminary Plan shall be submitted for non-residentially zoned land.

When submitting a Preliminary Plan, the applicant shall submit (18) sets of plans, one full-size, 17 half-size, and supporting documents as shown on the Preliminary Plan Checklists in Appendix F, accompanied by the appropriate fee and escrow amount along with an application form to the Planning Director during office hours. The applicant shall forward the application form to the Town Clerk who shall date-stamp the application form thus establishing the date of submission of the Preliminary Plan. The applicant shall provide a copy of the date-stamped application form to the Planning Director. The applicant is responsible for submitting the plan to the Board of Health and is directed to follow Board of Health application guidelines. At the time of submission of a Preliminary Plan, all plans and information must be complete and accurate and in acceptable form as required by these Subdivision Rules and Regulations and the fee paid before the application package is considered acceptable as set forth in Section 4.0 PROCEDURES FOR PLAN SUBMISSION, ACTION AND AMENDMENTS (See Section 6.0 for FEE, PERFORMANCE SECURITIES AND SPECIAL ACCOUNTS).

5.2.2 Contents of Preliminary Plan

Preliminary Plans shall be submitted as blue or black line prints at a suitable scale. The purpose of the Preliminary Plan is to show sufficient information about the subdivision to enable the Board to form a clear basis for the evaluation of potential problems of the subdivision prior to the preparation of the Definitive Plan. The Preliminary Plan shall contain the information shown on the Preliminary Plan checklist (See Appendix F).

5.2.3 Action on Preliminary Plans

The Preliminary Plan will be reviewed by the Planning Director and DRT Team in order to determine whether it complies with the requirements of these Subdivision Rules and Regulations and is consistent with sound land use and community planning goals.

Following review, the DRT will make suggestions for revisions it deems to be in the public interest. Within forty-five (45) days after receipt of application by the Town Clerk, the Board shall approve, disapprove, or approve with conditions the Plan, noting thereon any changes that should be made, and shall file a notice of its actions with the Town Clerk and mail a copy of the notice to the applicant, certified mail, return receipt requested. The Board shall give its reasons for disapproving any plan.

Neither approval nor disapproval of a Preliminary Plan with or without modifications shall constitute approval of the subdivision. The Preliminary Plan cannot be recorded at the Registry of Deeds.

Approval of a preliminary plan is not binding on the Planning Board.

The Board recommends that the applicant review the Preliminary Plan with the Conservation Commission pursuant to the applicability of M.G.L. c. 131 s. 40 and the Town of Duxbury General By-Law, Chapter 9, prior to submitting a Definitive Plan.

If the submittal of a Preliminary Plan is followed by the submittal of a Definitive Plan within 7 months and the Definitive Plan is subsequently approved, the zoning provisions in effect at the time of submission of the Preliminary Plan shall govern the land shown on the Definitive Plan for eight (8) years from the date of the Board's endorsement of the Definitive Subdivision Plan.

5.3 Definitive Plan Requirements

At the time of submission of a Definitive Subdivision Plan, applicants shall follow the procedures set forth in Section 4.0 PROCEDURES FOR PLAN SUBMISSION, ACTION AND AMENDMENTS.

5.3.1 Submission Requirements

Eighteen (18) sets of plans, two full-size, 17 half-size, of the complete set of plans and supporting documents as shown on the Definitive Plan Checklist in Appendix F, accompanied by the appropriate fee and escrow amount along with a copy of the application form shall be submitted to the Planning Director during regular office hours. The applicant shall forward the application for to the Town Clerk who shall date-stamp the form thus establishing the date of submission. The applicant shall provide a copy of the date-stamped application form to the Planning Director. The applicant is responsible for submitting the plan to the Board of Health and is directed to follow the Board of Health application guidelines. At the time of submission of a Definitive Plan, all plans and information must be complete and accurate and in acceptable form as required by these Subdivision Rules and Regulations and the fee paid before the application package is accepted as set forth in Section 4.0 PROCEDURES FOR PLAN SUBMISSION, ACTION AND AMENDMENTS (see Section 6.0 for FEES, PERFORMANCE SECURITIES AND SPECIAL ACCOUNTS). The definitive plan shall contain the information shown in the Definitive Plan checklist (see Appendix F) and as described in Section 5.3.2 through 5.3.10.

5.3.2 Plan Requirements

5.3.2.1 General Requirements

The Definitive Plan shall be prepared, signed and stamped on each sheet by a Registered Professional Engineer and Land Surveyor. The original shall be drawn on mylar. The plans shall be submitted on 24" x 36" sheets, with the longer dimension on the bottom. The property shall be oriented on the plan, when possible, so that the top is in a northerly direction.

Each sheet shall be consecutively numbered. Plans shall have a title sheet and an index sheet showing the entire subdivision and identifying each street's location on the index of the entire subdivision. A locus plan at a scale of 1" = 1000' shall show the location of the subdivision in relation to the existing street system.

The Planning Board signature block shall be located in the same general spot on each sheet of the submitted set of plans.

5.3.2.2 Title Sheet Requirements

The title sheet shall contain a title block and state the number of lots, and total length of roadways. The owner of the property shall be noted.

A Definitive Subdivision Plan shall include, but not be limited to the following:

5.3.2.2.1 Existing Conditions

- a) Locations and outlines of all existing buildings, septic systems, site features such as stone walls, fences, wooded areas, rock outcroppings, waterways, natural drainage courses, wetlands, water bodies, flood plains, and seasonal wet areas within or adjacent to the proposed subdivision.
- b) Location of abutting structures, buildings, driveways, etc. within three hundred (300) feet of the parcel proposed for subdivision, noting the ownership of adjacent properties.
- c) Lengths and bearings of tract boundary lines and meridian used.
- d) Location and descriptions of all rights-of-ways or other easements existing and proof of secured easements inside and connecting to the land to be subdivided.
- e) Topographical contour elevations at two (2) foot intervals. Elevations shall be in North American Vertical Datum of 1988 (NAVD88). This may be required to extend beyond the property boundaries for drainage design analysis and evaluation of clear sight distance.
- f) Zoning District boundaries including the Aquifer Protection Overlay District, Flood Hazard Areas Overlay District, and Wetlands Protection Overlay District, if applicable.
- g) Delineation of the vegetated wetlands line with station numbers noting the Conservation Commission's acceptance of the line, if applicable.
- h) Trees twelve (12) inches in diameter or greater located in the R.O.W. and other areas determined by the Planning Board.

5.3.2.2.2 Proposed R.O.W., Lot Lines, & Lots

- a) Lengths and bearings of all subdivision lot lines, including lot frontage on the streets.
- b) Lengths and bearings of all straight center lines of streets.

- c) Lengths, radii, tangents, and central angles of all curves in lot lines and street center lines.
- d) The location, name, width and grade of each street and public or private way, bounding, approaching, or within sight distance of the subdivision, and the proposed ways within the subdivision.
- e) Existing and proposed granite or cement concrete monuments shall be shown at all points of curvature, points of tangents, and changes in direction of street lines, or where otherwise designated by the Board. Proposed monuments shall be installed to the specifications of the Massachusetts Land Court.
- f) The total area of each lot with area of upland, wetlands, and usable areas as defined in the Protective Bylaw under Article 300, Definition of Lot Area and Section 410.4, Lot Shape.
- g) All proposed building lots shall meet or exceed the minimum area and frontage requirements specified in Section 410.4, Schedule of Intensity and Dimensional Regulations, of the Duxbury Protective Bylaw.

5.3.3 Water Distribution System

The proposed water distribution system shall be shown on the Definitive Plan. The location and size of all existing and proposed water mains and their appurtenances shall be shown on plans and shall be subject to the approval of the Water Superintendent. The location of any operating water wells within the proposed subdivision or within the boundaries of a lot adjacent to the proposed subdivision shall be shown on the Definitive Plan. Re-location of all existing and the location of proposed fire hydrants will be subject to the approval of the Duxbury Fire Chief and DPW Director. Within the Flood Hazard Areas Overlay District or Wetlands Protection Overlay District, all utilities shall be located, elevated and constructed so as to minimize or eliminate flood damage, including from future coastal flood hazards due to climate change.

5.3.4 Surface Water Drainage

Pursuant to the requirements of Section 7.3.7 Storm Water - Drainage, the proposed size, type and location of all drainage pipes, structures, detention and retention basins, and other appurtenances shall be shown on the Definitive Plan. Specific areas of concern are the impacts of the discharge of stormwater runoff to existing water bodies, natural waterways, wetlands and resource areas, and abutting land areas.

5.3.5 Utilities

The location of all proposed utilities to serve the proposed dwellings or buildings shall be shown. All utilities shall be underground. The location of streetlights shall be shown at street intersections. All wires shall be placed in conduit. Within the Flood Hazard Areas Overlay District or Wetlands Protection Overlay District, all utilities shall be located, elevated and constructed so as to minimize or eliminate flood damage, including from future coastal flood hazards due to climate change.

5.3.6 Notification

The following note shall be placed on each sheet of the plan: "All contractors shall contact the Planning Office at 781-934-1114 two business days prior to initiation of any construction or resumption after a stoppage of five (5) consecutive business days". In addition the DPW Director shall be notified in writing at least two business days in advance of beginning any work in a public way. Street opening permits are required. See DPW Director for permit requirements. This is to ensure that contractors are aware of the requirements and times for inspections.

5.3.7 Parks, Playgrounds, Open Space

Proposed park or open areas shall be suitably located for playground or recreation purposes within the subdivision in accordance with M.G.L. c. 41, s. 81-U.

5.3.8 Plan, Profile, Cross Sections

Plans – On the Plan of each street show:

- a) The extent of the cut or fill limits outside of the road layout required for construction of the way. Side Slopes shall have a maximum of 2:1 slope unless waived by the Planning Board due to a topographical hardship.
- b) Existing center line shall be shown as a solid line.
- c) All existing and proposed intersections, walks, driveways, shown on both sides.
- d) The high water elevation and all test hole locations.
- e) Elevations of at least two (2) bench marks as shown on plan, using NAVD88 datum.
- f) Flood Hazard Areas Overlay District Boundaries and associated FEMA Base Flood Elevation(s) and Sea Level Rise Base Flood Elevations (SLR-BFEs).

Profiles – Each sheet shall show:

- a) Vertical profiles of proposed streets with only one (1) street shown per sheet.
- b) A horizontal scale of one inch equals forty (1"=40') feet and a vertical scale of one inch equals four (1"= 4') feet.

- c) Proposed center line grades as solid line, showing grade elevations at every fifty- (50) foot station, except in vertical curves which shall be at every twenty-five (25) foot station. Existing ground elevations of center lines to be shown to the left of station. Depth of peat, ledge or undesirable roadway base material, as determined by test pits or borings, taken at the discretion of the Board or its engineer shall be shown on the center line.
- d) Rates of vertical curve gradients shown by figures and vertical curve design data.

Cross Sections – Typical Sections shall show:

- a) Each street between top and/or bottom of slopes; type, lines and width of all curbing to be used; and type of catch basin-frame and grate to be used (see Appendix B).
- b) Description of roadway construction including materials to be used.
- c) FEMA Base Flood Elevation(s) and SLR-BFE(s) for all Flood Hazard Overlay District areas.

5.3.9 Environmental Impact Assessment and Mitigation Measures

Unless specifically waived by the Board during the Preliminary Plan Submission, an Environmental Impact Assessment (EIA) is required in order to identify any significant impacts of a proposed development, and the best available technology to minimize or prevent negative impacts from occurring. The Final EIA shall be included at the time of submission of a definitive plan.

All subdivisions must minimize impacts to areas with steep slopes, flood plains, wetland resource areas, unique land forms, and rare or endangered plant and wildlife species in accordance with the goals and objectives of the Duxbury Comprehensive Plan, 1999 as amended, and any duly approved successor Comprehensive Plan.

The Board may retain an independent outside consultant, as outlined in Section 6.0 FEES, PERFORMANCE SECURITIES AND SPECIAL ACCOUNTS, to review the EIA and recommend appropriate mitigation measures. If a consultant is retained, a scope of work shall be provided by the Planning Director with input from other Town agencies and approved by the Board.

The EIA shall include an Analysis of Development Impact using nutrient loading standards as noted in the Hydrogeologic Study in Appendix G.

The following concerns must be considered in the EIA:

a) Impacts to groundwater resources

- b) Impacts to surface water bodies, rivers or Duxbury Bay
- c) Impacts of erosion from roadway, drainage or regrading of land for house site construction
- d) Resilience and adaptability to future climate change impacts, including increased flooding.
- e) Impact to existing water supplies
- f) Impacts to community services such as police, fire, public works, schools
- g) Impacts to traffic (See Appendix G for requirements)
- h) Whether the possible impacts are limited only to the subdivision or contribute to the cumulative incremental impact of environmental degradation of the surrounding area
- i) Measures to mitigate all identified impacts

5.3.10 Erosion/Sediment Control Plan

In order to reduce erosion occurring from the construction of roadways, utilities, drainage structures and regrading of house lots, and to prevent siltation/sedimentation of water bodies, water courses and wetlands resource areas, the Board shall require the submission of an Erosion/Sediment control plan. This plan shall explain in detail the specific mitigating measures that will be implemented by the developer, and any subsequent lot owners, both for short term and long term construction of the subdivision, including house lots.

In order for an Erosion/Sedimentation control plan to be effective and reduce cost to the developer, the designer shall consider the following in the early stages of designing a subdivision:

- a) Fit development to the terrain
- b) Schedule grading and construction to minimize soil exposure to weather elements
- c) Retain existing vegetation whenever feasible
- d) Vegetate and mulch barren areas
- e) Direct runoff away from barren areas
- f) Minimize length and steepness of slopes
- g) Keep runoff velocities low
- h) Prepare drainage ways and outlets to handle concentrated or increased runoff
- i) Trap sediment on site
- j) Inspect and maintain control measures frequently and during storms to check effectiveness

The plan must include the measures that will be implemented, both short and long term to prevent erosion. (See Appendix B, Section 4.0).

The plan shall explain the mitigating measures that will be taken to prevent stockpiles of soil from eroding or creating problems associated with airborne

particulates. Plastic covers and temporary vegetation may be used to prevent these problems from occurring.

The plan shall also include items such as the location, extent and type of berms, dikes, dams, detention/retention/ settling basins, silt fence, hay bales or any other erosion control measures that will be used to prevent erosion and sedimentation of wetlands and natural water courses.

In order to prevent dirt and mud from being tracked onto the roadway, which then washes into the drainage system, the construction of a crushed stone apron for vehicles entering home construction sites will be required as part of the erosion control plan (See Figure 1 for details).

If dirt is tracked onto an existing Public Way the DPW Director will require that the area be swept at the end of each day in order to prevent sedimentation of the existing town drainage system.

Erosion control plans shall be considered a part of any definitive plan approval.

Compliance with the National Pollution Discharge Elimination System (NPDES) Phase II program is required for all sites in excess on an acre. Such sites shall have a Storm Water Pollution Prevention Plan (SWPPP) available on site at all times.

5.4 As-Built Plan Requirements

Prior to placement of any bituminous concrete, a Utility As-Built Plan shall be supplied by the applicant {three (3) contact prints} to be reviewed and approved by the Planning Board. If after review, should any construction modifications be required by the Planning Board, an additional revised Utility As-Built plan shall also be submitted. The Utility As-Built Plan must meet all applicable and/or revised criteria of Appendix F. All applicants must sufficiently plan ahead to allow adequate time for Planning Board review and approval prior to scheduling with contractors for paving.

An accurate As-Built drawing of the development shall be submitted to the Board for approval within ninety (90) days of completion of all construction of the subdivision. The As-Built drawing shall contain the information listed in the As-Built plan checklist (See Appendix F).

5.5 Roadway Acceptance Plan

For subdivision roadways intended to be public ways accepted by Annual Town Meeting, a separate road acceptance plan in addition to the As-Built plan, shall be prepared and submitted for approval. Definitive As-Built plan approval does not constitute acceptance by the Town.

The applicant shall submit a street layout plan suitable for recording, prepared by a Massachusetts registered land surveyor (See Appendix F). The plan shall be prepared in accordance with the Rules and Regulations of the Registry of Deeds, MGL Chap. 82 Section 17 thru 23 showing the “Boundaries and Monuments of the Way”. If registered land, a land surveyor is also responsible for preparation of an appropriate plan in accordance with the “Commonwealth of Massachusetts Land Court Guidelines on Registered Land”. Upon approval, As-Built and street layout plans shall be submitted in electronic digital format (AutoCAD version 14 or higher) to the Planning Board. The applicant shall be responsible for all recording fees at both the Registry of Deeds and/or Land Court.

The Planning Board shall retain a minimum of \$25,000 surety or one buildable lot from the start of construction until the street is accepted by Town Meeting vote. Upon completion of the roadway, the applicant shall have submitted the As-Built plan and street layout plan for presentation to the Annual Town Meeting. The applicant shall also prepare a written document listing the metes and bounds description of the proposed layout, by reference to assessors map and parcel number of all land or easements acceptable by both the Director of the Department of Public Works and Town Counsel. Such document shall be an easement acquired for a public way purposes that will provide the public with all necessary rights of travel and associated use of the way(s) and relative easements, including installation of utilities but will not convey the fee interest in the land contained within the public way layout. After the date of the Town Meeting vote, the remainder of the \$25,000 surety shall be returned or the lot released, to the person(s) who originally posted the surety.

6.0 FEES, PERFORMANCE SECURITIES AND SPECIAL ACCOUNTS

6.1 Filing Fees

At the time of filing any plan with the Board, a Filing Fee in the form of cash or a check made payable to the “Town of Duxbury” shall be submitted with the application package. The application package will not be complete until all funds are deposited with the Duxbury Town Treasurer. Filing fees are as follows:

PLANNING BOARD FEE SCHEDULE

Approval Not Required Plans (ANR)	\$200 per plan plus \$100 per lot shown
Preliminary Plan	\$50 per lot (plus deposit of escrow account funds, see Sec. 6.2)
Definitive Plan <u>with</u> Preliminary Plan previously filed acted upon	\$200 per lot (plus deposit of escrow account funds, see Sec. 6.2)
Definitive Plan <u>Without</u> Preliminary Plan files and acted upon	\$400 per lot (plus deposit of escrow account funds, see Sec. 6.2)
Definitive Plan Amendments and Frontage Waiver Requests	\$100 per lot (plus deposit of escrow account funds, See Sec. 6.2)

6.2 Special Accounts for Consultant Costs

The Board may retain the services of a professional consultant to advise the Board on technical matters, review plans and inspect approved developments if the Board requires the assistance of a Planning, Traffic, Engineering, Legal, Soils or other professional to provide technical reviews and inspections of Subdivision Plans. The applicant will be responsible for paying all consultant costs incurred by the Town. At the time of filing either a preliminary or definitive plan, the applicant shall deposit with the Town Treasurer the following amount to be held in an individual interest bearing escrow account.

<u>3 Lots or Less:</u>	<u>4 or More Lots:</u>
\$3,000 minimum deposit	\$3,000 minimum deposit, plus \$500 per lot in the proposed subdivision

Checks shall be payable to the “Town of Duxbury.”

Funds in the individual interest bearing account will be spent to pay consultant fees for the specific project for which they were collected. If at any time prior to approval of the Plan or final completion of the project the amount in the account falls below \$1,000 for subdivisions of 3 lots or less or \$3,000 for subdivisions of 4 or more lots, the applicant shall deposit sufficient funds to bring the account back to the amount of the original deposit or an amount determined by the Board. Said funds must be deposited within ten (10) days of written notification of the Board. Failure to replenish the funds in the account within ten (10) days shall be reason for denial of the plan for failure to comply with these regulations. In the case of approved plans, failure to replenish the required amount of money within ten (10) days of notification shall be cause for the Board to schedule a hearing to rescind the lot releases of developments that are incomplete.

Following completion of the development and payment of the final consultant bill for reviewing the As-Built drawings, the remaining money in the account, including interest, if any, shall be returned to the applicant. Upon request, a final report of the account shall be made available to the applicant.

If the legal ownership of the development is transferred to another party, the new owner shall be responsible for meeting all applicable requirements of this section by re-establishing the account for consultant reimbursement. Any person or entity claiming to be the applicant's successor in interest shall provide the Board with sufficient documentation to establish legal ownership. The balance of the original escrow account shall be returned to the party who deposited it.

The consultant retained by the Board shall provide the Board with a line item invoice which indicates the cost incurred for each project. The consultant shall also provide a report to the Board of their findings and recommendations.

An applicant may appeal the selection of the Board's consultant to the Board of Selectmen (BOS), providing that such appeal is made within fourteen (14) days of notification of the Board's appointment of the consultant. The reasons for such an appeal shall be limited to claims that the consultant selected has a conflict of interest or does not possess the minimum required qualifications. The minimum qualifications shall consist of an educational degree and five (5) years of practice in the field at issue and , an appropriate license, registration and/or certification in the field at issue. The required time limit for action by the Board upon an application shall be extended by the duration of the administrative appeal. In the event that no decision is made by the Board of Selectmen within thirty (30) days following the filing of the appeal, the selection made by the Board shall stand.

6.3 Performance Bond

Following the approval of a Definitive Subdivision Plan, the developer has three options for completing the development:

Option 1

The developer completes all infrastructure improvements associated with the development such as: roads, drainage, seeding disturbed areas, utilities and tree plantings. If all work is completed to the satisfaction of the Board, no performance security is required and the Board will authorize release of lots.

Option 2

The developer partially completes improvements associated with the development and posts a Performance Security to ensure completion of the remaining work. The amount of the Performance Security is based on the estimated cost of completion of the development plus contingencies and a factor of 20%. After the developer posts a security acceptable to the Board (see Sec. 6.6 Form of Security) the Board will authorize release of the lots.

Option 3

The developer has an approved Definitive Plan, however, no construction has begun. The developer posts a security acceptable to the Board for the entire amount of the cost associated with completing the development. The amount of the security will be based upon the estimated cost of all improvements associated with the development plus contingencies and factor of 20%. After the developer posts a security acceptable to the Board; (see Sec. 6.6 Form of Security) they will authorize release of the lots with a condition that no lot may be built upon until the base coarse of asphalt leading to the lot has been inspected and approved.

6.4 As-Built and Roadway Acceptance Plan Security

Prior to the endorsement of a definitive subdivision plan the applicant shall post a security to ensure completion of an As-Built drawing of the development as required in Section 5.4 and a Roadway Acceptance Plan as required in Section 5.5. The amount of the As-Built Bond will be based upon the number of permanent monuments (bounds) and the length of roadway. Bond amounts will be calculated as follows:

\$150 per bound and \$10 per foot of roadway.

6.5 Procedures

6.5.1 Release of lots/covenant

The developer shall request in writing an inspection for the purpose of determining an amount for the cost of completing the development.

Following receipt of the itemized estimate for the cost of completing the development from the Board's consultant, the Board will vote to set the amount of the security.

After the Board has received the security and accepts the bond as being adequate to ensure completion of the development, it will vote to release the lots and sign a lot release form. An original of the lot release form shall be recorded by the developer at the Plymouth County Registry of Deeds. Proof of recording shall be submitted to the Board within thirty (30) days of endorsement of the release.

6.5.2 Partial Release of Security

Following completion of improvements of development under construction, the developer may request, in writing, a partial release of the performance security. The Board will have an inspection made to determine the amount of money necessary to hold in the performance security in order to ensure completion of the development. Following the Board's review of the inspection report the Board may vote to lower the amount of money required in the performance security. The Board will then notify the appropriate authorities to authorize a reduction of the performance security.

6.5.3 Total Release of Performance Security

a) Performance Security

Following completion of the development, the applicant shall request in writing a final inspection. If all work is completed to the satisfaction of the Board, the Board will vote to release all remaining funds held in the performance security. If work remains incomplete or unsatisfactory, the remaining work must be completed within thirty (30) days, at which time another inspection will be conducted. The Planning Director will notify the developer in writing within fourteen (14) days of all incomplete or unacceptable work. When all work is completed to the satisfaction of the Board, the Planning Board will vote to release the balance of the performance security.

b) As-Built Drawing and Roadway Acceptance Plan Security

Upon completion of the As-Built drawings and Roadway Acceptance Plan for public ways, the developer shall submit said drawings for review. Following an engineering review of the As-Built drawings, the Board's Engineer shall submit his/her findings to the Board. When the Board receives a favorable recommendation from its engineer to accept the As-Built and/or Roadway Acceptance Plan drawings, the Board will vote to release the security.

Continued Responsibility of Roadway

The developer is responsible for the continued roadway maintenance of the new street up until the street is accepted by Town Meeting. This includes but is not limited to pavement wearing surface; snowplowing; drainage system; street trees; and sidewalks, if any.

6.6 Form of Security

Two forms of security are available to the developer to select from to act as a "bond". The Board's requirements for these securities are described below. No depository institution acting as owner/developer may submit its own passbook account.

6.6.1 Treasurer's (Bank) Check

Deposit a signed check, made out to the "Town of Duxbury", with the Town Treasurer.

6.6.2 Surety Company

Surety companies acceptable to the Planning Board and registered with Massachusetts Division of Insurance can be utilized for posting a performance bond. The petitioner is responsible for maintaining such performance bond in good standing until such time the Planning Board votes a release.

6.7 Review and Recall of Security

6.7.1 The performance security held to ensure completion of the development will be reviewed annually after approval and endorsement of the Definitive Plan or at more frequent intervals at the discretion of the Board. The Board shall call a meeting with the developer to review progress. If the Board finds that the development has not been carried out in good faith, the Board will vote to recall the bond as described below.

6.7.2 If the Board determines that construction of the roadway, drainage structures or other improvements shown on the approved and endorsed definitive

plan have not been completed, the Board will notify the developer in writing. Said notification will specify the incomplete or unsatisfactory work and how the construction or installation fails to comply with the endorsed Definitive Plan and Rules and Regulations. If after forty five (45) days of the Town Clerk's receipt of said notice all work has not been satisfactorily completed, the Board may vote to recall the performance security. The money held in the performance security will be transferred into a special account of the Town's General Fund for the purpose of expenditure on completion of the development. All obligations under the security by the developer will be void. Any interest or remaining balance of the security not expended on completion of the development will be returned to the developer.

7.0 DESIGN AND CONSTRUCTION STANDARDS

7.1 General

All definitive plans must comply with the design standards contained in this section. Any variation from these standards must be authorized by a formal vote of the Board and must specify the section of these Rules and Regulations for which a waiver is requested. Failure to comply with these standards without benefit of a waiver shall be grounds for denial of the Definitive Plan.

NOTE: Material specifications and design standards not specifically addressed within these Rules and Regulations shall comply with the standards set forth in "Standard Specifications for Highways and Bridges", published by the Massachusetts Highway Department, hereafter referenced as "State Specifications", and "A Policy on Geometric Design of Highways and Streets" published by the American Association of State Highway and Transportation Officials (AASHTO) hereafter referred to as "AASHTO".

7.2 Design Guidelines

The roadway, drainage design and building construction in all subdivisions shall be designed to accomplish the following goals:

REDUCE, TO THE GREATEST EXTENT POSSIBLE:

- a) Volume of cut and fill;
- b) Area over which existing vegetation will be disturbed, especially if within 200 feet of a water body, wetlands resource area, or a slope of more than 15%;
- c) Number of mature trees removed. The petitioner should consult with the Tree Warden as to the removal of any trees that may be subject to the Shade Tree Act (MGL Chap.87) and/or the Scenic Road Act (MGL Chap. 40 section 15c);

- d) Extent of waterways altered or relocated;
- e) Visual impact of man-made elements not necessary for safety;
- f) Erosion or siltation;
- g) Exposure of buildings, roadways, and utilities to flooding, including from future climate change.
- h) Alteration of natural valley flood storage areas;
- i) Disturbance of important wildlife habitats, outstanding ecological or botanical features, scenic views or historic resources;
- j) Detrimental impacts to water quality

INCREASE, TO THE EXTENT REASONABLY POSSIBLE:

- a) Vehicular use of principal streets to avoid traffic on secondary and minor streets providing house frontages;
- b) Visual prominence of natural features of the landscape;
- c) Resilience and adaptability of buildings, roadways, utilities, and landscapes to future climate change impacts, including increased flooding.
- d) Legal and physical protection of views from public ways;
- e) Design street layouts to facilitate southern orientation of houses;
- f) Use of curvilinear street patterns;
- g) Pedestrian and bicycle access and safety;
- h) Natural green belt & trees, etc. on lots.

7.3 Streets

All streets shall be designed to provide safe vehicular travel, including during flooding events. Consideration shall be given to the number of dwellings served and to creating an aesthetically pleasing design of the street layout.

7.3.1 Classification of Streets –

Subdivision streets shall be divided into the following classifications for the purpose of establishing the applicable design and construction standards:

Principal Street - A way that carries or is designed to carry through traffic between parts of Town or between Duxbury and other Towns. Principal streets shall have a R.O.W. layout width of sixty (60) feet.

Secondary Street - A way that carries or is designed to carry through traffic to abutting lots and provide access to minor streets. Secondary streets provide access to eleven (11) or more lots. Secondary streets shall have a R.O.W. layout width of fifty (50) feet. Second means of access/egress required.

Minor Street - Streets that provide access to abutting lots only and serve ten (10) lots or less, including cul-de-sacs. The R.O.W. layout shall have a width of fifty (50) feet. No second means of access required.

Local Street - Streets that provide access to abutting lots only and serve three (3) lots or less. The R.O.W. layout shall have a width of fifty (50) feet. See Section 7.3.10 for a detailed description of local street requirements.

7.3.2 Pavement Widths

# of Lots Served	Minimum Width of Traveled Way	Berm Width*	R.O.W.
Local 1-3	14 ft.	1.5 ft.	50 ft.
Minor 4-10	18 ft.	1.5 ft.	50 ft.
Secondary 11+	22 ft.	1.5 ft.	60 ft.

* Berm width is in addition to the Traveled Way Width
(See Appendix D, Figures 2, 3 and 4)

7.3.3 Cross-Section

The Definitive Plan shall show a cross-section of the R.O.W. and traveled way. Minimum pavement and berm widths shall be as required on 7.3.2 above. The Board may require additional lanes, widths, or other dimension changes where the proposed use requires such for public safety. All cross sections shall conform to Figures 2 or 3 and shall meet the following design criteria:

- a) Except by approval of the Board, all wires for electricity, cable television, telephones or similar utility distribution systems shall be installed in conduit underground with all such distribution systems spaced not less than thirty six (36) inches (horizontally) from any water main, detector tape should be placed above the conduits.
- b) All poles for telephone, electric light or other cables shall be located at least five (5) feet from the back of berm and shall not be placed in sidewalks.
- c) Sidewalks shall be constructed as shown in Figures 2 and 3. Sidewalks are not required for Local Streets.

7.3.4 Location, Alignment, Intersections

a) Property lines at street intersections shall have a radius of not less than thirty (30) feet. In the case of intersections with significant traffic flow or other public safety issues, greater radii may be required. Minimum roadway berm radii at all intersections shall be thirty (30) feet.

b) The minimum roadway center line radius shall be one hundred fifty (150) feet. Greater radii may be required for principal and secondary streets, or where otherwise determined by the Board to pose a safety hazard.

c) Streets shall be laid out so as to intersect as nearly as possible at right angles. No street shall intersect any other street at less than sixty (60) degrees.

d) Streets entering opposite sides of another street shall be laid out either directly opposite each other or with a minimum offset of two hundred (200) feet between their center lines.

e) Connection of Subdivision Ways to Public Ways:

In the case of a Definitive Plan showing the connection of Ways within the subdivision over a private way to a Public Way, approval of the Definitive Plan shall be denied unless the applicant has sufficient rights in the Private Way to enable the applicant to construct improvements to the private way to bring it into conformance with the requirements of these Rules and Regulations, or as waived pursuant to M.G.L. c.41, s. 81R. The Definitive Plan shall show such Private Way, in accordance with the requirements set forth in Section 5.0 PLAN REQUIREMENTS and this section.

f) Reserve strips which prohibit access to streets or adjoining property shall not be allowed unless the Board determines that they are in the public interest.

7.3.5 Clear Sight Distance

a) All roadway design shall take into consideration safe sight distances not only at intersections but also along the traveled way, in accordance with appropriate AASHTO requirements. Clear sight distance shall take into account topography, density of dwelling units, and horizontal and vertical alignment.

b) There must be an unobstructed sight distance along both approaches of both roads at an intersection and across their included corners for a distance sufficient to allow the operators of both vehicles approaching simultaneously to see each other in time to prevent a collision. The clear sight distance shall conform to the AASHTO requirements for sight distance at at-grade intersections for passenger vehicles (Case III-Stop Control on Minor roads and as shown in Figure 4.) The sight triangles shown in Figure 4 shall be free of any obstructions which would

block visual contact. Any object located within the sight triangle, including structures, trees, vegetation, fences, cut slopes and embankments, high enough to constitute a visual obstruction shall be removed or lowered. In plan view, the triangle is formed by measuring twenty (20) feet from the edge of pavement of the through street along the centerline of the proposed approach street. The intersection sight distance values (legs AB and BC) shall be as shown in the table below:

Design Speed-Through Street (Posted speed + 5 mph)	Intersection Sight Distance (AB & BC)
50 m.p.h.	500 ft.
45 m.p.h.	450 ft.
40 m.p.h.	400 ft.
35 m.p.h.	350 ft.
30 m.p.h.	300 ft.

7.3.6 Grades

a) Grades of all streets shall be not less than one percent (1%), nor more than six percent (6%). Where the six percent (6%) requirement would result in adverse impacts to the aesthetic value of the site due to extensive cut and/or fill, tree removal, or flood protection, the Board may waive the six percent (6%) requirement provided such waiver is consistent with safety determinants, including the distance from an intersection, the number of dwellings served, the type of street, the length of the steeper graded portion of the street, the horizontal alignment and street curvature. At all intersections, the minimum grade on the approach street shall not exceed two percent (2%) within a distance of fifty (50) feet of the point at which the edges of the travel lanes intersect. Street grade at cul-de-sac turnarounds shall not exceed three percent (3%). Intersecting streets shall have sag vertical curve on approach street to keep water from encroaching onto pavement of through street.

b) There shall be a vertical curve for any change in street grade. Where proposed pavements meet existing pavements a vertical curve is not required if the difference in tangent grades is less than one-half of one percent (0.5%). Vertical crest curves shall have a minimum K value of thirty-five (35). Sag curves shall have a minimum K value of forty (40). K values of vertical curves shall be adjusted to provide the required stopping sight distance for the design speed as defined by AASHTO.

7.3.7 Storm Water - Drainage

a) General - The proposed storm water drainage shall minimize contribution of pollutants to surface or groundwater on or off the site and shall not adversely impact adjacent property by creating ponding, significant changes in the water table or increases in water discharge as noted herein. The applicant must contact

the Conservation Commission to determine if the M.G.L. c. 131, s. 40 and Town of Duxbury General Bylaw, Chapter 9, apply. The applicant is encouraged to be innovative in creating a system which will fulfill the objectives listed in Section 7.3.7c.

b) Design - Storm water drainage systems shall implement "Best Management Practices" and conform to the guidelines described in the "Performance Standards and Guidelines for Storm Water Management in Massachusetts" published by the Massachusetts Department of Environmental Protection.

Under certain circumstances, the Planning Board may also consider, after demonstration by a registered engineer, other designs and practices common to Low Impact Development (LID) to mitigate the effects of storm water runoff when reviewing storm water drainage systems.

c) Objectives - All available drainage management systems shall be reviewed to determine the appropriate method or combination of methods for the site. Soil types, topography, wetland types and location, vegetative cover, water table, flood conditions and the presence of water bodies on or near the site shall all be considered in the design of the drainage system:

Plans and calculations shall be developed in coordination with the Board, Planning Director, DPW Director, Board of Health, and the Conservation Commission. The following objectives shall guide the design:

1. Protect surface and groundwater quality using creative, multi-stage systems;
2. Minimize disruption to existing natural and topographic features on the site;
3. Ensure no increase in the rate of discharge from pre-development to post-development conditions.
4. Minimize future maintenance of the system;
5. Ensure public safety;
6. Protect existing abutting homes, properties and septic systems;
7. Create aesthetically pleasing designs which enhance views of the natural environment;
8. Prohibit direct discharges into any water body or resource area.

d) Design Requirements - Design of the drainage system shall conform to the following requirements:

1. Calculations - There shall be no increase in the peak rate of storm water runoff leaving the site for pre and post development. Design calculations to determine the size of all pipes, culverts and basins shall be submitted to the Board for review and shall be prepared by a professional engineer registered in the Commonwealth of Massachusetts. Calculations shall be clearly organized, detailed and accompanied by a written narrative. Sizing of the piping system shall be based on the Rational Method. Drainage calculations shall include a map showing the tributary watershed areas, soil types and surficial cover characteristics (e.g., forest, grass, pavement).

2. Drainage System - The drainage system shall be designed based on a twenty-five (25) year storm event. A complete storm drainage system shall be designed for each street and shall be laid out and be of sufficient size to permit unimpeded flow of all natural waterways, to eliminate undesirable accumulation of water on any portion of the subdivision or surrounding property and to intercept storm water runoff from adjacent lots. The storm drainage system shall include catch basins, manholes, pipe, gutters, swales, culverts, head-walls, and other related items as may be required to complete the system to the satisfaction of the Board. Appendix B - Drainage Materials and Installation Specifications contains the specifications for acceptable materials and installation practices for drainage systems.

a) Catch basins shall be located along edges of pavement at all low points in the roadway and at intervals as follows:

Maximum 300 ft. for grades up to 4%

Maximum 250 ft. for grades from 4% to 6%

Maximum 200 ft. for grades greater than 6%

No basins shall be located within driveway curb cuts or at sidewalk handicap access ramps.

b) Storm water drainage piping shall be minimum twelve (12) inch diameter and shall have a minimum depth of cover of two feet six inches (2'-6") as measured from the roadway subgrade. Slope of pipe shall not be less than 1/2 of one percent (0.5%). The drainage system shall be designed for a minimum self-scouring velocity of three (3) ft./sec.

c) Drainage pipes shall have positive outfalls, head-walls with wing walls or pre-formed flared end sections, and rip-rapped stone aprons to provide energy dissipation. In every case, a minimum of thirty (30) feet of vegetated swale

shall be provided above the high water line of any stream, swamp, bank or wetlands, or estimated future mean high tide line accounting for long-term sea level rise when discharging to tidal waterbodies or wetlands. All outfalls within the Flood Hazard Areas Overlay District shall be designed to prevent backflow of floodwaters through drainage pipes and overflow at upland catch basins. All outfalls into resource areas or their buffer zones shall be subject to the approval of the Conservation Commission.

d) Manholes shall be located at all changes in direction of drainage pipe, either horizontally or vertically, at all pipe connections and at maximum intervals of three hundred (300) ft. along pipe runs.

e) Culverts shall be designed on the basis of a one hundred (100) year storm on the assumption that the entire drainage area is built up to the density allowed by the current zoning bylaws. For culverts within the Flood Hazard Areas Overlay District and located in areas with a Sea Level Rise Base Flood Elevation, culverts shall also be designed on the basis of the future 1% annual chance coastal flood in the Target Year as shown on the Best Available Future Coastal Flood Hazard Areas Map. Hydraulic Calculations necessary to determine the size of waterway opening shall be submitted to the Board for review. Culverts shall have a head-wall at each end. Culverts thirty-six (36) inches or greater in equivalent diameter shall include additional protection for roadway side slopes and grates.

3. Swales - Wherever practical, except alongside roadways, stormwater shall be channeled via open swales to facilitate the removal of contaminants.

a) Scuppers or swales from the roadway onto adjacent lots must be designed to direct flows away from any existing or proposed homes. Whenever possible, scuppers and swales should be grassed to promote aesthetics and the removal of contaminants. Where higher velocities require the use of a heavier lining, rip-rap, trap rock or other similar material shall be used to prevent erosion.

b) Swales shall have minimum side slopes of 3:1 (horizontal to vertical) with maximum slope of swale not to exceed five percent (5%).

c) Dense vegetative cover shall be established as quickly as possible. Organic matter shall be incorporated into the soil to enhance potential for pollutant removal. Grasses shall be planted to provide enhanced vertical resistance to stormwater runoff.

4. Off-Site Systems - The use of existing or proposed off-site drainage systems will require the submission of legal easements or agreements with the applicable land owner as well as an access easement in the Town's favor. Drainage systems within off-site easement areas must comply with the requirements of these Subdivision Rules and Regulations. Calculations must be submitted demonstrating conformance with these Subdivision Rules and Regulations. All easements must be of a form acceptable to Town Counsel. See Section 7.3.13 Easements.

5. Sites within Aquifer Protection Overlay Districts (APOD) and Other Sensitive Areas - Special attention shall be given to sites within the APOD as defined in Section 406 of the Duxbury Protective Bylaw and shown on a map named the same dated December 4, 2002; other communities' Zone II; and areas subject to protection under M.G.L. c. 131, s. 40 or Town of Duxbury General Bylaw, Chapter 9; and other sensitive areas.

For such sites, the Board will require that a nitrogen loading analysis be performed to determine the suitability of the drainage system. These requirements also apply to existing drainage facilities either on or off the site which will be affected by runoff from the proposed subdivision. The analysis shall be based on criteria established in the Duxbury Protective Bylaw Section 406.6, Item 4, subscripts d, i and ii.

6. Drainage Basins - Detailed designs of all detention/retention basins and pre-treatment basins are required. At a minimum they shall include cross sections, soil types, depth to maximum level of groundwater, final slopes and elevations. A planting and stabilization schedule is required for side slopes. Drainage basins shall meet the following criteria:

a) Bottom of basins shall be a minimum of two (2) feet above maximum groundwater level and shall be vegetated to promote filtration of contaminants. Permanent standing water is discouraged unless the basin is located adjacent to or hydrogeologically connected to a wetland or water body.

b) A pre-treatment facility shall be provided to remove contaminants from the water prior to entering a detention/retention basin. Contaminants shall include sediment, grit, oil and general debris. Pre-treatment facilities may include lined siltation basins, oil/water separators, and oil/grit separators. No water shall be permitted to recharge or leach into the ground unless it has been pre-treated to remove oil and sediment.

c) Basins shall be designed to contain a twenty-five (25) year design storm with one (1) foot of freeboard at the maximum water level. All basins shall be designed with an emergency overflow spillway with appropriate erosion control protection.

d) Retention facilities shall be designed to dissipate within seventy-two (72) hours based on the percolation rate of the soil. Percolation tests for the site shall be required if a retention basin with recharge of stormwater into the ground is proposed.

e) Basin length to width ratio shall be at least 3:1 to maximize distance from inlet to outlet. Basin surface area shall be maximized.

f) Side slopes in basins shall not exceed 3:1 (horizontal to vertical) above a permanent pool and 2:1 within a permanent pool.

g) In dry basins, a pervious low flow channel shall be used to prevent erosion of the bottom of basin. Low flow channels shall have a minimum grade of two (2%) percent to prevent ponding. Suitable protection shall be provided to prevent erosion of the channel.

h) All pipes and risers shall be equipped with trash racks and/or guards as appropriate to prevent entry by children and animals.

i) Basins and associated outlet aprons and swales shall be incorporated into separate land parcels exclusively for purposes of stormwater management rather than be shown as easements. These parcels shall include the required buffers and maintenance access.

j) All facilities shall be designed to blend into the landscape to obviate the need for fencing and screening. Wherever possible, they shall follow the natural contours of the land so as not to create large disturbed areas, steep slopes or walls. Basins over four (4) feet in depth are not permitted.

k) Means of access for mechanized maintenance equipment shall be provided to all basins.

l) Plans for pre-treatment marshes shall specify the average and maximum levels of the adjacent water body and the final proposed water level of the marsh. If storage capacity is being created, the plans shall illustrate the methods being employed as well as the type and elevation of inlets and outlets. A specific planting scheme of wetland vegetation is required.

1. Pre-treatment marshes shall be constructed in upland areas. Wetlands shall not be removed or altered for marsh construction without approval of the Conservation Commission.

2. To promote water quality, the marsh shall be designed to retain the "first flush" of stormwater runoff to allow contaminants to settle out prior to entering the adjacent water body. Subsequently, it must be capable

of storing or detaining a ten (10) year storm event.

m) A fifty (50) ft. buffer zone of existing vegetation shall be retained between all basins or pre-treatment facilities and adjacent uses or structures. Buffers shall be adapted for access and shall be fully contained within the drainage lot. A thirty (30) ft. buffer zone of existing vegetation shall be retained between all point source discharges of stormwater and surface waters and wetlands. In tidal areas, the buffer zone shall be measured from estimated future mean high tide line accounting for long-term sea level rise.

n) Basins shall have positive outfalls with rip-rapped stone aprons to provide energy dissipation. All outfalls within the Flood Hazard Areas Overlay District shall be designed to prevent backflow of floodwaters through drainage pipes and overflow at basins. In every case, a minimum of thirty (30) ft. of vegetated swale above the high water line of any stream, swamp, bank or wetlands shall be provided, or above the estimated future mean high tide line accounting for long-term sea level rise in tidal areas.

o) The Board may require that a separate performance guarantee be posted to secure the completion and satisfactory functioning of any drainage basin or pre-treatment facility. This performance guarantee may be required for a specified time period to ensure the proper growth of plant species pursuant to M.G.L. c. 131, s. 40 310 CMR (10.55).

7.3.8. Utility Requirements

a) Water pipes and related equipment such as hydrants and water main shut-off valves shall be designed in accordance with the latest edition of the Rules and Regulations of the Duxbury Water Department and shall be installed under the direction and supervision of the Water Department to serve each lot of the subdivision.

b) Public Water Supply Standards: Wherever feasible, water supply shall be provided from a public water supply system. The water supply system will be considered adequate only if it is capable of providing each proposed fire hydrant with a flow of 750 gpm at 20 psi residual pressure for single and two family residential developments. For multi-family and non-residential developments approval of the Fire Chief/Department is required. Each proposed lot shall have water pressure of 35 psi, average peak day, at street grade without individual booster pumps for domestic water. Where any part of any lot is at elevation 120 feet (msl) or higher, the applicant shall submit calculations documenting supply adequacy.

c) Private Supply Standards: Where connection to the public water supply is not feasible in the opinion of the Planning Board, the Planning Board may approve a subdivision upon the Board's determination, following consultation with the Fire Department, that a sprinkler system or other provisions will adequately provide for fire safety. In addition, upon the Board's determination, following

consultation with the Board of Health, wells on each lot shall be able to provide a sustained yield of five (5) gpm of water meeting latest edition DEP "Drinking

Water Regulations of Massachusetts" standards. Test wells may be required of the applicant.

d) Sewage disposal: On-site sewage disposal facilities shall be constructed in conformance with the Rules and Regulations of the Board of Health as promulgated and amended from time to time. No house may be occupied until the sewage disposal facilities have been approved by the Board of Health, and a certificate of occupancy has been issued by the Inspectional Services Department.

The applicant shall submit sufficient information including test pits, perc tests, topographic and hydrologic data to indicate the feasibility of on-site disposal in the event public sewers are not available.

7.3.9 Dead End Streets

a) General - Dead end streets, including cul-de-sacs, shall not be more than 1000 feet in length, nor serve more than ten (10) lots. The length of dead end streets shall be measured beginning from the edge of the traveled way of the nearest through street to the center of the turnaround along the center line of the road.

b) Design Standards - All cul-de-sacs/dead end streets shall be provided with the following:

1. A circular turnaround. The pavement width at all turnarounds shall be a minimum of eighteen (18) feet with a one and a half (1.5) ft. Cape Cod berm.

2. A vegetated island shall be provided in the center of the cul-de-sac. See Figure 5.

3. Road grade shall not exceed three (3%) within a cul-de-sac.

4. Bituminous paving shall be used.

5. Drainage shall be provided in accordance with the requirements of Section 7.3.7

6. Modified turnarounds such as hammerheads may not be used, except as permitted under Section 7.3.10

7. Within the Flood Hazard Areas Overlay District, roads shall have a minimum elevation of the higher of the FEMA Base Flood Elevation or SLR-BFE, except that the Planning Board may waive or condition the application of this standard if the Board determines (1) that the non-compliant portion(s) of the proposed road involves a way that existed on the effective date of the Bylaw, and (2) that the measures that would be required to raise the non-compliant portion(s) of such existing way to the required elevation, or to construct an alternative access route that would meet the standard would endanger human health and safety, have an adverse effect on the natural function of the floodplain, have a significant

adverse impact on wetlands or conservation areas, or be substantially detrimental to the character of the neighborhood.

7.3.10 Local Street

a) General: When the subdivision of a tract of land creates three (3) or less lots, a local street design may be used utilizing the design standards below. All provisions of the Subdivision Control Law and these Subdivision Rules and Regulations shall apply to the application and plan. Only the dimensional requirements for the roadway within the fifty (50) foot R.O.W. shall differ from the standard definitive subdivision requirements.

b) Objectives: The intent of this provision is to reduce tree removal, site disruption and paving widths while providing safe and adequate access to the lots served by the local street.

c) Design Standards:

1. Fifty (50) foot R.O.W. with a one hundred and fifty (150) foot diameter cul-de-sac layout shall be required (See Figure 5).

2. Bituminous concrete paving shall be used.

3. Minimum width of traveled way shall be fourteen (14) ft. with one and a half (1.5) ft. Cape Cod berm.

4. Drainage facilities shall be provided to meet requirements of Section 7.3.7

5. Modified turnarounds built within the one hundred fifty (150) ft. cul-de-sac layout may be used such as hammerheads, etc. Such design shall accommodate a turnaround for a single unit (SU-30) truck (see AASHTO geometric requirements).

6. All lots must accrue legal frontage and access over the R.O.W. lines.

7. Within the Flood Hazard Areas Overlay District, roads shall have a minimum elevation of the higher of the FEMA Base Flood Elevation or SLR-BFE, except that the Planning Board may waive or condition the application of this standard if the Board determines (1) that the non-compliant portion(s) of the proposed road involves a way that existed on the effective date of the Bylaw, and (2) that the measures that would be required to raise the non-compliant portion(s) of such existing way to the required elevation, or to construct an alternative access route that would meet the standard would endanger human health and safety, have an adverse effect on the natural function of the floodplain, have a significant adverse impact on wetlands or conservation areas, or be substantially detrimental to the character of the neighborhood.

8.

7.3.11 Street Lights

Street lights may be required at intersections of streets, near sharp turns or other areas where the Board deems they are needed for public safety. Within the Flood Hazard Areas Overlay District, wiring screw caps shall be watertight or have a minimum elevation of the higher of the FEMA Base Flood Elevation or SLR-BFE. The developer is responsible for installing the pole, wiring and arranging installation of the light fixture. The developer is responsible for paying for the cost of electricity until such time as the road is accepted by Town Meeting, or in the case of private roads, approval of the As-Built drawing at which time the light bill will be paid by fee owners of the road. Street lights must be installed prior to the issuance of the certificate of occupancy for the first dwelling in the subdivision. Design shall be approved by the DPW Director.

7.3.12 Street Names

Applicants shall submit the proposed street names in writing to the Planning Director who shall forward them to the Town Historian along with the title sheet of the definitive plan that shows the locus and layout of the subdivision. Appropriate street names shall have historical significance or be related to a natural feature of the area. The Town Historian shall comment on the proposed name or give alternative suggestions for the applicant to select. Names of living persons will not be accepted. The Planning Board must grant final approval of all street names.

Any proposal for a public street name change shall be reviewed in accordance with Chapter 85 Section 3, 3A & 3B (Changing of name of ways) of the Massachusetts General Laws after notice of a public hearing in a newspaper of general circulation. Petitioners seeking such a change will be responsible for all costs incurred as to advertising and recording of the appropriate documentation at the Plymouth County Registry and/or Land Court (if applicable).

7.3.13 Easements

Utility or drainage easements shall be provided where necessary and shall, whenever possible, be centered on side or rear lot lines, and shall be a minimum of twenty-five (25) ft. wide. For any utilities or drainage pipes buried greater than ten (10) feet below finished grade, the Planning Board will require Town ownership in lieu of an easement unless a public benefit can be demonstrated. All easements shall be shown on the definitive plan, As-Built drawing and Roadway Acceptance Plan.

All easements shall be accompanied by Easement Documents for recording at the Registry of Deeds. Easements must be clearly defined and described on the definitive plan. The applicant is responsible for recording all easement documents following endorsement of the definitive plan by the Board. Proof of recording shall be submitted to the Board within thirty (30) days of endorsement of the plan. Easements shall be in a form acceptable to Town Counsel.

There shall be no placement of any structure and/or subsurface system either above or below the land subject to an approved easement unless such easement is expressly dedicated to such use.

8.0 FRONTAGE WAIVER REQUESTS

Applicants shall apply under the same procedures as a standard Definitive Subdivision plan, however, the plan showing the lots for which a waiver is requested shall consist of a plan similar to an ANR plan. All other plan requirements shall be the same as in a modification request.

9.0 LOT LETTERING

Lot letters shall be assigned to each lot in a subdivision in the following manner:

Lot letters shall begin with letter “A” being the first lot on the right side of the proposed roadway with each lot alphabetically lettered around the proposed roadway. Should the number lots exceed the letters of the alphabet, double lettering shall be used, i.e. “AA, BB, CC...”. If the land shown on the plan is registered land, a separate plan shall be required showing the registered parcel forming single building lots and labeled alphabetically.

Lot letters shall be clearly displayed during construction. Lot letters shall be removed once a Certificate of Occupancy has been signed for a new house and a house number is assigned.

10.0 STREET SIGNS

During construction, temporary signage shall be posted for street identification. The developer shall erect and set in concrete the permanent street sign pole. The street sign will be made by the Department of Public Works upon written request and payment of the applicable DPW fee. The developer is then responsible for installing the sign on the pole prior to the issuance of the certificate of occupancy for the first house in the development. All streets must have a sign made by the Department of Public Works that conforms to Town specifications. Any other proposal for street identification shall require approval from the Department of Public Works prior to installation.

11.0. SHADE TREES

All subdivisions shall have deciduous shade trees in order to enhance the aesthetic quality of the streetscape.

The location, size, number and species of trees shall be determined jointly by the developer and the Director of Lands and Natural Resources (Tree Warden), and approved by the Board. Following the construction of the base course of the roadway, the developer shall request the tree warden to verify the staked locations for tree plantings. Groups of trees or shrubs may be required within the island of a cul-de-sac.

Trees shall be nursery stock quality, minimum of two (2) inch caliper. All trees must be properly wrapped and guyed. Trees shall be planted at appropriate seasons in order to ensure survival. The developer shall be responsible for maintaining the health of the trees for two (2) full growing seasons or until such time as the As-Built plans of the street are approved by the Board (private ways), or the acceptance of the street by Town Meeting (public ways) whichever is longer.

12.0 PRESERVATION OF NATURAL VEGETATION

Every effort shall be made to preserve the existing trees or other rare or unique flora within the R.O.W. and on the lots being created. Cuts and fill for roadway construction shall be done in a manner that preserves natural vegetation whenever possible. Stock piles of fill shall be located in areas that do not bury existing trees above the natural grade. Machine operators shall exercise due caution during construction and avoid unnecessary damage to root systems or scraping bark from trees to be preserved.

The developer shall erect 8 ft x 8 ft. temporary wooden tree guards around specific trees designated to be saved to protect them from damage during construction.

13.0 CONSTRUCTION STANDARDS

The construction of all subdivision improvements shall only occur during seasonal and weather conditions that allow for high quality infrastructure construction, utilizing accepted industry standards. See Appendix A for Roadway Construction Standards. See Appendix B for Drainage Materials and installation specifications.

14.0 CLEAN UP

Upon completion of all work on the ground, the developer shall remove from the streets and adjoining property, all temporary structures and all surplus material and rubbish which may have accumulated during construction, and shall leave the work in a neat and orderly condition. During construction, the developer shall keep the site free of rubbish which may be carried by wind or rain off the site to abutting properties or onto public ways.

15.0 MAINTENANCE

The developer shall maintain the roads for vehicular travel, including snow plowing, in a manner satisfactory to the Board, until approval of the As-built plan for private roads or acceptance by Town Meeting for proposed public ways. Further, the developer shall maintain the completed roads, drainage structures and shade trees in a subdivision in a condition which meets all the above requirements to the satisfaction of the Board up until approval of the As-Built plan or until acceptance of the roads by vote of Town Meeting.

APPENDIX A

ROADWAY CONSTRUCTION SPECIFICATIONS AND STANDARDS

The following specifications shall govern the construction of all streets within the right-of-way (R.O.W.) lines of a proposed subdivision under the Rules and Regulations governing the Subdivision of Land, adopted by the Duxbury Planning Board.

Whenever the term "State Specifications" is used in this section in reference to materials and methods of construction, it shall mean the Standard Specifications for Highways and Bridges of the Massachusetts Highway Department, dated 1988, including amendments.

The contractor shall notify the D.P.W. Director in writing at least forty-eight (48) hours in advance of beginning any construction within a public way.

1.0 ROADWAYS

1.1 Clearing and Grubbing

All areas to be cleared and grubbed within the roadway R.O.W. lines of a subdivision shall be clearly shown on the definitive plan in conjunction with the proposed landscaping. The intent of the Board is to maintain as much of the original natural vegetation as possible within a subdivision. Clearing and grubbing shall be required as follows:

- a) A minimum of eight (8) feet beyond the back of roadway berm
- b) A minimum of four (4) feet beyond the back of sidewalk
- c) Within areas required for grading purposes
- d) Within ten (10) feet of an underground utility
- e) As required to maintain sight lines

Areas to be cleared and grubbed shall be cleared of all stumps, brush, roots, boulders and trees not designated for preservation. Trees to be preserved shall be physically protected from construction operations in a manner satisfactory to the Duxbury Tree Warden. All resulting debris from clearing and grubbing operations shall be properly disposed of off-site in accordance with all local, state and federal regulations. Stump dumps shall not be permitted within a subdivision.

1.2 Excavation and Subgrade Preparation

All topsoil shall be removed for the full width of the paved roadway, under the six (6) foot wide grass shoulders and under sidewalks, regardless of whether the finished grade is above or below existing grade. All other material shall be removed for the full length and width of roadway to the proposed roadway subgrade. If the soil below the proposed subgrade contains undesirable material which will affect the structural integrity of the pavement such as clay, soft or spongy material, sand pockets, tree stumps, or other material detrimental to the subgrade, such material shall be excavated and removed as required by the Board's Engineer and/or the DPW Director. Excavation below subgrade shall be backfilled with processed gravel per Section M1.03.1 of the "State Specifications" and compacted.

1.3 Grading

All roadways shall be brought to a finished grade as shown on the vertical roadway profiles of a Definitive Plan. Before sub-base material is spread, the subgrade shall be shaped to a true surface conforming to the proposed cross section of the roadway and sidewalk and compacted in accordance with Section 170 in the "State Specifications". Roadway crown shall be a minimum of 1/4 inch per foot.

1.4 Pavement Sub-Base

After the roadway subgrade has been carefully graded and compacted, a pavement sub-base layer consisting of the following shall be spread and compacted:

- a) Eight (8) inches of processed gravel for sub-base meeting the requirements of Section M1.03.1 of the "State Specifications" except that the maximum stone size shall be two (2) inches. Spread and compact the material in accordance with the requirements of Section 405 of the "State Specifications".
- b) Four (4) inches of dense graded crushed stone for sub-base meeting the requirements of Section M2.01.7 of the "State Specifications". Spread and compact the material in accordance with Section 402 of the "State Specifications".

The sub-base material shall continue beyond the back of berm a distance of six (6) feet to provide a stabilized shoulder for occasional parking of vehicles.

1.5 Pavement and Wearing Surface

After the pavement sub-base has been carefully graded and compacted, the pavement shall be constructed. The pavement shall consist of the following:

- a) Two (2) inches of Class I Bituminous Concrete Base Course, Type I-1 meeting the requirements of Section 420 of the "State Specifications".

b) One and 1/2 inches of Class I Bituminous Concrete Pavement, Type I-1 meeting the requirements of Section 460 of the "State Specifications". An RS-1 emulsion shall be applied between the base and top courses.

The final top course shall be applied when a substantial portion of the construction on adjacent lots is completed as determined by the Board and/or DPW Director.

2.0 SIDEWALKS

2.1 Location, section and dimensions of concrete sidewalks shall be as shown in Figures 2 and 3. Sidewalks shall be at least six (6) inches higher than the adjacent roadway and at least 4'-6" wide. Sidewalks shall be installed with the placement of the final top course pavement.

2.2 Sidewalks shall be constructed of four (4) inches of cement concrete on a minimum eight (8) inch gravel borrow sub-base conforming to the requirements of Section 701 of the "State Specifications". Concrete shall have a minimum 28 day compressive strength of 4,000 psi with maximum 3/4 inch aggregate. One layer of No. 4, 4 by 6 welded wire mesh shall be provided at mid depth. The walking surface shall be broom finished. Concrete surfaces shall be coated on the top and sides with an approved sealer. Expansion joints (1/2 inch open) shall be provided at least every twenty (20) feet, with score joints at four (4) foot intervals. All expansion joints shall use a preformed expansion joint filler conforming to Section 9.14.0 of the "State Specifications".

2.3 Sidewalks may meander to avoid destruction of existing major trees.

2.4 All driveway aprons that cross proposed sidewalks shall be concrete to match the concrete sidewalk. Concrete driveway aprons shall be installed with the installation of sidewalks.

3.0 GRASS STRIPS AND CLEARED AREAS

3.1 All areas disturbed by construction and grading operations adjacent to the pavement and sidewalk, within the limits of the Right-of-Way shall be seeded. A minimum of six (6) inches of loam (depth after compaction) shall be applied and the areas shall be seeded with grass seed. Composition of seed mixture must be indicated on the Definitive Plan Landscape Plan. A dense robust vegetated area must be established and maintained until the development is certified as complete by the Board. These areas shall be periodically mowed and watered as required to maintain a neat appearance during construction of houses in the development.

4.0 UNDERGROUND UTILITIES

4.1 All underground utilities shall be marked with continuous plastic detector tape located in the backfill six (6) inches above the utility.

4.2 Water mains, hydrants and house lateral connections shall be constructed in accordance with the requirements of the Duxbury Water Department.

APPENDIX B

DRAINAGE MATERIALS AND INSTALLATION SPECIFICATIONS

1.0 GENERAL

1.1 DESCRIPTION

- a) This section specifies the materials and methods of construction required for the construction of a storm drainage system for a proposed development
- b) An applicant may propose alternate materials and methods of construction which deviate from the requirements of these specifications provided that such proposed alternates are of equal or better quality to the materials and methods of construction specified in this section. The Board will be the sole judge as to the acceptability of any proposed alternate.

1.2 STATE SPECIFICATIONS

Whenever the term "State Specifications" is used in this section in reference to materials and methods of construction, it shall mean the Standard Specifications for Highways and Bridges of the Massachusetts Highway Department, dated 1988, including amendments.

1.3 NOTIFICATION

The contractor shall notify the D.P.W. Director in writing at least forty-eight (48) hours in advance of beginning any construction within a public way.

2.0 MATERIALS

2.1 PIPE

- a) Pipe for storm drainage systems shall be either reinforced concrete pipe (Class III minimum) or corrugated plastic meeting the requirements of Sections M5.02.1 and M5.03.10 of the "State Specifications", respectively. Minimum pipe size shall be twelve (12) inch diameter. Corrugated plastic pipe shall not be used as flared ends or in other applications where the pipe is exposed to vandalism or ultraviolet radiation. Corrugated plastic pipe shall have a smooth interior.
- b) Pipe joint material for reinforced concrete pipe shall be rubber ring or plastic gaskets made of tough, flexible, chemical-resistant material of such size and shape to ensure satisfactory, water-tight pipe joints in conformance with ASTM-C443. Gaskets for joining pipe shall be compatible with the pipe system. Corrugated plastic pipe shall be

firmly joined by an approved coupling. Methods for joining pipe shall be approved by the DPW Director.

2.2 MANHOLES AND CATCH BASINS

- a) Manholes and catch basins shall be precast concrete units conforming to the requirements of Section M4.02.14 of the "State Specifications. Concrete for precast units shall have a minimum 28 day compressive strength of 4,000 psi. Precast units shall be designed for HS-20 loading. Joints between sections shall be tongue and groove, sealed with a rubber joint material conforming to ASTM C361. Exterior surfaces of precast units shall be sealed with a cold applied bituminous sealer. Size and dimensions of manholes and catch basins shall be approved by the DPW Director.
- b) Castings for frames, grates, covers and hoods shall conform to the requirements of ASTM A48, Grade 30, minimum. All castings shall be coated with an approved black asphaltum.
- c) Brick and mortar for field adjusting collars shall conform to the requirements of Sections M4.05.02 and M4.02.15 of the "State Specifications," respectively.
- d) The minimum diameter of manholes shall be forty-eight (48) inches. Manholes shall have cast iron or reinforced plastic step rungs at twelve (12) inch spacing for access to the bottom. Steps shall be designed for a minimum load of 300 pounds. Manhole covers shall have the word "DRAIN" embossed on the cover unless otherwise directed by the DPW Director.
- e) Catch basins shall have a minimum 3'-0" sump provided. Cast iron hoods shall be provided on all outlet pipes to prevent floating oil and debris from entering the drainage pipe.

2.3 PIPE OUTFALLS

- a) Flared end sections of pipe shall be reinforced concrete precast sections (Class III) conforming to the requirements of Sections M5.02.0 of the State Specifications".
- b) Headwalls and wingwalls for end sections shall be constructed of reinforced concrete with a minimum 28 day compressive strength of 4,000 psi conforming to the requirements of Sections M4.02.00 (4,000 psi, 3/4 inch, 610 pound cement) of the "State Specifications." Steel bar reinforcement shall be ASTM A615, Grade 60. Headwalls and wingwalls shall be designed in accordance with the requirements of the AASHTO Standard Specifications for Highway Bridges, latest edition.
- c) All pipe outfalls shall be protected from erosion with stone for pipe ends conforming to the requirements of Section M2.02.3 of the "State Specifications".

3.0 CONNECTIONS TO EXISTING STRUCTURES

3.1 Cut holes in existing structure walls for new pipe connections to the minimum size required for pipe installation. Completely fill the space around the pipe with stiff cement mortar for the full thickness of the wall. All pipes shall be cut flush with the inside of structure.

3.2 Rim elevations of existing drainage structures shall be adjusted as required to meet new finished grades. Grade adjustments shall be made in the masonry leveling course.

4.0 EROSION CONTROL DURING CONSTRUCTION

4.1 The drainage system shall be made operational as soon as it is complete. At no time shall a completed drainage system be prevented from operating. Until adjacent embankment cut and fill slopes are stabilized to prevent erosion, and during construction on adjacent lots, the contractor shall employ temporary erosion control measures as necessary to prevent sediment from entering the drainage system.

4.2 The type and design of erosion control measures that will be required will vary from site to site and the specific cause of environmental degradation. The protective measures may consist of, but are not limited to:

- a. Temporary sedimentation pools for the protection of rivers, lakes, streams and ponds
- b. Temporary earth berms and slope drains to control and channel heavy runoff, thus preventing washouts
- c. Ditches and swales at bottoms of slopes
- d. Check dams in swales and ditches to slow runoff
- e. Filters at drain inlets
- f. Energy dissipators at culvert outlets such as splash pads and rip rap
- g. Silt fences with or without hay bales
- h. Haybales

4.3 An erosion control plan describing materials and specific methods of erosion control must be submitted as part of the definitive plan submittal and shall be approved by the Board.

4.4 If the final top course of pavement will not be applied immediately, the catch basin grates shall be temporarily set at the base course elevation to allow storm water to enter the drainage system. When the final top course of pavement is applied, the grate elevations shall be adjusted to meet the final grades.

5.0 FINAL ACCEPTANCE

Prior to final acceptance of the drainage system, all pipes, drainage structures, basins and swales shall be flushed and cleaned to remove any accumulated sediment and debris. All temporary erosion control measures shall be removed.

Until a roadway is accepted by the Town, the developer shall be responsible for snow plowing and sanding during inclement weather. In the case of a public safety emergency, should the Town Department of Public Works be required to address any accessibility issue, due to weather relating conditions, the developer shall be responsible for all costs incurred by the Town for failure to maintain safe and adequate access.

APPENDIX C
INSPECTION AND TESTING OF REQUIRED IMPROVEMENTS

1.0 GENERAL

- 1.1** All work shall be reviewed by the Board and shall be approved and accepted or disapproved, rejected, and re-done correctly. The Board will employ a Registered Professional Engineer to act as its agent in the inspection of work to ensure compliance with these Subdivision Rules and Regulations. The Board's engineer shall make a report to the Board to approve or disapprove the work, citing specific reasons. The Board's engineer will make inspections as required in Section 3.0 below and as requested by the Board to check the adequacy of the work at various stages of work. The Board, its engineer, and others the Board may designate shall have the right to inspect the work at any time. The applicant shall provide safe and convenient access to all parts of the work for inspection by the Board or its authorized agents.
- 1.2** Work which has been disapproved or is not acceptable to the Board shall be corrected to comply with the approved plans. Work covered by subsequent work prior to acceptance or otherwise not available for inspection shall be considered not acceptable. Such work shall be removed as directed by the Board to insure availability for inspection as required.
- 1.3** Construction of the required improvements shall be inspected by the Board's Engineer or authorized agent, and unless the work is approved, including approval of materials, no further work shall be commenced. Inspections may include sampling for laboratory analysis or testing. Where samples are removed from the completed work, the applicant shall replace and restore such work, to the satisfaction of the Board's Engineer.

The Board's engineer may require certified copies of delivery receipts or bills of lading or other certification describing materials used. Samples shall be furnished at the expense of the applicant, and the applicant shall be liable for all costs and fees incurred by the Board as a result of transporting and testing materials.

2.0 NOTIFICATION TO THE APPLICANT

- 2.1** The Board will notify the applicant of the name and address of the Engineer designated as its representative. The applicant shall keep the Planning Director fully informed as to the status and progress of the work and shall notify the Planning Director directly in writing at least forty-eight (48) hours in advance, that the work has progressed to a stage that an inspection is required.

2.2 If the Board's Engineer is unable to make required inspections for forty-eight (48) hours after the work is ready for inspection, the applicant shall notify the Planning Director so an alternate to may make the inspection.

2.3 The applicant shall be liable for all costs and fees incurred by the Board as a result of requests by the applicant for an inspection of the work.

3.0 INSPECTION OF REQUIRED IMPROVEMENTS

The following inspections to the required improvements must be made by the Board's Engineer or authorized agent. There may be additional inspections required by the Board.

3.1 First inspection: An inspection will be made upon completion of all clearing, grubbing and excavation. No fill shall have been placed at the time of this inspection.

3.2 Second Inspection: An inspection will be made of the completed drainage system (without backfill) as shown on the Definitive Plan. At the same time, an inspection will be made of the completed utility services (without backfill) as shown on the Definitive Plan. The inspection of the required utility services will be made by the agency responsible for the particular service. Each agency so involved will notify the Board's Engineer of the approval of such work.

Backfill of any portion of the drainage system or municipal services shall not be made until after receipt of notification of approval or acceptance by the Board's Engineer or agency responsible.

The inspection of the construction of the ways shall include the inspection of the back-filling and compaction of all utility trenches as may be installed by utility companies, and such work shall be performed in the manner as required by these Subdivision Rules and Regulations. It shall be the applicant's responsibility to insure compliance with these requirements.

3.3 Third Inspection: An inspection will be made of the compacted fill required to bring the roadways to their proposed grades. The applicant shall notify the Board's Engineer of his source of gravel for fill so that samples may be taken and analyzed if necessary. The applicant is advised not to proceed with the filling until the Board's Engineer notifies the applicant that the gravel is acceptable. If the applicant proceeds with the fill prior to such notice he does so at his own risk. The applicant shall not use a gravel source other than the one designated without prior approval from the Board's Engineer.

3.4 Fourth Inspection: An inspection will be made of the compacted roadway foundation. Gravel samples may be taken at the option of the Board's Engineer, in the same manner as detailed for the Third Inspection.

3.5 Fifth Inspection: An inspection will be made of the completed Class I Bituminous Concrete Base Course Type-I-1 for the roadway surface. Samples of the mix may be taken by the Board's Engineer for the purposes of performing an extraction test to compare the sample with the job-mix formula previously submitted.

3.6 Sixth Inspection: An inspection will be made of all work as required on bituminous concrete pavement sidewalks, curbing, grass plots, side slopes, monuments, bounds and street signs.

3.7 Seventh Inspection: A final inspection will be made of all subsequent work as required herein or on the Definitive Plan, including the final clean-up.

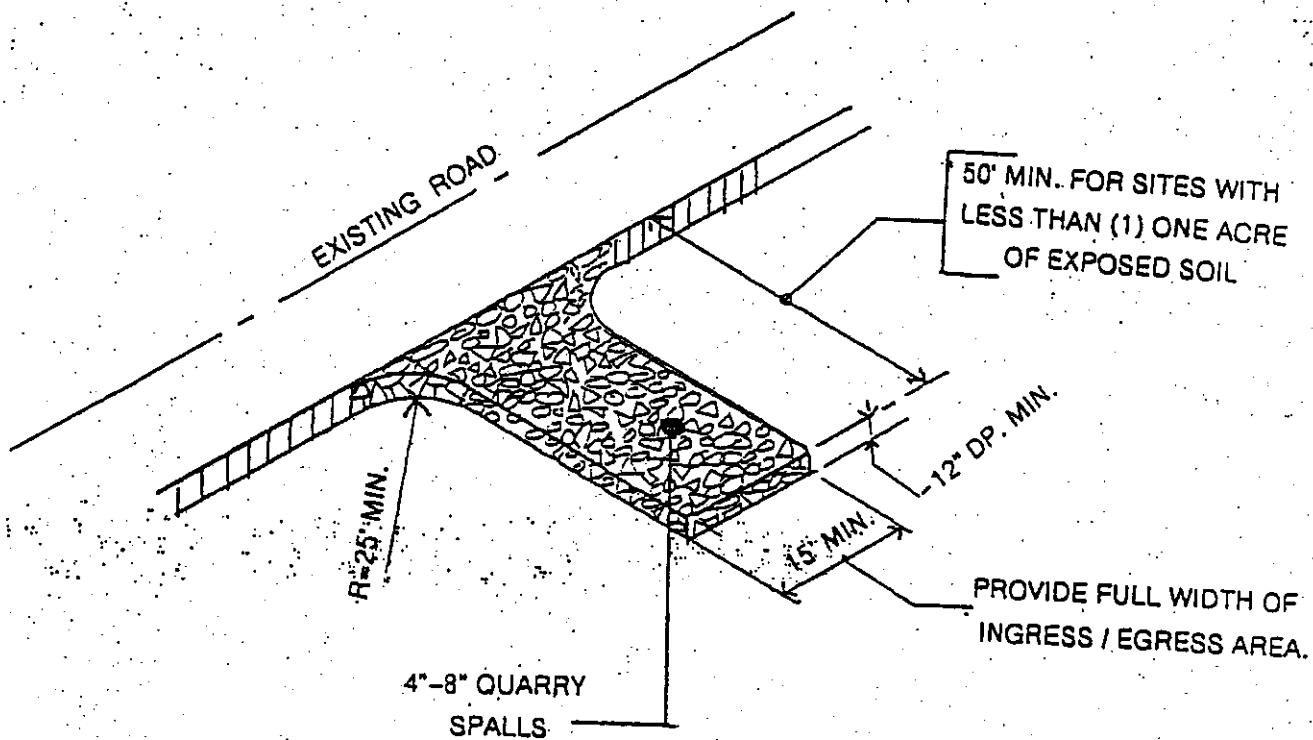
4.0 ENGINEER'S REPORT

4.1 The Board's Engineer will report that the work has been performed in accordance with these Subdivision Rules and Regulations and the Definitive Plan. The Board's Engineer will advise the Board when the work is not acceptable citing the reasons therefore.

4.2 At any time during the progress of the work, the Board's Engineer shall advise the Board immediately of any factors which may adversely affect the progress of the work.

APPENDIX D

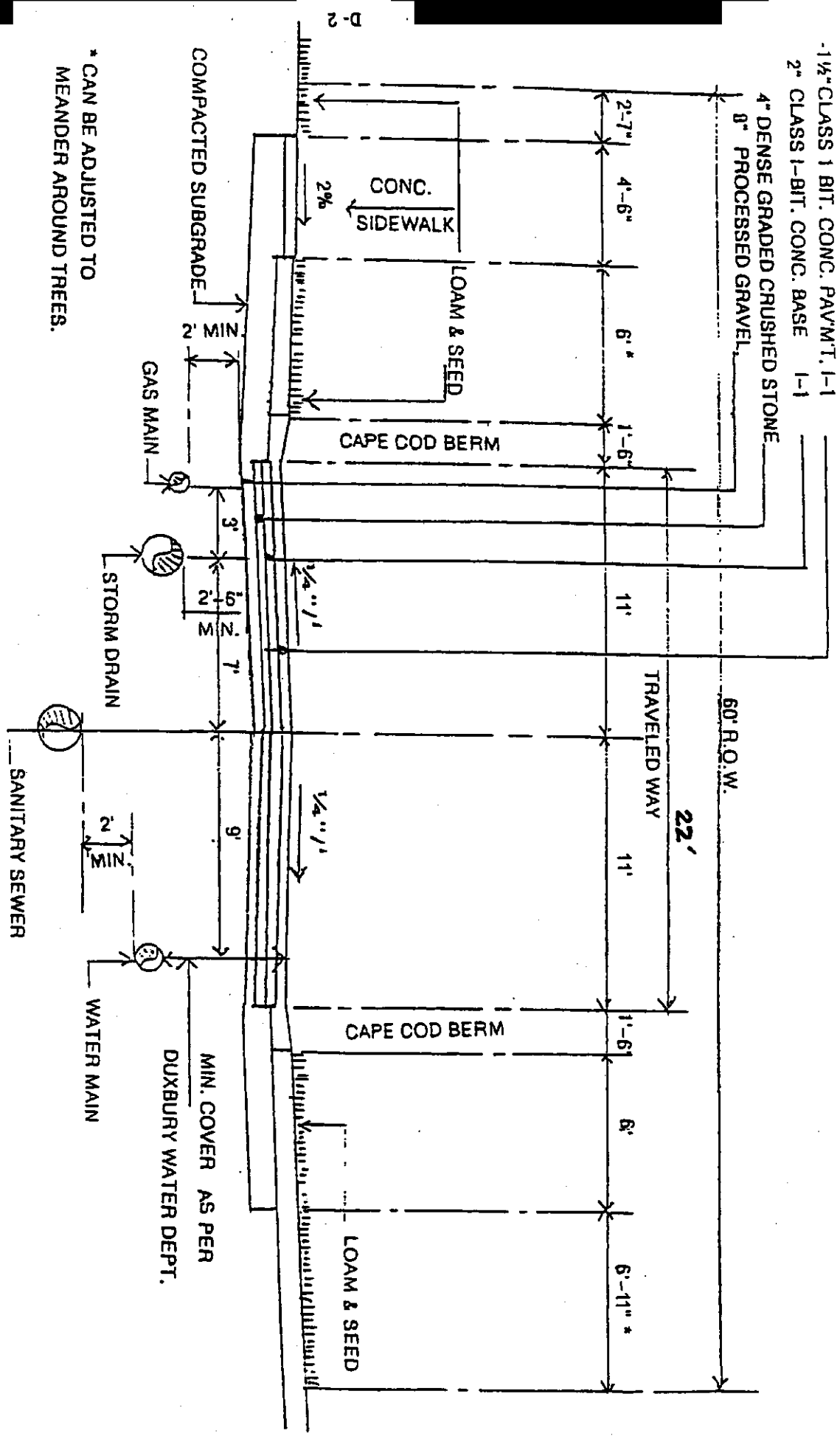
FIGURES



CRUSHED STONE APRON

N.T.S.

FIGURE 1



SECONDARY STREET

N. T. S.

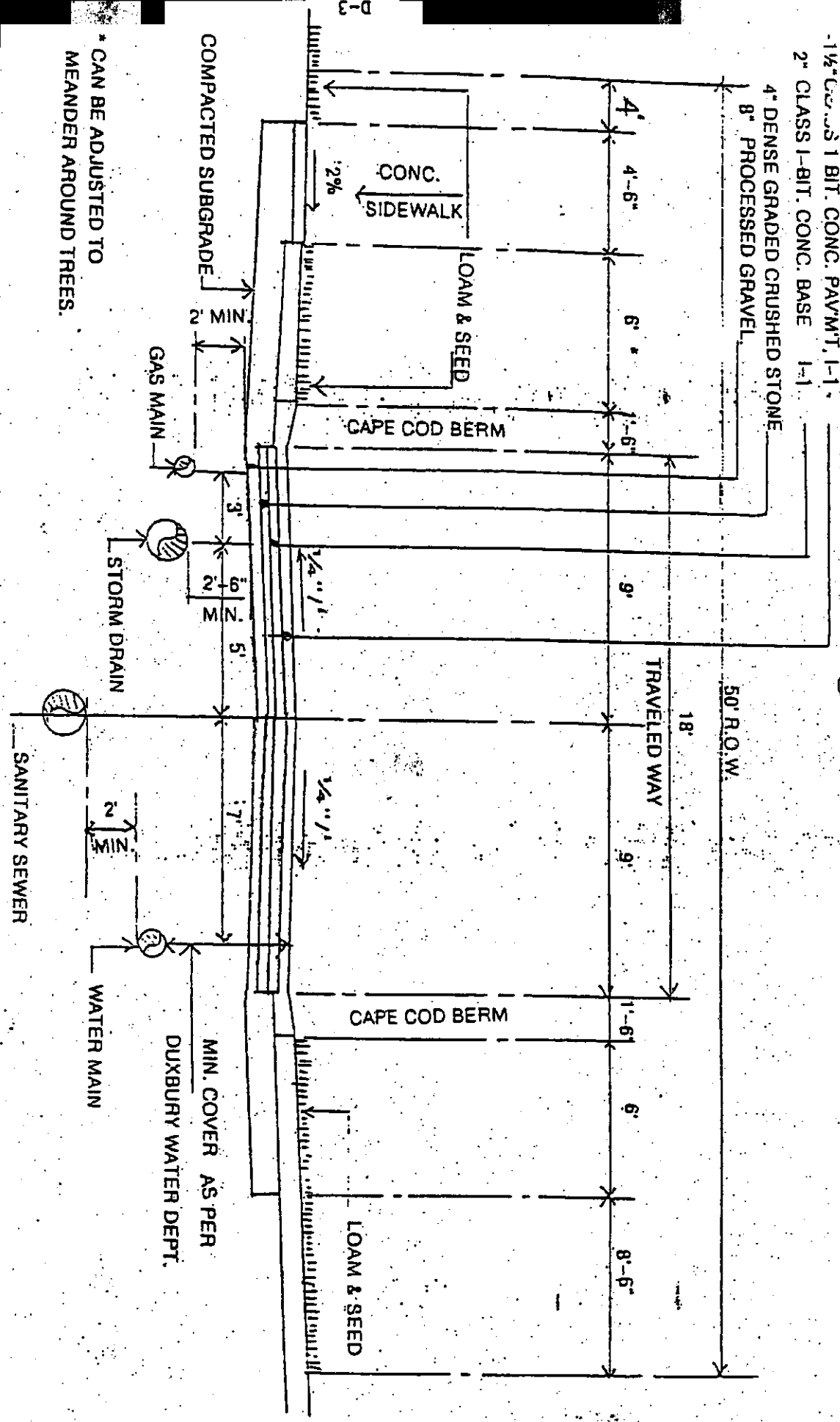
FIGURE 2

D-3

1-1/2" CLASS 1 BIT. CONC. PAVMT, 1-1-1
2" CLASS 1-BIT. CONC. BASE 1-1-1

4" DENSE GRADED CRUSHED STONE
8" PROCESSED GRAVEL

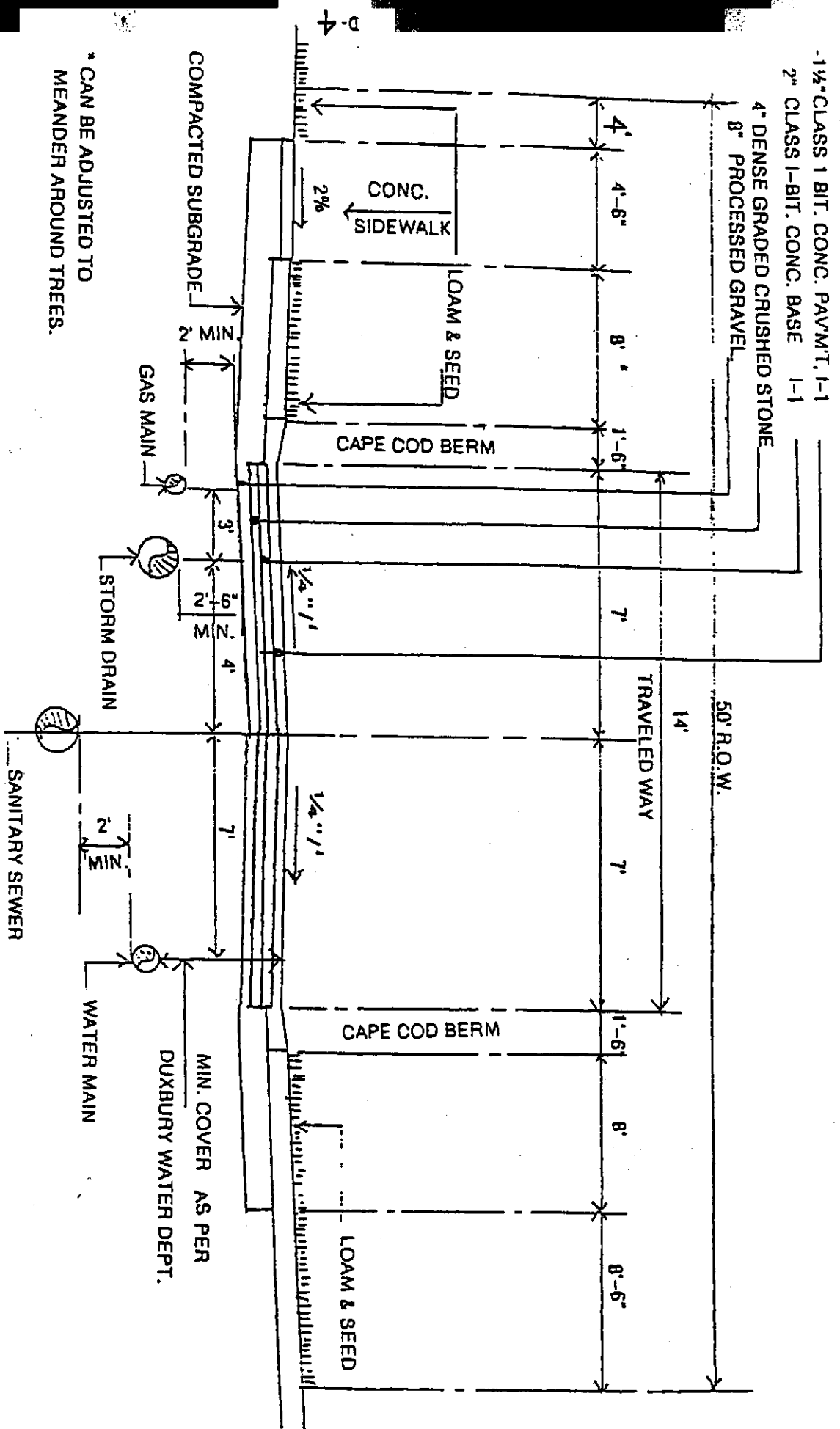
* CAN BE ADJUSTED TO
MEANDER AROUND TREES.



MINOR STREET

N. T. S.

FIGURE 3



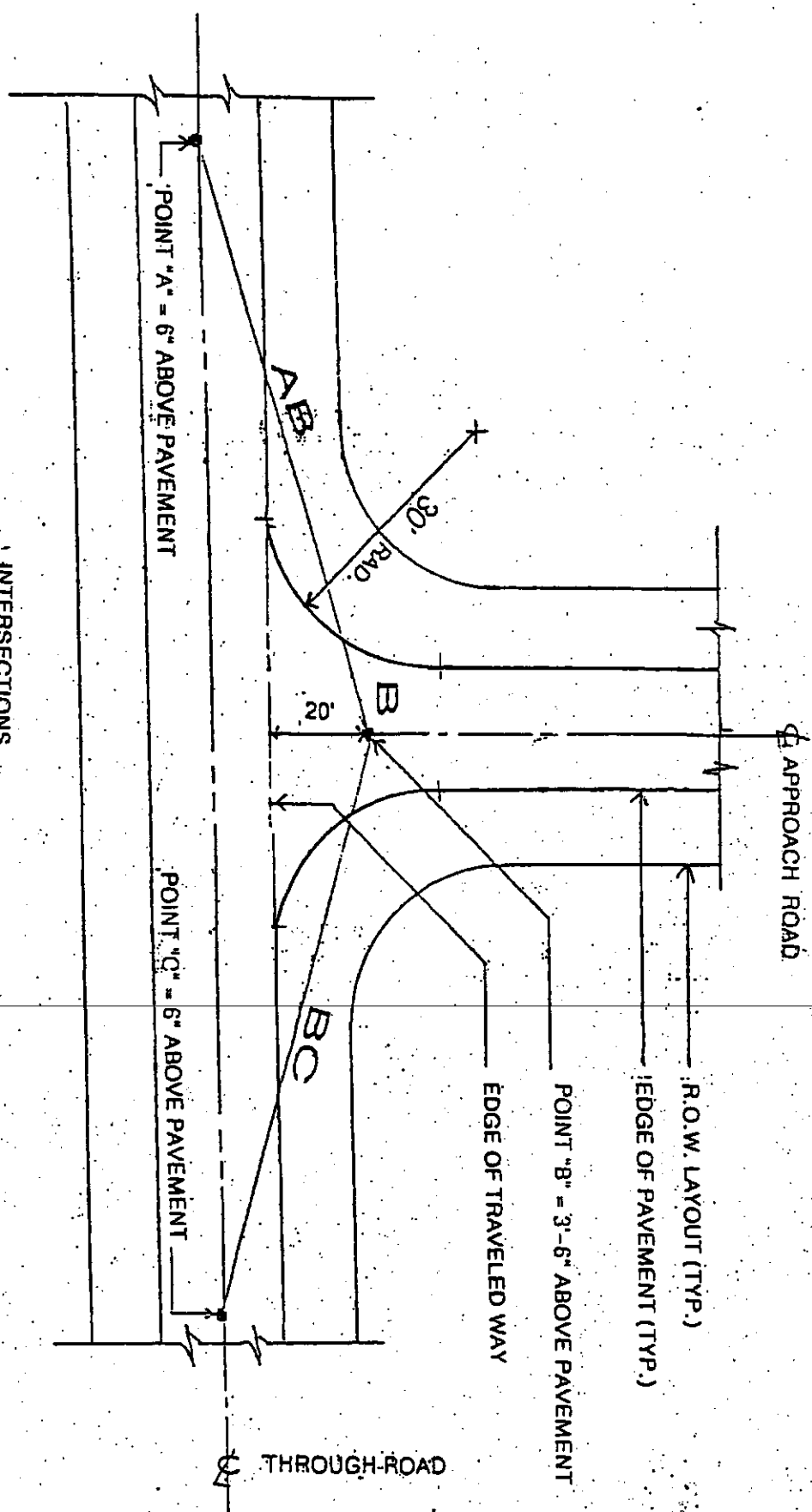
* CAN BE ADJUSTED TO MEANDER AROUND TREES.

LOCAL STREET

N. T. S.

FIGURE 4

D-5



DESIGN SPEED LIMIT - THROUGH STREET
(POSTED SPEED + 5 MPH)

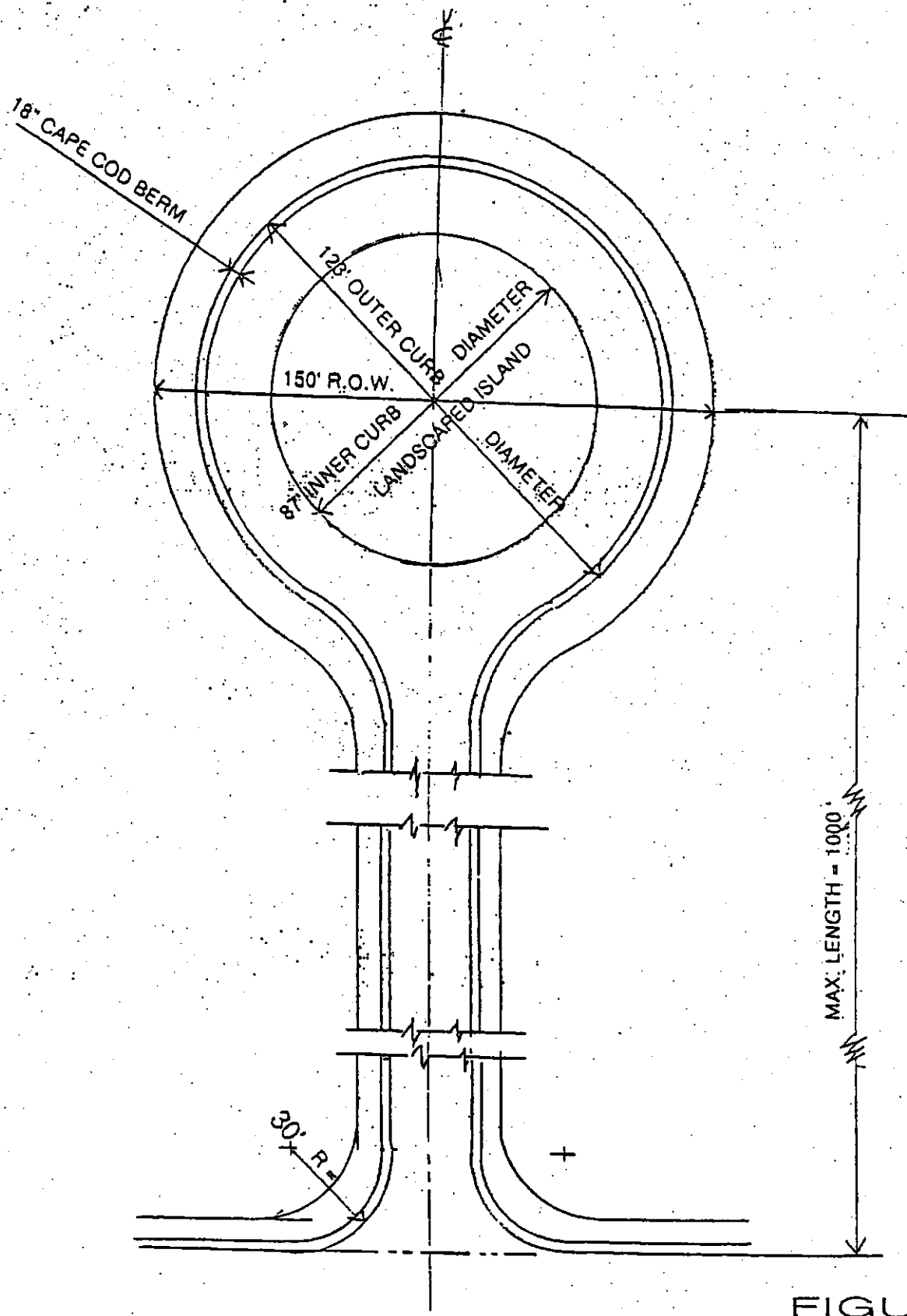
INTERSECTIONS
SIGHT DISTANCE
(AB & BC)

SITE DISTANCE
REQUIREMENTS

50 MPH	500 FT.
45 MPH	450 FT.
40 MPH	400 FT.
35 MPH	350 FT.
30 MPH	300 FT.

N.T.S.

FIGURE 5



D-6

FIGURE 6

TYPICAL CUL-DE-SAC.

APPENDIX E

FORMS

APPLICATION FOR ENDORSEMENT OF PLAN (Rev. 03/23/05)
BELIEVED NOT TO REQUIRE APPROVAL

Date: _____

To The Planning Board of the Town of Duxbury:

The undersigned wishes to record the accompanying plan and requests a determination and endorsement by said Board that approval by it under the Subdivision Control Law is not required. The undersigned believes that such approval is not required for the following reasons: (Circle as appropriate.)

1. The accompanying plan is not a subdivision because the plan does not show a division of land.

2. The division of the tract of land shown on the accompanying plan is not a subdivision because every lot shown on the plan has frontage of at least such distance as is presently required by the DUXBURY PROTECTIVE BYLAW under Section 502 which requires 200 feet for erection of a building on such lot; and every lot shown on the plan has such frontage on:
 - a. a public way or way which the Town Clerk certifies is maintained and used as a public way, namely _____, or

 - b. a way shown on a plan theretofore approved and endorsed in accordance with the subdivision control law, namely _____ on _____, and subject to the following conditions _____; or

 - c. a private way in existence August 18, 1950, the date when the subdivision control law became effective in the Town of DUXBURY, MASSACHUSETTS having, in the opinion of the Planning Board, sufficient width, suitable grades, and adequate construction to provide for the needs of vehicular traffic in relation to the proposed use of the land abutting thereon or served thereby, and for the installation of municipal services to serve such land and the buildings erected or to be erected thereon, namely _____.

3. The division of the tract of land shown on the accompanying plan is not a "subdivision" because it shows a proposed conveyance/other instrument, namely _____, which adds to/takes away from/changes the size and shape of, lots in such a manner so that no lot affected is left without frontage as required by the TOWN OF DUXBURY PROTECTIVE BYLAW under Section, 502, which requires 200 feet.

4. The division of the tract of land shown on the accompanying plan is not a subdivision because two or more buildings, specifically _____ buildings were standing on the plan prior to August 18, 1950, the date when the subdivision control law became effective in the Town of DUXBURY, MASSACHUSETTS, and one of such buildings remains standing on each of the lots/said buildings as shown and located on the accompanying plan. Evidence of the existence of such buildings prior to the effective date of the subdivision control law is submitted as follows:

Printed Name and Signature of Applicant: _____

Address and Telephone Number of Applicant: _____

Printed Names and Signatures of All Persons Whose Land is the Subject of this ANR Plan (except applicant):

APPLICATION FOR APPROVAL OF A PRELIMINARY PLAN

Date: _____

To the Planning Board in the Town of Duxbury:

The undersigned, being the applicant as defined under Chapter 41, Section 81-L, for approval of a proposed subdivision shown on a plan entitled:

By _____ dated _____

and described as follows: _____

located _____, number of lots proposed

_____ total acreage of tract _____, said applicant hereby submits said plan as a

Preliminary subdivision plan in accordance with the Rules and Regulations of the Duxbury Planning Board and makes application to the Board for approval of said plan.

The undersigned's title to said land is derived from

_____ by deed dated

_____ and recorded in the Plymouth County Registry of Deeds Book _____,

Page _____, and/or registered in the Commonwealth of Massachusetts Land Court, Certificate of Title No. _____.

Received by City/Town Clerk:

Applicant's Signature _____

Applicant's Address _____

Applicant's phone # _____

Owner's signature and address if not the applicant

Received by Board of Health:

Date _____

Time _____

Signature _____

(Application must be accompanied by a completed Preliminary Plan Application Checklist.)

**APPLICATION FOR APPROVAL OF A
DEFINITIVE SUBDIVISION PLAN**

Date: _____

To the Planning Board in the Town of Duxbury:

The undersigned, being the applicant as defined under Chapter 41, Section 81-L, for approval of a proposed subdivision shown on a plan entitled:

By _____ dated _____
and described as follows: _____
located _____, number of lots proposed _____
total acreage of tract _____, said applicant hereby submits said plan as a DEFINITIVE plan in
accordance with the Rules and Regulations of the Duxbury Planning Board and makes application to the
Board for approval of said plan.

The undersigned's title to said land is derived from

_____ by deed dated _____
and recorded in the Plymouth County Registry of Deeds Book _____, Page _____, and/or registered
in the Commonwealth of Massachusetts Land Court, Certificate of Title No.

_____ ; and said plan is free of encumbrances except for the following:

Said plan has () has not () evolved from a preliminary plan submitted to the Board on
_____ (date) and approved (with modifications) () (disapproved) () on
_____ (date).

The undersigned hereby applies for the approval of said DEFINITIVE plan by the Board, in belief that the
plan conforms to the Board's Rules and Regulations.

Received by City/Town Clerk:

Applicant's signature _____

Applicant's address _____

Received by Board of Health

Applicant's phone # _____

Date _____

Owner's signature and address if not the applicant

Time _____

Signature _____

(Must be accompanied by a completed Definitive Plan Application Checklist)



Town of Duxbury, Massachusetts Planning Board Covenant

Date: _____

KNOW ALL MEN by these presents that the undersigned has submitted an application dated _____ to the Duxbury Planning Board for approval of a definitive plan of a subdivision of land entitled: _____, plan by: _____, dated: _____, and owned by: _____, address: _____, land located: _____, and showing _____ proposed lots. The undersigned has requested the Planning Board to approve such plan without requiring a performance bond.

IN CONSIDERATION of said Planning Board of Duxbury in the county of Plymouth approving said plan without requiring a performance bond, the undersigned hereby covenants and agrees with the inhabitants of the _____ as follows:

1. That the undersigned is the owner in fee simple absolute of all the land included in the subdivision and that there are no mortgages of record or otherwise on any of the land, except for those described below, and that the present holders of said mortgages have assented to this contract prior to its execution by the undersigned. If there is more than one owner, all must sign. "Applicant" may be an owner or his agent or representative, or his assigns, but the owner of record must sign the covenant.
2. That the undersigned will not sell or convey any lot in the subdivision or erect or place any permanent building on any lot until the construction of ways and installation of municipal services necessary to adequately serve such lot has been completed in accordance with the covenants, conditions, agreements, terms and provisions as specified in the following:
 - a. The Application for Approval of Definitive Plan (Form C).
 - b. The Subdivision Control Law and the Planning Board's Rules and Regulations governing this subdivision.
 - c. The certificate of approval and the conditions of approval specified therein, issued by the Planning Board, dated _____.
 - d. The definitive plan as approved and as qualified by the certificate of approval.
 - e. Other document(s) specifying construction to be completed, namely:

However, a mortgagee who acquires title to the mortgaged premises by foreclosure or otherwise and any succeeding owner of the mortgaged premises or part thereof may sell or convey any lot, subject only to that portion of this covenant which provides that no lot be sold or conveyed or shall be built upon until ways and services have been provided to serve such lot.

3. That this covenant shall be binding upon the executors, administrators, devisees, heirs, successors and assigns of the undersigned and shall constitute a covenant running with the land included in the subdivision and shall operate as restrictions upon the land.
4. That particular lots within the subdivision shall be released from the foregoing conditions upon the recording of a certificate of performance executed by a majority of the Planning Board and enumerating the specific lots to be released; and

5. That nothing herein shall be deemed to prohibit a conveyance by a single deed subject to this covenant, of either the entire parcel of land shown on the subdivision plan or of all lots not previously released by the Planning Board.
6. That the undersigned agrees to record this covenant with the Plymouth County Registry of Deeds, forthwith, or to pay the necessary recording fee to the said Planning Board in the event the Planning Board shall record this agreement forthwith. Reference to this covenant shall be entered upon the definitive subdivision plan as approved.
7. A deed of any part of the subdivision in violation of the covenant shall be voidable by the grantee prior to the release of the covenant; but not later than three (3) years from the date of such deed, as provided in Section 81-U, Chapter 41, M.G.L.
8. That this covenant shall be executed before endorsement of approval of the definitive plan by the Planning Board and shall take effect upon the endorsement of approval.
9. Upon final completion of the construction of ways and installation of municipal services as specified herein, on or before _____ the Planning Board shall release this covenant by an appropriate instrument, duly acknowledged. Failure to complete construction and installation within the time specified herein or such later date as may be specified by vote of the Planning Board with a written concurrence of the applicant, shall result in automatic rescission of the approval of the plan. Upon performance of this covenant with respect to any lot, the Planning Board may release such lot from this covenant by an appropriate instrument duly recorded.
10. Nothing herein shall prohibit the applicant from varying the method of securing the construction of ways and installation of municipal services from time to time or from securing by one, or in part by one and in part by another of the methods described in M.G.L., Chapter 41, Section 81-U, as long as such security is sufficient in the opinion of the Planning Board to secure performance of the construction and installation; and

For title to the property, see deed from _____, dated _____, recorded in _____ Registry of Deeds, Book _____, Page _____, or registered in _____ Land Registry as Document No. _____, and noted on certificate of title no. _____, in Registration Book _____, Page _____.

The present holder of a mortgage upon the property is _____ of _____ The mortgage is dated _____ and recorded in _____ Registry of Deeds, Book _____, Page _____. The mortgagee agrees to hold the mortgage subject to the covenants set forth above and agrees that the covenants shall have the same status, force and effect as though executed and recorded before the taking of the mortgage and further agrees that the mortgage shall be subordinate to the above covenant.

_____, spouse of the undersigned applicant hereby agrees that such interest as I, we, may have in the premises shall be subject to the provisions of this covenant and insofar as is necessary releases all rights of tenancy by the dower or homestead and other interests therein.

(One acknowledgement must be completed for each of the following: Planning Board representative, Owner or owners, Spouse of the owner, Mortgagee. ---see next page)

I. (OWNER OR OWNERS)

IN WITNESS WHEREOF we have hereunto set our hands and seals this on this date:_____.

_____(Owner or owners).

COMMONWEALTH OF MASSACHUSETTS

Plymouth, ss

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared _____ and proved to me through satisfactory evidence of identification, to be the person(s) whose name(s) is (are) signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

(Signature of Notary Public)

My commission expires _____

II.(SPOUSE OF OWNER)

IN WITNESS WHEREOF we have hereunto set my hand and seal on this date:_____.

_____(Spouse of Owner).

COMMONWEALTH OF MASSACHUSETTS

Plymouth, ss

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared _____ and proved to me through satisfactory evidence of identification, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

(Signature of Notary Public)

My commission expires _____

III. (MORTGAGEE)

IN WITNESS WHEREOF we have hereunto set our hands and seals this on this date: _____.

(Mortgagee).

COMMONWEALTH OF MASSACHUSETTS

Plymouth, ss

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared _____ and proved to me through satisfactory evidence of identification, to be the person(s) whose name(s) is (are) signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

(Signature of Notary Public)

My commission expires _____

IV. (PLANNING BOARD)

IN WITNESS WHEREOF we have hereunto set our hands and seals this on this date: _____.

(Acceptance by a Majority of the Planning Board of Duxbury)

COMMONWEALTH OF MASSACHUSETTS

On this _____ day of _____ (month), _____ (year), before me, the undersigned notary public, personally appeared members of the Duxbury Planning Board, proved to me through satisfactory evidence of identification, which was based on my personal knowledge of the identity of the principal, to be the persons whose names are signed on the preceding or attached document, and in my presence acknowledged to me that he/she signed it voluntarily for its stated purpose.

Notary

My commission expires _____



Town of Duxbury, Massachusetts Planning Board

PERFORMANCE SECURED BY DEPOSIT OF MONEY

Date: _____

AGREEMENT made this date between the Town of Duxbury and _____,
hereinafter referred to as "the applicant" of _____, to secure construction
of ways and installation of municipal services in the subdivision of land shown on a plan entitled:

_____, by:

_____, dated _____,

owned by: _____ address: _____, land

located: _____, and showing _____ proposed lots.

KNOW ALL MEN by these presents that the applicant hereby binds and obligates himself, his or its executors, administrators, devisees, heirs, successors and assigns to the Town of Duxbury, a Massachusetts municipal corporation, acting through its Planning Board, in the sum of _____ dollars, and has secured this obligation by depositing with the Treasurer of the Town of Duxbury a deposit of money in the above sum to be deposited in a subdivision escrow account in the name of the Town of Duxbury. The deposit of money is to be used to insure the performance by the applicant of all covenants, conditions, agreements, terms and provisions contained in the following:

1. Application for Approval Definitive Plan (Form C), dated: _____;
2. The subdivision control law and the Planning Board's Rules and Regulations governing this subdivision and dated _____;
3. Conditions included in the Certificate of Approval issued by the Planning Board and dated _____;
4. The definitive plan as qualified by the Certificate of Approval; and
5. Other document(s) specifying construction or installation to be completed, namely: (specify other documents, if any, and list lots secured if only a part of the subdivision is secured by a deposit of money) _____

This agreement shall remain in full force and effect until the applicant has fully and satisfactorily performed all obligations or has elected to provide another method of securing performance as provided in M.G.L., Chapter 41, Section 81-U.

Upon completion by the applicant of all obligations as specified herein, on or before _____, or such later date as may be specified by vote of the Planning Board with a written concurrence of the applicant, the deposit of money including all interest accrued thereon shall be returned to the applicant by the Town of Duxbury and this agreement shall become void. In the event the applicant should fail to complete the construction of ways and installation of municipal services as specified in this agreement and within the time herein specified, the deposit of money may be applied in whole, or in part, by the Planning Board for the benefit of the Town of Duxbury to the extent of the reasonable cost to the Town of Duxbury of completing such construction or installation as specified in this agreement. Any unused money and the interest accrued on the deposit of money will be returned to the applicant upon completion of the work by the Town of Duxbury; and

Applicant Name: _____
Date: _____

The Town of Duxbury acting by and through its Planning Board hereby agrees to accept the aforesaid deposit of money in the amount specified in this agreement as security for the performance of the project as aforesaid.

Any amendments to this agreement and/or to the aforesaid security shall be agreed upon in writing by all parties to this agreement.

IN WITNESS WHEREOF we have hereunto set our hands and seals on this date:_____.

Signatures of a Majority of the Planning Board

Signature of Applicant

COMMONWEALTH OF MASSACHUSETTS

Plymouth County

On this ____ day of _____ (month), _____ (year), before me, the undersigned notary public, personally appeared members of the Duxbury Planning Board, proved to me through satisfactory evidence of identification, which was based on my personal knowledge of the identity of the principal, to be the persons whose names are signed on the preceding or attached document, and in my presence acknowledged to me that he/she signed it voluntarily for its stated purpose.

Notary

My commission expires _____

Duplicate copy to:
Applicant
Planning Board
Town Clerk
Town Treasurer
Board of Selectmen



Town of Duxbury, Massachusetts Planning Board

PERFORMANCE SECURED BY A SURETY COMPANY

Date: _____

AGREEMENT made this date between the Town of Duxbury and _____, hereinafter referred to as "the applicant" of _____; and _____, a corporation duly organized and existing under the laws of the state of _____ and having a usual place of business at _____, hereinafter referred to as "the surety," to secure construction of ways and installation of municipal services in the subdivision of land shown on a plan entitled: _____, by _____, dated: _____ owned by: _____, address: _____ land located: _____ and showing _____ proposed lots.

KNOW ALL MEN by these presents that the applicant and the surety hereby bind and obligate themselves, their or its executors, administrators, devisees, heirs, successors and assigns, jointly and severally to the Town of Duxbury, a Massachusetts municipal corporation, acting through its Planning Board, in the sum of _____ dollars, and have secured this obligation by depositing with the Treasurer of the Town of Duxbury a surety bond to secure the above sum of money, said surety bond to be used to insure the performance by the applicant of all covenants, conditions, agreements, terms and provisions contained in the following:

6. Application for Approval Definitive Plan (Form C), dated: _____;
7. The subdivision control law and the Planning Board's Rules and Regulations governing this subdivision and dated _____;
8. Conditions included in the Certificate of Approval issued by the Planning Board and dated _____;
9. The definitive plan as qualified by the Certificate of Approval; and
10. Other document(s) specifying construction or installation to be completed, namely: (specify other documents, if any, and list lots secured if only a part of the subdivision is secured by a surety company)

This agreement shall remain in full force and effect until the applicant has fully and satisfactorily performed all obligations, or has elected to provide another method of securing performance as provided in M.G.L., Chapter 41, section 81-U.

Upon completion by the applicant of all obligations as specified herein, on or before _____, or such later date as may be specified by vote of the Planning Board with a written concurrence of the applicant and the surety, the interest of the Town of Duxbury in such surety bond shall be released, the surety bond shall be returned to the surety, and this agreement shall become void. In the event the applicant should fail to complete the construction of ways and installation of municipal services as specified in this agreement and within the time herein specified, the surety bond may be enforced, in whole, or in part, by the Planning Board for the benefit of the Town of Duxbury to the extent of the reasonable cost to the Town of Duxbury of completing such construction or installation as specified in this agreement. Any unused portion of the surety bond will be released and the unused portion of the surety bond will be returned to the surety upon completion of the work by the Town of Duxbury.

The Town of Duxbury, acting by and through its Planning Board hereby agrees to accept the aforesaid surety bond in the amount specified in this agreement as security for the performance of the project as aforesaid.

Any amendments to this agreement and/or to the aforesaid security shall be agreed upon in writing by all parties to this agreement.

SIGNATURES:

(PLANNING BOARD AND APPLICANT)

IN WITNESS WHEREOF we have hereunto set our hands and seals on this date: _____.

Signatures of a Majority of the Planning Board

Signature of Applicant

COMMONWEALTH OF MASSACHUSETTS

Plymouth County

Date: _____

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared the above named person(s) and proved to me through satisfactory evidence of identification, to be the person(s) whose name(s) is (are) signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

Notary Public

My commission expires _____

(REPRESENTATIVE OF SURETY COMPANY)

IN WITNESS WHEREOF we have hereunto set our hands and seals on this date: _____.

Signature of Representative of Surety Company

COMMONWEALTH OF MASSACHUSETTS

Plymouth, ss

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared _____ and proved to me through satisfactory evidence of identification, to be the person(s) whose name(s) is (are) signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

(Signature of Notary Public

My commission expires _____

- Duplicate copy to:
- Applicant
- Planning Board
- Town Clerk
- Town Treasurer
- Board of Selectmen



Town of Duxbury, Massachusetts Planning Board

PERFORMANCE SECURED BY REGISTERED NEGOTIABLE SECURITIES (BONDS, STOCKS, PUBLIC SECURITIES)

Date: _____

AGREEMENT made this date between the Town of Duxbury and _____, hereinafter referred to as "the applicant" of _____, to secure construction of ways and installation of municipal services in the subdivision of land shown on a plan entitled: _____, dated: _____, owned by: _____ address: _____, land located: _____, and showing _____ proposed lots.

KNOW ALL MEN by these presents that the applicant hereby binds and obligates himself, his or its executors, administrators, devisees, heirs, successors and assigns to the Town of Duxbury, a Massachusetts municipal corporation, acting through its Planning Board, in the sum of _____ dollars and has secured this obligation by depositing with the Treasurer of the Town of Duxbury, an instrument of transfer to the Planning Board of the Town of Duxbury, duly acknowledged, and prepared in a suitable form pursuant to the provisions of the Massachusetts General Laws for the following type of negotiable security _____, said instrument of transfer shall also specify the above sum of money as a security for performance by the applicant of construction of the ways and installation of municipal services in the aforesaid subdivision and, where apt, a new certificate shall also be deposited with said Treasurer. Said certificate shall be free from encumbrances and shall be issued pursuant to Chapter 156-B, Section 30, M.G.L. in the name of the Planning Board of the Town of Duxbury and shall express on its face that it is held as collateral security to insure the performance by the applicant of all covenants, conditions, agreements, terms and provisions contained in the following:

1. Application of Approval Definitive Plan (Form C), dated: _____;
2. The subdivision control law and the Planning Board's Rules and Regulations governing this subdivision and dated _____;
3. Conditions included in the Certificate of Approval issued by the Planning Board and dated _____;
4. The definitive plan as qualified by the Certificate of Approval; and
5. Other document(s) specifying construction or installation to be completed, namely: (specify other documents, if any, and list lots secured if only a part of the subdivision is secured by a bank passbook)

_____.

This agreement shall remain in full force and effect until the applicant has fully and satisfactorily performed all obligations, or has elected to provide another method of securing performance as provided in M.G.L., Chapter 41, Section 81-U.

Upon completion by the applicant of all obligations as specified herein, on or before _____, or such later date as may be specified by vote of the Planning Board with the written concurrence of the applicant, the interest of the Town of Duxbury in the aforesaid security shall be released and said security shall be returned, by appropriate instrument, to the applicant by the Town of Duxbury and this agreement shall

Applicant Name: _____
Date: _____

become void. In the event the applicant should fail to complete the construction of ways and installation of municipal services as specified in this agreement and within the time specified herein, the security, namely _____ may be negotiated in whole, or in part, by the Planning Board for the benefit of the Town of Duxbury to the extent of the reasonable cost to the Town of Duxbury of completing such construction or installation as specified in this agreement. Any unused funds resulting from the negotiation of aforesaid security by the Town of Duxbury or any securities which are not negotiated by the Town of Duxbury will be returned to the applicant upon completion of the work by the Town of Duxbury; and

The Town of Duxbury acting by and through its Planning Board hereby agrees to accept the aforesaid negotiable security, namely _____ as specified in this agreement as security for the performance of the project as aforesaid.

Any amendments to this agreement and/or to the aforesaid security shall be agreed upon in writing by all parties to this agreement.

IN WITNESS WHEREOF we have hereunto set our hands and seals on this date: _____.

Signatures of a Majority of the Planning Board of the
Town of Duxbury

Signature of Applicant

COMMONWEALTH OF MASSACHUSETTS

Plymouth, ss

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared _____ and proved to me through satisfactory evidence of identification, to be the person(s) whose name(s) is (are) signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

Notary

My commission expires _____



Town of Duxbury, Massachusetts Planning Board

PERFORMANCE SECURED BY BANK PASSBOOK

Date: _____

AGREEMENT made this date between the Town of Duxbury and _____, herinafter referred to as "the applicant" of _____, to secure construction of ways and installation of municipal services in the subdivision of land shown on a plan entitled: _____, dated: _____, owned by: _____ address: _____, land located: _____, and showing _____ proposed lots.

KNOW ALL MEN by these presents that the applicant hereby binds and obligates himself, his or its executors, administrators, devisees, heirs, successors and assigns to the Town of Duxbury, a Massachusetts municipal corporation, acting through its Planning Board, in the sum of _____ dollars and has secured this obligation by depositing with the Treasurer of the Town of Duxbury, a deposit of money for the above sum represented by Bank Passbook No. _____ with an order drawn on the _____ Bank of _____, payable to the order of the Planning Board of the Town of Duxbury, said sum to be used to insure the performance by the applicant of all covenants, conditions, agreements, terms and provisions contained in the following:

1. Application of Approval Definitive Plan (Form C), dated: _____;
6. The subdivision control law and the Planning Board's Rules and Regulations governing this subdivision and dated _____;
7. Conditions included in the Certificate of Approval issued by the Planning Board and dated _____;
8. The definitive plan as qualified by the Certificate of Approval; and
9. Other document(s) specifying construction or installation to be completed, namely: (specify other documents, if any, and list lots secured if only a part of the subdivision is secured by a bank passbook)

_____.

This agreement shall remain in full force and effect until the applicant has fully and satisfactorily performed all obligations, or has elected to provide another method of securing performance as provided in M.G.L., Chapter 41, Section 81-U.

Upon completion by the applicant of all obligations as specified herein, on or before _____, or such later date as may be specified by vote of the Planning Board with the written concurrence of the applicant and the bank, the bank passbook shall be returned to the applicant by the Town of Duxbury and this agreement shall become void. In the event the applicant should fail to complete the construction of ways and installation of municipal services as specified in this agreement and within the time herein specified, the funds on deposit in the account represented by the aforesaid bank passbook and order drawn thereon may be applied in whole, or in part, by the Planning Board for the benefit of the Town of Duxbury to the extent of the reasonable cost to the Town of Duxbury of completing such construction or installation as specified in this agreement. Any unused funds and the bank passbook will be returned to the applicant upon completion of the work by the Town of Duxbury.

The Town of Duxbury acting by and through its Planning Board hereby agrees to accept the aforesaid bank passbook and order drawn thereon as security for the performance of this project; and

Applicant Name: _____
Date: _____

The _____ Bank of _____ hereby agrees not to release any funds from the account represented by the aforesaid bank passbook or otherwise amend or make a change to the aforesaid bank passbook or to the order drawn thereon without written agreement by the Planning Board.

SIGNATURES:

(PLANNING BOARD AND APPLICANT)

IN WITNESS WHEREOF we have hereunto set our hands and seals on this date: _____.

Signatures of a Majority of the Planning Board of the
Town of Duxbury

Signature of Applicant

COMMONWEALTH OF MASSACHUSETTS

Plymouth County

Date: _____

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared the above names persons and proved to me through satisfactory evidence of identification, to be the person(s) whose name(s) is (are) signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

Notary Public

My commission expires _____

(BANK)

IN WITNESS WHEREOF we have hereunto set our hands and seals on this date: _____

COMMONWEALTH OF MASSACHUSETTS

Plymouth County

Date: _____

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared _____ and proved to me through satisfactory evidence of identification, to be the person(s) whose name(s) is (are) signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

Notary Public

My commission expires _____

Duplicate copy to:
Applicant

_____(name) Bank
Duxbury Town Clerk
Duxbury Town Treasurer
Board of Selectmen



**Town of Duxbury, Massachusetts
Planning Board**

**CONVEYANCE OF EASEMENTS
AND UTILITES**

_____ of _____,
(address and county)

for the consideration of _____ hereby grants, transfers and delivers unto the Town of Duxbury, a municipal corporation in Plymouth County, the following:

- A. The perpetual rights and easements to construct, inspect, repair, remove, replace, operate and forever maintain (1) a sanitary sewer or sewers with any manholes, pipes, conduits and other appurtenances, (2) pipes, conduits and the appurtenances for the conveyance of water, and (3) a covered surface and ground water drain or drains with any manholes, pipes, conduits and their appurtenances, and to do all other acts incidental to the foregoing, including the right to pass along and over the land for the aforesaid purposes, in, through, and under the whole of _____, dated _____, said plan is made and said plan is incorporated herein for a complete and detailed description of said roads.
- B. The perpetual rights and easements to use for _____ (describe use or purpose) of the following parcel of land situated on _____ (street) in the Town of Duxbury and bounded and described as follows:

Description:

The grantor warrants that the aforesaid easements are free and clear of all liens or encumbrances, that s/he (it) has good title to transfer the same, and that s/he will defend the same against claims of all persons.

Conveyance of Utilities and Easements(3/05) (Cont.)

Date:

Grantor:

For grantor's title see deed from _____ dated _____, and recorded in Plymouth County Registry of Deeds, Book _____, Page _____, or under Certificate of Title No. _____ registered in _____ District of the Land Court, Book _____, Page _____.

This is not a homestead property.

(To be completed if a mortgage exists): _____
(name and address)

the present holder of a mortgage on the above described land, which mortgage is dated _____, and recorded in said Deeds, Book _____, Page _____, for consideration paid, hereby releases unto the Town of Duxbury forever from the operation of said mortgages, the rights and easements hereinabove granted and assents thereto.

Authorized Signature of Mortgagee

Owner

IN WITNESS WHEREOF we have hereunto set our hands and seals on this date: _____.

COMMONWEALTH OF MASSACHUSETTS

Plymouth County

Date: _____

On this _____ day of _____ (month), _____ (year), before me the undersigned Notary Public, personally appeared _____ and proved to me through satisfactory evidence of identification, to be the person(s) whose name(s) is (are) signed on the preceding or attached document, and acknowledged to me that they signed it voluntarily for its stated purpose.

Notary Public

My commission expires _____

APPENDIX F
CHECKLISTS

Duxbury Planning Board
Approval Not Required Plan Checklist

Petitioner: _____

Meeting Date: _____

1. _____ Application filed
2. _____ Fee paid/amount (\$200/plan plus \$100/lot shown)
3. _____ Nine copies of plan filed along with mylar
4. _____ Name and address of owner of record, petitioner & surveyor
5. _____ Deed reference or land court certificate number noted on plan
6. _____ Plan reference noted on plan
7. _____ Date of application noted on plan
8. _____ Location of all existing structures and septic systems
9. _____ Minimum frontage on approved way (200 ft. minimum)
10. _____ Direct abutters noted by name and parcel number
11. _____ Delineation and gross area - square feet and acres
12. _____ Delineation and gross area of wetlands- sq. feet and acres
13. _____ Delineation and gross area of uplands - sq. feet (40,000 sq. ft. minimum)
14. _____ Net area of each lot (sq. feet)
15. _____ Net area of each lot of wetlands and upland - (sq. feet)
16. Delineation of Flood Hazard Areas Overlay District
17. _____ North arrow, locus sketch, date and scale
18. _____ Notation: "Planning Board endorsement does not certify compliance with Zoning Bylaw."
19. _____ Notation: "No official verification of any wetlands has been made or intended by Planning Board endorsement."
20. _____ Signature block

21. _____Stone fences and public shade trees (per scenic road act)

PRELIMINARY PLAN APPLICATION CHECKLIST

(To be submitted by applicant with application)

Applicant: _____

Planning Board Meeting Date: _____

- _____ 1. Subdivision name, boundaries, north arrow, scale, legend and title, "Preliminary Plan".
- _____ 2. Name of the record owner, applicant, engineer and surveyor.
- _____ 3. Existing and proposed lines of streets, easements and any public areas within the subdivision.
- _____ 4. Existing and proposed public water supply and utilities in the area, including elevations of flood-sensitive equipment with the Flood Hazard Areas Overlay District.
- _____ 5. Existing and proposed system of surface water, drainage and existing and proposed method of sewage disposal.
- _____ 6. Approximate boundary lines of proposed lots, with approximate areas and dimensions.
- _____ 7. Names, approximate location and widths of streets within 200' of property.
- _____ 8. Topography of the existing land at two (2)-foot contour intervals, with elevations shown in NAVD88.
- _____ 9. Location of all permanent monuments, large boulders, stone walls, vegetation and special features showing the outline of all woodlands, significant individual or group tree masses, rock outcroppings, roads and trails, flowing streams or waterways, drainage ways and ponds, noting those being disturbed by proposed ways, drainage easements, or any change in topography.
- _____ 10. An outline of all areas within the Wetland and Watershed Protection District, Flood Hazard Areas Overlay District, and/or Aquifer Protection Overlay District (APOD).
- _____ 11. A roadway profile drawn to a horizontal scale of 1"=40' and a vertical scale of 1"=4', showing all existing and proposed grades, drainage and sewer systems, and, within Flood Hazard Areas Overlay District, FEMA Base Flood Elevations and Sea Level Rise Base Flood Elevations.
- _____ 12. Zoning of proposed subdivision and contiguous parcels.
- _____ 13. Existing on-site structures including septic systems.
- _____ 14. Names and nine-digit parcel numbers of all direct abutters as they exist on the most recent tax list.
- _____ 15. Physical, geological, environmental and other characteristics unique to the site but no covered in 1-15 above.
- _____ 16. EIGHTEEN COPIES (THREE full-size, FIFTEEN half-size) of the plan are required. The signature block must be in the same space on each page.

FEES: Application Fee: (\$50 per building lot) = _____(check payable to the Town of Duxbury)

Escrow Account: (Separate check payable to the Town of Duxbury. W-9 form required).

For 3 Lots or Less: \$3,000 minimum deposit.

For 4 or More Lots: \$3,000 minimum deposit, plus \$500 per lot in the proposed subdivision _____

DEFINITIVE PLAN APPLICATION CHECKLIST

(To be submitted by applicant with application)

Applicant: _____

Planning Board Meeting Date: _____

- _____ 1. Subdivision name, boundaries, north arrow, scale, legend and title, "Definitive Plan".
- _____ 2. Name of the record owner, applicant, engineer and surveyor.
- _____ 3. Existing and proposed lines of streets, easements and any public areas within the subdivision.
- _____ 4. Existing and proposed public water supply and utilities in the area, including elevations of flood-sensitive equipment with the Flood Hazard Areas Overlay District.
- _____ 5. Existing and proposed system of surface water, drainage and existing and proposed method of sewage disposal.
- _____ 6. Approximate boundary lines of proposed lots, with approximate areas and dimensions.
- _____ 7. Names, approximate location and widths of streets within 200' of property.
- _____ 8. Topography of the existing land at two (2)-foot contour intervals, with elevations shown in NAVD88.
- _____ 9. Location of all permanent monuments, large boulders, stone walls, vegetation and special features showing the outline of all woodlands, significant individual or group tree masses, rock outcroppings, roads and trails, flowing streams or waterways, drainage ways and ponds, noting those being disturbed by proposed ways, drainage easements, or any change in topography.
- _____ 10. An outline of all areas within the Wetland and Watershed Protection District, Flood Hazard Areas Overlay District, and/or Aquifer Protection Overlay District (APOD).
- _____ 11. A roadway profile drawn to a horizontal scale of 1"=40' and a vertical scale of 1"=4', showing all existing and proposed grades, drainage and sewer systems, and, within Flood Hazard Areas Overlay District, FEMA Base Flood Elevations and Sea Level Rise Base Flood Elevations.
- _____ 12. Zoning of proposed subdivision and contiguous parcels.
- _____ 13. Existing on-site structures including septic systems.
- _____ 14. Names and nine-digit parcel numbers of all direct abutters as they exist on the most recent tax list.
- _____ 15. Physical, geological, environmental and other characteristics unique to the site but no covered in 1-14 above.
- _____ 16. EIGHTEEN COPIES (THREE full-size, FIFTEEN half-size) of the plan are required. The signature block must be in the same space on each page.
- _____ 17. Environmental Impact Plan
- _____ 18. Erosion Control Plan
- _____ 19. Drainage Calculations

FEES: See next page

DEFINITIVE PLAN FEES:

APPLICATION FEE: (Check payable to the Town of Duxbury)

(With Preliminary Plan previously filed and acted upon): \$200 per building lot

Total = _____

(Without Preliminary Plan previously filed and acted upon): \$400 per building lot

Total = _____

(For Definitive Plan Amendments and Frontage Waiver Requests): \$100 per lot

Total = _____

ESCROW ACCOUNT: (Check payable to the Town of Duxbury. Signed W-9 form also required.)

For 3 Lots or Less: \$3,000 minimum deposit.

For 4 or More Lots: \$3,000 minimum deposit, plus \$500 per lot in the proposed subdivision

Total = _____

DUXBURY PLANNING BOARD

**AS-BUILT PLAN AND PROFILE
REQUIREMENTS**

As-built plans showing the location, grades, and other significant information regarding utilities shall be prepared by the applicant's professional land surveyor and turned over to the Planning Board prior to the final approval of the improvements and release of security as hereinafter provided. This will be done by submitting Mylar(s) and computer disk(s) of the subdivision's metes and bounds as prepared in accordance with the Rules and Regulations of the Registers of Deeds, Chapter 82, Section 17 thru 23 and this section. Additionally, a surveyor's certificate signed and sealed by a registered professional land surveyor in the Commonwealth of Massachusetts must be furnished to the Planning Board. The certificate shall state that all bounds have been set in accordance with the subdivision plan filed and recorded at the Registry of Deeds. Also included will be the plan number, year, plan book and page of the recorded plan.

The subdivider shall file with the Planning Board an As-built plan on mylar, two sepia prints, three (3) blue-line prints and on a computer disk compatible with Auto Cad, Version 14 of the completed street or streets, utilities and easements together with proper legal descriptions for initiating an article in the Town Warrant pursuant to the acceptance of the ways by the Town Meeting and shall grant a deed to the Town of the streets, utilities and easements, as contained in the plan said deed to be recorded by the Town upon acceptance of the streets by the Town Meeting.

1. The As-built plan will meet the following criteria:
 - a. Scale one inch (1") equals forty feet (40')
 - b. 24" x 36" sheets
 - c. Index plan at one inch (1") equals one hundred feet (100') or otherwise approved by the Board.
 - d. A signature block for the Planning Board to sign when the road is acceptable to recommend acceptance as a public way.
 - e. Professional Land Surveyor's stamp and signature
 - f. Lot numbers
 - g. Name of subdivision
 - h. Name of street(s)
 - i. Date
 - j. Name of owner
 - k. Name of subdivider
 - l. Name of design engineer
 - m. North point and reference
 - n. Bench marks(NAD88 Datum)
 - o. Locus map(1"=600')
 - p. Intersecting boundary lines of abutting land
 - q. All necessary bearings, lengths of lines and radii, tangents, arc lengths, and central angles of curves of all street lines, boundary

Continued:

AS-BUILT PLAN AND PROFILE REQUIREMENTS

lines, and areas needed to adequately described but not limited to the following:

1. Streets
 2. Ways
 3. Easements
 4. Common or public areas
- r. Sufficient data to determine the locations, elevation, direction and length of:
1. Streets
 2. Ways
 3. Boundary Lines
 4. Pavement and right of way widths
 5. Location of permanent monuments
 - a. A minimum of three of the permanent concrete monuments shall have their North American Datum (NAD83) horizontal datum coordinates and North American Vertical Datum (NAVD88) vertical datum coordinates shown on the final As-built. The Planning Board or their designee shall determine which three monuments are chosen. More monuments may be chosen if deemed necessary by the Board or their designee.
 6. Location and names of streets intersecting the subject area
- s. The following shall be accurately located by survey on the plan (station and offset where appropriate):
1. Storm drains and all appurtances
 2. Water mains and all appurtances
 3. Sewer mains and all appurtances
 4. Other underground and above ground utilities (electric, telephone, gas, etc.) and all appurtances, including elevations of flood-sensitive equipment with the Flood Hazard Areas Overlay District.
 5. Hydrants
 6. Water services, gate valves and sewer services including ties to buildings and other permanent structures
 7. Street signs
 8. Headwalls
 9. Wheelchair ramps
 10. Guardrails

Continued:

AS-BUILT PLAN AND PROFILE REQUIREMENTS

11. Curbing and or berms
 12. Edge of pavements
- t. Sizes and material type of the following:
 1. Storm drains
 2. Water mains
 3. Sewer mains
 4. Gas mains
 - u. Sidewalks and driveways
 - v. NAVD88 elevation datum
If the approved subdivision used a different datum then the conversion shall also be supplied.
 - w. NAVD88 bench marks
 - x. Original datum bench mark described
 - y. Rates of gradients for drainage and sewer mains.
 - z. Roadway centerline stationed
 - aa. Offsite easements shown and completely described.
 - bb. The As-built profiles should meet the following requirements:
 1. Horizontal scale: 1" = 40'
 - Vertical scale: 1" = 4'
 2. Center line grades-heavy line
 3. Grade elevations at 50' stations
 4. Locations of the following (station and offsets as appropriate):
 - a. Storm drains and all appurtances
 - b. sewer mains and all appurtances
 - c. headwalls
 5. Sizes and material type of the following:
 - a. storm drains
 - b. sewer mains

Continued:

AS-BUILT PLAN AND PROFILE REQUIREMENTS

- 6. Rims and inverts of the following:
 - a. storm drains
 - b. sewer mains
- 7. NAVD88 elevation datum
- 8. Rates of gradients for drainage and sewer mains
- 9. Off street easements shown with all utilities

cc. 3 ½” x 3 ½” registry block

dd. Ownership of abutting lots

ee. Lot lines within 100' of the street right of way &/ or easements.

ff. The As-built plan must be recordable at the Registry of Deeds or Land Court as applicable as a street acceptance plan.

gg. Board of Selectmen acceptance signature block.

hh. A monument certification stating:

“I certify that the monuments are set as shown on this plan”.

Professional Land Surveyor Date

ii. A registry certification block stating:

“I certify that these plans are prepared in accordance with the Rules and Regulations of the Register of Deeds.”

Professional Land Surveyor Date

- 2. Prior to placement of any bituminous concrete, a Utility As-Built Plan shall be supplied by the applicant {three (3) contact prints} to be reviewed and approved by the Planning Board. If after review, should any construction modifications be required by the Planning Board, an additional revised Utility As-Built plan shall also be submitted. The Utility As-Built Plan must meet all applicable and/or revised criteria of Appendix F. All applicants must sufficiently plan ahead to allow adequate time for Planning Board review and approval prior to scheduling with contractors for paving.

DUXBURY PLANNING BOARD
STREET ACCEPTANCE PLAN CHECKLIST

GENERAL:

- ___ Title Block specifying "Street Acceptance Plan for _____, Duxbury, Massachusetts" indicating scale (1" = 40'), Date, Preparer of Plan.
- ___ North Arrow, graphic scale, locus
- ___ Board of Selectmen approval signature box
- ___ Town Clerk certification of filing date and final acceptance date
- ___ Surveyor certification that plan prepared in conformity with requirements of Registry of Deeds
- ___ Title box for Registry use only
- ___ Roadway location, including all bearings, distances, horizontal curve (radius, turnouts, length of curve)
- ___ Name of street and intersecting streets
- ___ Names of lot owners on street
- ___ Location of all public easements with written description attached on separate instrument detailing size and purpose.

*No need for utility information, house locations or driveway locations.

Street Acceptance Plan shall also have written description of layouts for recording.

APPENDIX G
ASSESSMENT STUDY STANDARDS/MISC.

HYDROGEOLOGIC STUDY GUIDELINES

1.0 BASE MAP – Should include:

- 1.1 Existing surface water bodies and wetlands
- 1.2 Wetlands Protection Overlay District, Flood Hazard Overlay District (labeled with FEMA Base Flood Elevation and Sea Level Rise Base Flood Elevations), and Aquifer Protection Overlay District (APOD) boundaries
- 1.3 Location of existing wells and septic systems for abutting properties
- 1.4 Existing and planned land surface elevations
- 1.5 Groundwater contours at minimum two (2) foot intervals
- 1.6 Detailed description of proposed project, including:
 - a) location of planned septic systems
 - b) water supply wells
 - c) residential dwellings
 - d) lawn areas
 - e) paved areas

2.0 BACKGROUND INFORMATION – Should include:

- 2.1 Existing condition of ground and surface water quality, including physical characteristics and water chemistry. Measurements shall specifically include concentrations of total phosphorus if in the recharge zone of freshwater pond; nitrate-nitrogen if in the recharge zone of saltwater pond or embayment; and nitrate-nitrogen if in a zone of contribution to a private or public water supply well.
- 2.2 Subsurface geology
- 2.3 Surface drainage patterns

3.0 ANALYSIS OF DEVELOPMENT IMPACT

The analysis of the impact of the development will vary depending on its location in relation to sensitive water resources within the Town. One of four categories will apply. They are: 1) Zone II protection areas to public drinking water supplies; 2) contributing areas to fresh water lakes or ponds; 3) contributing areas to coastal estuaries; and 4) those areas designated as not impacting in a significant way the sensitive water resources. Subdivisions with upland in excess of 80,000 square feet per buildable lot would be designated as being in the fourth category. No further analysis of

development impact by subdivision in category four need to be performed, unless specifically required by the Planning Board.

3.1 Zone II Protection Areas to Public Drinking Water Supplies

Analysis should include:

The existing condition of the water supply, including well location and construction and the quality of water pumped by the well.

A calculation of the total nitrogen loading from the proposed development (in pounds per year) and the predicted nitrogen concentration in ground water underneath the development (in mg/l) using loading rates provided in Table G-1 below.

A calculation of the predicted nitrogen concentration in ground water pumped by the water supply well from throughout the Zone II area. This analysis must include a calculation of the total loading within the Zone II area from all sources under saturation or build-out conditions. The loading analysis should use the loading rates provided in Table G-1 below.

A comparison of the results of the post-development Zone II loading analysis to the critical nitrogen concentration of 5 mg/l for water pumped by the water supply well. If the predicted concentration is above 5 mg/l, the applicant must indicate nitrogen reduction measures for the proposed development that will reduce the nitrogen loading so the predicted concentration is 5 mg/l or less.

3.2 Contributing Areas to Fresh Water Lakes or Ponds

Analysis should include:

A map showing the boundaries of the contributing area based on ground water flow and/or surface water runoff.

A calculation of the total phosphorus loading from the proposed development (in pounds per year) using loading rates provided in Table G-2 below.

A calculation of the predicted phosphorus concentration in the fresh water system from sources throughout the contributing area. This analysis must include a calculation of the loading within the contributing area from all sources under saturation or build-out conditions. The loading analysis should use the loading rates provided in Table G-2 below.

A comparison of the results of the post-development phosphorus loading analysis to the critical phosphorus concentration of 0.2 mg/l for the fresh water resource. If the predicted concentration is above 0.2 mg/l, the applicant must indicate phosphorus reduction measures for the proposed development that will reduce the phosphorous loading so the predicted concentration is 0.2 mg/l or less.

3.3 Contributing Areas to Coastal Ponds or Estuaries

Analysis should include:

A map showing the boundaries of the contributing area based on ground water flow.

A flushing calculation showing how quickly water and associated nutrients and other contaminants are removed from the coastal system into Massachusetts Bay.

A calculation of the total nitrogen loading from the proposed development (in pounds per year) using loading rates provided in Table G-1 below.

A calculation of the predicted nitrogen loading to ground water (in pounds per year) throughout the contributing areas. This analysis must include a calculation of the total loading within the contributing area from all sources under saturation or build-out conditions. The loading analysis should use the loading rates provided in Table G-1 below.

A comparison of the results of the predicted loading analysis for the post-development condition to the critical nitrogen loading levels provided in Table G-3 below which are based on the flushing characteristics of the coastal system. If the predicted concentration is above the critical loading levels, the applicant must indicate nitrogen reduction measures for the proposed development that will reduce the nitrogen loading so the predicted concentration is reduced to, or below the critical rate.

**Table G-1
Nitrogen Loading Analysis Parameters**

SOURCE	CONCENTRATION	LOADING RATE	FLOW/RECHARGE
Sewage	40 mg N/liter	(6.72 lbs N/person/yr) (165 gallons/dwelling)	55 gallons/person/day
Fertilizer (Lawns)		(0.9 lbs N/1000 sq. ft./yr.)	18 in./year
Pavement Runoff	2.0 mg N/liter	(.42 lbs N/1000 sq.ft./yr.)	40 in./yr
Roof Runoff	0.75 mg N/liter	(0.15 lbs N/1000 sq.ft./yr.)	40 in./yr
Precipitation	0.05 mg N/liter	(0.005 lbs N/1000 sq.ft./yr.)	18 in./year

Average Loading Rate Per Dwelling (25.3 lbs/yr)

*Agricultural fertilizer loading rates should be determined for dominant local crops, if appropriate.

**TABLE G-2
Watershed Phosphorus Loading Model
Build-out Conditions**

	QUANTITY	SOURCE LOADING	PERSISTENCE	LOADING LBS/YR.
GROUNDWATER				
Septic Systems	*	9.6 lbs/unit/yr	0.20	**
Lawns	*	0.91 lbs/5000 sq.ft/yr	0.19	**
Agricult.Fields (w/ manure) (acres)	*	10 lbs/acre/yr	0.24	**
Feedlots (acres)	*	227 lbs/acre/yr	0.24	**
Forested (acres)	*	0.2 lbs/acre/yr	0.37	**
Road Drainage (acres)	*	0.92 lbs/acre/yr	0.00	**
TOTAL (Loading to Stream/Pond)				***
STORMWATER FLOW				
Septic Systems	*	9.6 lbs/unit/yr	0.31	**
Lawns	*	0.91 lbs/5000 sq.ft/yr	0.31	**
Agricult.Fields (w/ manure) (acres)	*	10 lbs/acre/yr	0.40	**
Feedlots (acres)	*	227 lbs/acre/yr	0.40	**
Forested (acres)	*	0.2 lbs/acre/yr	0.63	**
Road Drainage (acres)	*	0.92 lbs/acre/yr	1.00	**
TOTAL (Loading to Stream/Pond)				***
		TOTAL LOADING		****

Runoff/Recharge Calculations:

	Soils (acres)	Runoff (ft/yr)	Runoff (M gal/yr/acre)	Recharge (ft/yr)	Result (M gal/yr/acre)
Glacial Till	*	1	0.3258	0.25	0.0814
Sandy Soils	*	0.25	0.0814	1.50	0.4887
Total	***		0.4072		0.569
Average stormflow (cfs)		1.86	Average baseflow (cfs) 0.69		

* quantity of

** quantity times unit loading times persistence measured in pounds per year

*** Column total

**** Sum of groundwater and stormwater flows

NOTE: Number of acres times 43,560 square feet times runoff/recharge in ft/yr times 7.48 gallons per cubic foot equal gallons per year. Convert to liters and convert pounds per year to milligrams to get MG/L concentration.

TABLE G-3

Recommended Critical Nitrogen Loading Limits

Type of Embayment	SB* Waters	SA* Waters	Sensitive Waters
Shallow:			
Flushing in less than or equal to 5 days	350 mg/M3/Vr	200 mg/M3/Vr	100 mg/M3/Vr
Flushing in greater than 5 days	30 g/M2/yr	15 g/M2/yr	5 g/M2/yr
Deep: Use lesser loading rate	500 mg/M3/Vr or 45 g/M2/yr	260 mg/M3/Vr or 20 g/M2/yr	130 mg/M3/Vr or 10 g/M2/yr
Vr = residence time/square root (1+ residence time)			
* SB and SA are classifications for coastal waters relating to existing, desired water quality based on waterbody type, location, size, etc. and adjacent land uses. SB is lower quality based on waterbody type, location, size, etc. and adjacent land uses. SB is a lower quality than SA. The Commonwealth of Massachusetts has classified all coastal waters under the authority of 314 CMR 4, and has currently classified Duxbury coastal waters as SA.			

OUTLINE OF MINIMUM REQUIREMENTS FOR A TRAFFIC STUDY REPORT

1. Introduction

- Project Description
- Locus Map

2. Description of Existing Conditions

- Existing Road Geometrics
 - Lane and shoulder widths
 - Lateral Clearances
 - Horizontal and Vertical Alignment
 - Intersection Geometrics
 - Traffic Signalization
 - Sight Distances
- Abutting Land Uses and Zoning
- Flood Hazard Areas Overlay District
 - Exposure to present or future flood risk and associated impacts to emergency access/egress and/or traffic/pedestrian safety
- Existing Traffic Characteristics Based on Traffic Counts or Observation
 - Vehicle Speeds
 - Average Daily Traffic (ADT)
 - Peak Hour Traffic
 - Directional Distribution
 - Truck Percentage for ADT and Peak Hour
 - Turning Movements at Adjacent Intersections
 - Pedestrian Volumes
- Accident Data Collection and Analysis
 - Summary of Three Year Accident History
 - Accident Diagrams
 - Evaluation of Accidents

3. Projected Traffic Impacts Due to Proposed Development

- Methodology for Making Projections
- Average Daily Traffic (ADT)
- Peak Hour Traffic
- Directional Distribution
- Truck Percentage for ADT and Peak Hour
- Turning Movements at Adjacent Intersections
- Pedestrian Volumes

4. Proposed Methods of Mitigating Traffic Impacts

- Geometric Improvements
- Traffic Signalization

5. Level of Service Chart

<u>Level</u>	<u>Delay in Seconds</u>	<u>Description</u>
A	Less Than 5.0	Very little delay, rare stopping
B	5.1 – 15.0	Majority of vehicles do not stop
C	15.1 – 25.0	Some pass-through, significant # stop
D	25.1 – 40.0	Most stop, sometimes twice in cycle
E	40.1 – 60.0	Almost all stop, cycle failure frequent
F	Greater than 60.0	Gridlock



F-3 Wetlands Regulations

WETLANDS REGULATIONS

RED LINES BY WOODS HOLE GROUP

FOR THE DUXBURY CLIMATE CHANGE VULNERABILITY ASSESSMENT AND ADAPTATION PLAN



Duxbury Conservation Commission Wetlands Protection Bylaw Chapter 9

Adopted February 28, 2017

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PART I. PURPOSE AND PROCEDURES

1.0. AUTHORITY, PURPOSE, AND WETLAND VALUES

1.1. Purpose

These Town of Duxbury Wetlands Regulations (hereinafter referred to as the “DWR” or “Regulations”) were promulgated under the Town of Duxbury Wetlands Protection Bylaw (General Bylaws of the Town of Duxbury, Chapter 9), hereinafter referred to as the “Bylaw”), in order to implement the purposes of the Bylaw and to protect the wetlands, related water resources and adjoining land areas of the Town of Duxbury by controlling activities affecting Resource Areas. These Regulations set forth additional definitions, regulations and performance standards necessary to protect the values and/or intent of the Bylaw, protect additional Resource Areas and wetland values, and specify standards and procedures stricter than those of the Wetlands Protection Act, M.G.L. Ch. 131, § 40 and implementing regulations at 310 CMR 10.00.

1.2. Authority

These Regulations were promulgated by the Town of Duxbury Conservation Commission (hereinafter referred to as the “Commission”), pursuant to the authority granted to them under the Bylaw and under the Home Rule authority of this municipality. These Regulations shall complement the Bylaw, and shall have the force of law upon their effective date. Following public notice and a public hearing thereon, these Regulations may be amended and/or added to by a majority vote of the Commission.

1.3. Wetland Values

These regulations are promulgated in order to protect the following wetland values, including, but not limited to:

- 1) protection of public or private water supply;
- 2) groundwater;
- 3) flood control;
- 4) erosion and sedimentation control;
- 5) storm damage prevention, including coastal storm flowage;
- 6) prevention of water pollution;
- 7) fisheries;
- 8) shellfish;
- 9) Wildlife Habitat;
- 10) Rare Species Habitat, including rare plant and animal species;
- 11) Recreation;

- 12) agriculture;
- 13) aquaculture; and
- 14) aesthetics.

2.0. JURISDICTION

The Bylaw and Regulations provide protection for Resource Areas and their wetland values. Resource Areas protected under the Bylaw are ALL of the following:

- 1) Any freshwater or Coastal Wetland, isolated wetland, beach, dune, flat, marsh, wet meadow, bog, swamp, vernal pool, creek, river, stream, pond, lake, estuary, or ocean;
- 2) Any bank bordering on a freshwater or Coastal Wetland or water body;
- 3) Land under Water Bodies and Waterways, including but not limited to, Land Under the Ocean, ponds, lakes, rivers, streams, creeks, any fresh water or Coastal Wetland, and estuaries;
- 4) Land subject to flooding or inundation by groundwater or surface water, including but not limited to, fresh water wetlands, isolated wetlands, beaches, wet meadows, marsh, swamps, bogs, vernal pools, streams, rivers, ponds, lakes, or reservoirs;
- 5) Land bordering on the ocean, including but not limited to, beaches, dunes, Tidal Flats, coastal bank, Salt Marshes, salt meadows, estuaries;
- ~~6) Land within 100 feet from any of the aforementioned Resource Areas (1-5 described above) (hereinafter referred to as the "Buffer Zone");~~
- 6) Land subject to tidal action, coastal storm flowage, or flooding, including but not limited to, the coastal floodplain (FEMA Flood Zones A and V, as shown on the Flood Insurance Rate (FIRM) maps for the Town of Duxbury); or
- 7) Land within 100 feet from any of the aforementioned Resource Areas (1-6 described above) (hereinafter referred to as the "Buffer Zone");
[Consider including SLR/LSCF as Resource area that the buffer zone is applied to. Make the argument that due to sea level rise the LSCF and other coastal resources will migrate landward]
- ~~7)8) Land within 200 feet of any river, stream, or creek (hereinafter referred to as the "Riverfront Area", refer to DWR 21.1 (c)).~~

Resource Areas shall be protected whether or not they border surface water.

3.0. REGULATED ACTIVITIES

Activities subject to regulation under the Bylaw and Regulations include the following:

3.1 Activity in a Resource Area

Activity proposed or undertaken within a Resource Area as described in DWR 2.0 et seq.;

3.2 Activity with adverse effect on Resource Areas

Any Activity deemed by the Commission as likely to have a Significant or cumulative adverse effect upon Resource Areas as defined herein;

3.3 Other Activities

Any Activity, including but not limited to, any and all of the following activities when undertaken to, upon, within or affecting Resource Areas or their wetland values, as determined by the Commission:

- a) Removal, excavation, or dredging of soil, sand, gravel, or aggregate materials of any kind;
- b) Changing of preexisting drainage characteristics, flushing characteristics, salinity distribution, sedimentation patterns, flow patterns, or flood retention characteristics;
- c) Drainage, or other disturbance of water level or water table;
- d) Dumping, discharging, or filling with any material which may degrade water quality;
- e) Placing of fill, or removal of material;
- f) Driving of piles, construction or expansion or repair of buildings or structures or construction of any kind whether it be for industrial, commercial, residential, recreational or other purposes, regardless of its size;
- g) Placing of obstructions or objects in water or the surface water or groundwater hydrology of any Resource Area;
- h) Significant damage, destruction or removal of plant life, including, but not limited to, cutting or trimming of trees and shrubs and salt water and freshwater aquatic vegetation;
- i) Changing temperature, biochemical oxygen demand, or other physical, biological, or chemical characteristics of any waters;
- j) Any activities, changes, or work which may cause or tend to contribute to pollution of any body of water or groundwater; and
- k) Incremental activities which cause, or may cause, a cumulative adverse effect on the Resource Areas and interests protected by this Bylaw.

3.4 Activities Outside the Areas Subject to Protection Under the Bylaw.

Any Activity proposed or undertaken outside the areas specified in DWR 2.0 is not subject to regulation under the Bylaw, and does not require the filing of a Permit Application unless and until that Activity actually Alters a Resource Area. In the event that the Commission determines that such Activity has in fact Altered a Resource Area referenced in DWR 2.0(1) through (8), it shall impose such conditions on the Activity or any portion thereof as it deems necessary to contribute to the protection of the wetland values identified in DWR 1.3.

4.0. EXCEPTIONS

Exceptions may be made at the discretion of the Conservation Commission or its Administrator for maintaining, repairing or replacing, but not substantially changing or enlarging, an existing and lawfully located structure or facility used in the service of the public and used to provide electric, gas, water, telephone, and other telecommunication services. It is the responsibility of the owner of the property or the person or entity proposing such work to notify the Conservation Commission or its Administrator of such proposed activities.

5.0. PROMULGATION OF REGULATIONS

The Commission may adopt such additional definitions, regulations, policies, fees, and performance standards as it may deem necessary to protect the wetland values of this Bylaw. Said definitions, regulations, fees and performance standards shall become effective upon publication following a public hearing for which public notice has been provided. Policies may be adopted by a majority vote of the Commission.

6.0. DEFINITIONS

Definitions of selected words, terms and phrases used in these Regulations are provided below. Definitions of Resource Areas are found in subsequent sections for each Resource Area. Capitalized terms used in these Regulations but not otherwise defined in these Regulations shall have the meanings set forth in the Massachusetts Wetlands Regulations, 310 CMR 10.00 et seq. Where applicable, the definitions, presumptions of significance, and performance standards, set forth in the Bylaw or the Massachusetts Wetlands Regulations, 310 CMR 10.00 et seq., are hereby incorporated herein only when no definitions, presumptions of significance or performance standards are given in these Regulations.

[Adaptation means measures designed or intended to protect resource areas from the impacts of climate change and to protect the ability of the resource areas to mitigate the impacts of climate change through providing wetland values protect under DWR 17-22](#)

Alter means to change the condition of any area subject to protection under this Bylaw.

Examples of alterations include, but are not limited to, the following:

- a) The changing of pre-existing drainage characteristics, flushing characteristics, salinity distribution, sedimentation patterns, flow patterns and flood retention areas;
- b) The lowering of the water level or water table;
- c) The destruction of vegetation, including eel grass;
- d) The changing of water temperature, biochemical oxygen demand (BOD), or other physical, biological or chemical characteristics of any water;
- e) Removal, excavation or dredging of soil, sand, gravel or aggregate material of any kind;
- f) Dumping, discharging or filling with any material which may degrade water quality;
- g) Placing of fill, or removal of material, which would Alter elevation;

- h) Placing of obstructions or objects in water (other than boats, moorings, fish or shellfish traps, pens or trays used in conjunction with aquaculture, or aids to navigation);
- i) Driving of piles, erection or repair of buildings or structures of any kind;
- j) Application of pesticides or herbicides.

Coastal Wetland means any bank, marsh, swamp, meadow, flat or other lowland, or shellfish habitat subject to tidal action or coastal storm flowage.

Cumulative Effect means any effect that is significant when considered in combination with other activities that have occurred that are occurring simultaneously, or that are reasonably foreseeable, whether such other activities have or are contemplated as a separate phase of the same project, or arise from unrelated but reasonably foreseeable future projects. Future effects of sea level rise, coastal or inland flooding, or other future climate change effects are included among cumulative effects. (Based on Boston Ordinance)

Extreme Weather Event means weather at the extremes of the historical distribution lying in outermost ten percent (10%) of the Town of Duxbury weather history, including but not limited to heat and humidity, droughts, high winds and microbursts, blizzards and ice storms, rain, wildfire, tornadoes, thunderstorms, hurricanes and tides affected by weather. (Based on Boston Ordinance/Arlington Regs)

Flood Control means the prevention or reduction of flooding and flood damage, both as currently expected to occur and as projected to occur based on the best available data

Impacts of Climate Change means, but are not necessarily limited to, extreme heat, timing, frequency, intensity, and amount of precipitation, storm surges, and rising water levels; increased intensity or frequency of storm events or extreme weather events; and frequency, intensity, and duration of droughts. (Based on Boston Ordinance/Arlington Regs)

Minimize Adverse Effect means to make as small as possible, to achieve the least amount of adverse effect that can be attained using best available measures or best practical measures, whichever is referred to in the pertinent section.

Naturally Vegetated Condition means an area on a lot or parcel of land, or portion thereof, that is left in a natural, undisturbed vegetative state; has existed in a primarily natural, undisturbed state, but has been enhanced with indigenous plantings conducive to improved Wildlife Habitat according to a plan approved by the Commission; or has been disturbed, but is revegetated with indigenous plantings that will return the land to its pre-disturbance condition according to a plan approved by the Commission.

Navigation means the ability to traverse a waterway and is part of the wetland value of Recreation under the Bylaw.

Pier means the entire structure of any pier, dock, wharf, walkway, bulkhead or float, and any part thereof including pilings, ramps, walkways, stairs, platforms, floats and/or tie-off pilings attached to the shore, including seasonal structures.

Rare Species Habitat means areas that are utilized by threatened, rare, or endangered plant or animal species, or Species of Special Concern; or species on the "Watch List"; or Priority Sites of Rare Species Habitat; or Exemplary Natural Communities; (all of which are defined and
Duxbury Wetlands Regulations 6 Adopted 2/28/2017

determined by the Massachusetts Division of Fisheries and Wildlife, Natural Heritage & Endangered Species Program).

Recreation means the use and enjoyment of our natural surroundings in a manner consistent with their preservation. Activities should not hinder access to coastal and inland resources. Activities that shall be considered part of the use and enjoyment of our natural surroundings in a manner consistent with their preservation shall include but not be limited to recreational boating, swimming and shellfishing. The Commission's analysis of the project's effect on the wetland value of recreation should be relative to a proposal's potential impacts on other protected wetland values, with priority given to enhancing and protecting those recreational values which are not detrimental to the continued natural functions of wetlands or their wetland values.

Resilience means the ability to minimize the negative impacts of climate change and other natural hazards; to build capacity of a resource area to minimize negative impacts of climate change. (Based on Arlington Regs)

Resource Area means any of the areas specified in DWR 2.0. It is used synonymously with Area Subject to Protection Under the Bylaw, each one of which is described in DWR 17.0 through 22.0.

Resource Area Enhancement means, with the Commission's prior approval, the removal or management of invasive species; removal of man-made debris, garbage or trash; stabilization of bank or other resource area; or planting of non-invasive species of vegetation. (Based on Arlington Regs)

Sea level Rise (SLR) means the rise in sea level over time

Significant means plays a role. A Resource Area is significant to a wetland value when the Resource Area plays a role in the provision or protection of that wetland value.

Species of Special Concern are any species of plant or animal which has been documented by biological research and inventory to have suffered a decline that could threaten the species if allowed to continue unchecked or that occurs in such small numbers or with such a restricted distribution or specialized habitat requirements that it could easily become threatened within the Commonwealth as defined by the Massachusetts Natural Heritage and Endangered Species Program (NHESP).

Storm Damage Prevention means the prevention of damage caused by water from storms, as currently occurs and is predicted by best available data to occur from the impacts of climate change, including but not limited to erosion and sedimentation, damage to vegetation, property or buildings or damage caused by flooding, waterborne debris or waterborne ice. (Based on Boston Ordinance/Arlington Regs)

Wildlife Habitat means areas which, due to their plant community composition and structure, hydrologic regime or other characteristics, provide food, shelter, migratory or overwintering areas, or breeding areas for animals. This includes all areas in a Naturally Vegetated Condition.

7.0. PROCEDURES

Any person who proposes to perform work within a Resource Area shall submit to the Commission either a Notice of Intent for such work or a Request for Determination of Applicability. Said request shall include sufficient information to enable the Commission to find and view the area and to determine whether the proposed work will Alter a Resource Area under the Bylaw.

Specific filing requirements, instructions, and fees can be found in the Commission's Policies and Procedures Guide.

7.1. Request for Determination of Applicability (RDA)

- a) Any person who desires a determination as to whether the Bylaw applies to land, or to work that may affect a Resource Area protected under the Bylaw, may submit to the Commission by certified mail or hand delivery a Request for Determination of Applicability using forms provided by the Town of Duxbury and according to instructions provided by the Town of Duxbury. For work within Riverfront Areas, an applicant may submit to the Commission by certified mail or hand delivery a Request for Determination of Applicability to identify the scope of alternatives to be evaluated under DWR 21.1, including sufficient information to enable the Commission to determine the applicable scope of alternatives.
- b) A Request for a Determination of Applicability shall include certification that the owner of the area subject to the request, if the person making the request is not the owner, has been notified that a determination is being requested under the Bylaw.

7.2. Determination of Applicability

- a) Within 21 days after the date of receipt of the Request for a Determination of Applicability, all necessary supporting documentation and/or plans, and appropriate fees, the Commission shall hold a public meeting. Notice of the time and place of the public meeting at which the determination will be made shall be given by the Commission at the expense of the person making the request not less than 5 days prior to such meeting, by publication in a newspaper of general circulation in the Town of

Duxbury. Notice shall also be given in accordance with the Open Meeting Law, M.G.L. c. 30A, , §§18-25. Said determination shall be signed by a majority of the Commission, and copies thereof shall be provided by the Commission to the person making the request. Delivery of the copy to the person making the request shall be by hand delivery or certified mail, return receipt requested. Said determination shall be valid for 3 years from the date of issuance.

- b) The Commission shall have the authority to continue the public meeting to a date certain announced at the meeting, for reasons stated at the meeting. The applicant may also request to continue a meeting to a date certain announced at the meeting. Reasons for continuing a meeting may include, but are not limited to, failure of the applicant or others to provide information (including comments, recommendations, or action of other town boards and officials) by the submittal deadline, lack of timely receipt of necessary information from the applicant, time needed by the applicant to provide additional or missing information and for the Commission to review such information, inability to view the proposed project, and need for additional information to evaluate the potential impacts upon the wetland values. Once the Commission closes the public meeting it shall issue a Determination within 21 calendar days.
- c) The Commission shall find that the Bylaw and these Regulations apply to the land, or a portion thereof, if it is a Resource Area under the Bylaw. The Commission shall find that the Bylaw and these Regulations apply to the work, or a portion thereof, if it is an Activity Subject to Regulation under the Bylaw as defined in DWR 3.0. The Commission shall identify the scope of alternatives to be evaluated, if requested, for work within Riverfront Areas under DWR 21.1.
- d) A Notice of Intent which is filed as a result of a positive determination shall be filed with the Commission according to the procedures set forth in DWR 7.4. A Determination of Applicability may be conditioned by the Commission to protect the wetland values of the Resource Areas involved.

7.3 Abbreviated Notice of Resource Area Delineation (ANRAD)

- a) To establish the extent of Bordering Vegetated Wetland and other Resource Areas on land subject to protection under the Bylaw, applicants may use the Abbreviated Notice of Resource Area Delineation for the confirmation of a delineated boundary of bordering Vegetated Wetlands and other Resource Areas on the site, prior to filing a Notice of Intent for proposed work. Alternatively, the boundary of bordering vegetated wetland (or other Resource Area) may be determined through the filing of a Notice of Intent.
- b) The ANRAD shall be submitted on the form and according to instructions provided by the Town of Duxbury Conservation Commission along with all necessary supporting documentation and/or plans, and appropriate fees. A public hearing shall be held as described under DWR 7.6. Procedures for an ANRAD filing, hearing, and issuance of a decision follow those outlined for the Notice of Intent as described in DWR 7.4. c) The Department of Environmental Protection (DEP) File Number for the ANRAD submitted

under 310CMR 10.00 may serve as the File Number for the ANRAD submitted under the Bylaw. The designation of a file number shall not imply that the plans and supporting documents have been judged adequate for the issuance of an ORAD, but only that copies of the minimum submittal requirements contained in the General Instructions have been filed.

- c) If the Commission determines that the Resource Areas are incorrectly or incompletely delineated, they shall request that the applicant provide the correct delineation or missing information. If the correct delineation or missing information is not provided, the Commission shall close the ANRAD hearing and issue a denial Order of Resource Area Delineation within 21 calendar days, specifying each Resource Area that is incorrectly or incompletely delineated. The Commission shall have the authority to deny any proposed Resource Area delineation when 1) the application is incomplete; 2) the delineation is incorrect, or 3) the Commission requires additional information that is not provided by the applicant.
- d) The Commission shall have the authority to continue the ANRAD hearing to a date certain announced at the hearing, for reasons stated at the hearing. The applicant may request to continue a hearing to a date certain announced at the hearing. Reasons for continuing a hearing may include, but are not limited to, lack of timely receipt of necessary information from the applicant or others (including comments, recommendations, or action of other town boards and officials), time needed by the applicant to correct the delineation and for the Commission to review the corrected delineation, inability to view the proposed delineation, need for additional information to evaluate the potential impacts upon the wetland values, or incorrect or incomplete abutter notification as required under DWR 7.5. Once the Commission closes the public hearing it shall issue an ORAD within 21 calendar days, specifying whether the proposed Resource Area boundaries are correct or not (i.e., approval or denial of the boundaries).

7.4. Notice of Intent (NOI)

- a) Any person who proposes to do work that will Alter or affect any Resource Area under the Bylaw shall file a NOI on the form and according to instructions provided by the Town of Duxbury Conservation Commission along with all necessary supporting documentation and/or plans, and appropriate fees.
- b) To establish the extent of bordering vegetated wetland and other Resource Areas on land subject to protection under the Bylaw, applicants may file an Abbreviated Notice of Resource Area Delineation for the confirmation of a delineated boundary of Bordering Vegetated Wetlands and other Resource Areas on the site prior to filing a Notice of Intent for proposed work. Alternatively, the boundary of Bordering Vegetated Wetland (or other Resource Area) may be determined through the filing of a Notice of Intent.
- c) The Department of Environmental Protection File Number for the Notice of Intent submitted under 310 CMR 10.00 may serve as the File Number for the Notice of Intent submitted under the Bylaw. The designation of a file number shall not imply that the plans and supporting documents have been judged adequate for the issuance of an

Order, but only that copies of the minimum submittal requirements contained in the General Instructions have been filed.

- d) In the event that only a portion of a proposed project or Activity lies within a Resource Area under the Bylaw, and the remainder of the project or Activity lies outside those areas, only that portion within those areas must be described in the detail called for by the General Instructions and by the Town of Duxbury. Notwithstanding the foregoing, when the Commission has determined that an Activity outside the Resource Areas has in fact Altered a Resource Area, it may require such plans, supporting calculations and other documentation as are necessary to describe the entire Activity.
- e) The requirement under these Regulations to obtain or apply for all obtainable permits, variances and approvals required by local bylaw with respect to the proposed Activity shall mean only those which are feasible to obtain at the time the Notice of Intent is filed.
- f) If the Commission rejects a Notice of Intent because of a failure to obtain or apply for all permits, variances and approvals required by local bylaw, it shall specify in writing the permit, variance or approval that has not been applied for. A ruling by the municipal agency which has jurisdiction for the issuance of the permit, variance or approval, or by the Town Counsel or Board of Selectmen, concerning the applicability or obtainability of such permit, variance or approval shall be accepted by the Commission. In the absence of such a ruling, other evidence may be accepted.
- g) A Notice of Intent shall expire when the applicant has failed to diligently pursue the issuance of a Final Order in proceedings under the DWR. A Notice of Intent shall be presumed to have expired two (2) years after the date of filing unless the applicant submits information showing that (a) good cause exists for the delay of proceedings under the Bylaw; and (b) the applicant has continued to pursue the project diligently in other forums in the intervening period; provided, however, that unfavorable financial circumstances shall not constitute good cause for delay. No NOI shall be deemed expired under the Bylaw when an appeal under the Bylaw is pending and when the applicant has provided all information necessary to continue with the prosecution of the case.
- h) The Commission may require that supporting plans and calculations be prepared and stamped by a registered professional engineer when, in its judgment, the proposed work warrants this professional certification. The Commission may also require preparation and submission of supporting materials by other professionals including, but not limited to, registered landscape architect, registered land surveyor, environmental scientist, geologist or hydrologist when in its judgment the complexity of the proposed work and/or the wetland values of the Resource Areas warrants the relevant specialized expertise. Submitted materials may be used by the Commission to evaluate the effects of the proposed project on wetland values. Submission of requested materials does not imply approval of the project.
- i) [Consider adding an additional item for a requirement to integrate considerations for climate change in an application]
[For example, the the Boston Ordinance states "The Applicant shall...integrate climate

change and adaptation planning considerations into their project to promote climate resilience to protect and promote Resource Area Values and functions into the future. These considerations include but are not limited to: sea level rise, increased heat waves, extreme precipitation events, stormwater runoff, changing precipitation patterns and changes in coastal and stormwater flooding.”]

[Additionally “These considerations are especially important in Land Subject to Flooding and Land Subject to Coastal Storm Flowage and other Resource Areas which protect the interest of Flood Control and Storm Damage Prevention, including Buffer Zones.”]

h)j) The Commission shall have the authority to continue the hearing to a date certain announced at the hearing, for reasons stated at the hearing. The applicant may also

request to continue a hearing to a date certain announced at the hearing. Reasons for continuing a hearing may include, but are not limited to, failure of the applicant or others to provide information (including comments, recommendations, or action of other town boards and officials) by the submittal deadline, lack of timely receipt of necessary information from the applicant, time needed by the applicant to provide additional or missing information and for the Commission to review such information, inability to view the proposed project, need for additional information to evaluate the potential impacts upon the wetland values, and incorrect or incomplete abutter notification as required under these Regulations. Should the applicant refuse to continue the hearing or to provide the requested information, the Commission shall close the public hearing and issue an Order of Conditions within 21 calendar days.

h) The Commission shall have the authority to deny any NOI application for which 1) the application is incomplete and the applicant fails to provide the Commission with additional information that the Commission deems necessary in order to evaluate the potential impacts of the proposed project on the wetland values; and/or 2) the proposed work or Activity does not meet the performance standards specified herein and cannot be conditioned to meet the performance standards specified herein.

7.5. Abutter Notification

Any applicant filing a Notice of Intent or Abbreviated Notice of Resource Area Delineation for work within jurisdiction of the Bylaw must notify abutters within 100 feet of the lot, or lots upon which work is proposed, by certified mailing, Certificate of Mailing, or hand delivery of the form and according to instructions provided by the Commission. Mailing at least seven days prior to the public hearing shall constitute timely notice. Notification shall be at the applicant's expense. Proof of abutter notification (e.g., certified mail receipts) must be provided to the Commission at the public hearing, if requested.

7.6. Public Hearings/Public Meetings

A public hearing or public meeting shall be held by the Commission within 21 days of receipt of the submittal requirements set forth in the Commission's Policies and Procedures Guide. The public hearing/public meeting shall be held under both M.G.L. c.131, § 40 and the Duxbury Wetlands Bylaw, unless the project is located in only one of the two jurisdictions. The Commission shall send notice of the public hearing or public meeting to a newspaper of local circulation. The applicant is responsible for the cost of the legal notice. **The 21 day requirement to hold a public hearing can be waived with the approval of the applicant.**

7.7. Orders of Conditions Regulating Work

- a) Within 21 days of the close of the public hearing, the Commission shall either:
 - (a) Make a determination that the area on which the work is proposed to be done, or which the proposed work will remove, fill dredge or Alter, is not Significant to

any of the wetland values identified in the Bylaw, and shall so notify the applicant; or

- (b) Make a determination that the area on which the work is proposed to be done, or which the proposed work will remove, fill, dredge or Alter, is Significant to any of the wetland values identified in the Bylaw, and shall issue an Order of Conditions for the protection of said values.
- b) The standards and presumptions to be used by the Commission in determining whether an area is Significant to the wetland values in the Bylaw are found in DWR 17.0 through 23.0.
- c) The Order of Conditions shall impose such conditions as are necessary to meet the performance standards set forth in DWR 17.0 through 23.0 for the protection of those areas found to be Significant to any of the wetland values identified in the Bylaw. The Order shall prohibit any work or any portion thereof that cannot be conditioned to meet said standards.
- e)d) Consider adding an additional condition that states “The Commission may enact guidelines and performance standards implementing regulation specific to adaptation and green-infrastructure projects such as projects that allow for salt marsh migration or reduce risk of coastal inland flooding, impacts of extreme weather, sea level rise and other adverse impacts of climate change.”

7.8. Denials

- a) Procedural Denials. If the Commission finds that the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the wetland values of the Resource Area, it may issue a denial prohibiting the work. The denial shall specify the information which is lacking and why it is necessary. In writing the procedural denial, the Commission shall:
 - 1) State that the denial is specifically based on lack of information describing the site, the work and/or the effect of the work on the wetland values; and
 - 2) List specific information needed in each of the 3 possible problem areas mentioned above, citing appropriate sections of the Regulations.
- b) Substantive Denials. The Commission may deny permission for any Activity within areas under its jurisdiction if, in its judgment, such denial is necessary to protect the wetland values. Due consideration shall be given to all possible effects of the proposal on all wetland values. Substantive denials are based on a reasoned analysis of the proposed Activity and the likely effects of this Activity on the wetland values. In most cases, neither the assumption of protection nor the assumption of damage will be able to be proven with certainty. The Commission will base its judgment on the best information available at the time and in all cases will act to protect the wetland values.

The written decision will include the reasons for the denial, citing wetland values protected, and relevant regulations. The written decision will be signed by a majority of the Commission.

- c) Revocation. For good cause, the Commission may revoke or modify any permit, order, determination or other decision issued under the Bylaw after notice to the holder of the permit, the public, abutters, and town boards, pursuant to DWR 7.6 (Public Hearings) and DWR 16.2 (Coordination of Permitting), and holding a public hearing.

7.9. Recording in Registry of Deeds or Land Court

In no case shall any work or construction commence unless and until the Order of Conditions or Order of Resource Delineation has been recorded at the Registry of Deeds or Land Court and the proof of recording is delivered to the Commission.

7.10. Validity

A Determination of Applicability, Order of Resource Delineation and Orders of Conditions shall be effective for three (3) years from the date of issuance.

7.11. Extensions of Orders of Conditions and Orders of Resource Area Delineations

- a) The Commission may extend an Order for one or more periods of up to three years each, which shall be made on Form 7. The request for an extension shall be made to the Commission at least 30 days prior to expiration of the Order.
- b) The Commission may deny the request for an extension and require the filing of a new Notice of Intent for the remaining work or a new Abbreviated Notice of Resource Area Delineation in the following circumstances:
 - 1) Where no work has begun on the project, except where such failure is due to an unavoidable delay, such as appeals, in the obtaining of other necessary permits;
 - 2) Where new information, not available at the time the Order was issued, has become available and indicates that the Order is not adequate to protect the wetland values identified in the Bylaw;
 - 3) Where incomplete work is causing damage to the Resource Area and wetland values in the Bylaw;
 - 4) Where work has been done in violation of the Order or Bylaw and Regulations; or
 - 5) Where a Resource Area delineation or certification in an Order of Resource Delineation is no longer accurate.
- c) The Extension Permit shall be recorded in the Land Court or the Registry of Deeds, whichever is appropriate and evidence of the recording shall be delivered to the Commission.

7.12 Certificates of Compliance

- a) Upon completion of the work described in the Final Order of Conditions, the applicant shall request in writing the issuance of a Certificate of Compliance stating that the work has been satisfactorily completed. Upon written request by the applicant on the required form with all necessary supporting documentation and/or plans, and appropriate fees, a Certificate of Compliance shall be acted on by the Commission within 21 days of receipt thereof, and shall certify on the required form that the Activity

or portions thereof described in the Notice of Intent and plans has been completed in compliance with the Order.

- b) Prior to issuance of a Certificate of Compliance a site inspection shall be made by the Commission or its Administrator.
- c) If the Commission determines, after review and inspection, that the work has not been done in compliance with the Order, it may refuse to issue a Certificate of Compliance. Such refusal shall be issued within 21 days of receipt of a request for a Certificate of Compliance, shall be in writing and shall specify the reasons for denial.
- d) If a project has been completed in accordance with plans stamped by a registered professional engineer, architect, landscape architect or land surveyor, a written statement by such a professional person certifying compliance with the plans and setting forth what deviation, if any, exists from the plans approved in the Order shall accompany the request for a Certificate of Compliance.
- e) If the final Order contains conditions which continue past the completion of the work, such as maintenance or monitoring, the Certificate of Compliance shall specify which, if any, of such conditions shall continue. The Certificate shall also specify to what portions of the work it applies, if it does not apply to all the work regulated by the Order.
- f) The Certificate of Compliance shall be recorded in the Land Court or Registry of Deeds, whichever is appropriate, and evidence of the recording shall be delivered to the Commission.

8.0. EMERGENCY CERTIFICATION

The notice required by this Bylaw shall not apply to emergency projects necessary for the protection of the health or safety of the citizens of Duxbury and to be performed or ordered to be performed by an administrative agency of the Commonwealth or by the Town. Emergency projects shall mean any projects certified to be an emergency by the Commission or its Administrator. In no case shall any removal, filling, dredging or alteration authorized by such certification extend beyond the minimum amount of work and time necessary to abate the emergency. The Commission or its Administrator may impose conditions to protect wetland values of this Bylaw. Failure to agree to or follow these conditions shall be due cause for stopping all work. Upon failure to meet these requirements, the Commission may order all such work stopped and require the filing of a Notice of Intent or other application. The Commission may adopt emergency regulations in conformance with the Bylaw for limited durations after severe storms, notice of which shall be provided as soon as possible after their adoption.

9.0. RIGHT OF ENTRY

The Commission, its Administrator, employees, consultants, and officers, may enter upon the land upon which proposed work is to be done in response to a request for a prior

determination or for the purpose of carrying out its duties under the Bylaw and Regulations and may make or cause to be made such examination or survey as deemed necessary.

10.0. ENFORCEMENT

- a) Authority. The Commission shall have the authority to enforce these Regulations and permits issued thereunder by undertaking and issuing violation notices, administrative orders, and civil and criminal court actions. Upon request of the Commission to the Board of Selectmen, the Town Counsel may take legal action for enforcement under civil law. Upon request of the Commission or its Administrator, the Chief of Police may take legal action for enforcement under criminal law.
- b) Fines. Any person who violates any provision of the Bylaw and these Regulations or permits issued thereunder, shall be punished by a fine set by the Commission. Each day or portion thereof during which a violation continues shall constitute a separate offense, and each provision of the DWR, regulations or permit violated shall constitute a separate offense.
- c) Non-criminal Disposition. In addition to the procedure of enforcement as described above, the provision of the Bylaw and these Regulations or permits issued thereunder may also be enforced by the Commission or its Administrator, by non-criminal complaint pursuant to the provisions of M.G.L. Ch. 40, § 21D. Each provision of the chapter, regulations or permit violation that is violated shall constitute a separate offense.

11.0. SECURITY

As part of a permit issued under the Bylaw, in addition to any security required by any other municipal or state board, agency or official, the Commission may require that the performance and observance of the conditions imposed thereunder (including requiring mitigation work) be secured wholly or in part by one or more of the methods described below:

- a) By a proper bond or deposit of money or negotiable securities or other undertaking of financial responsibility sufficient in the opinion of the Commission, to be released in whole or in part upon issuance of a Certificate of Compliance for work performed pursuant to the permit. Such bond or deposit shall be released only upon issuance of a Certificate of Compliance.
- b) By accepting a conservation restriction, easement, or other covenant enforceable in a court of law, executed and duly recorded by the owner of record, running with the land to the benefit of this municipality whereby the permit conditions shall be performed and observed before any lot may be conveyed other than by mortgage deed. This method shall be used only with the consent of the applicant.

12.0. BURDEN OF PROOF

The applicant shall have the burden of proof by a preponderance of credible evidence that the work proposed will not have a Significant or cumulative detrimental effect upon Resource Areas or their wetland values protected herein. No project determined to have a Significant or cumulative detrimental effect upon Resource Areas or wetland values protected herein shall be allowed. Failure to provide adequate evidence to the Commission supporting this burden shall be sufficient cause for the Commission to deny the proposed project. In all instances herein, the Commission, after due deliberation, shall have the discretion to determine the weight of the information presented or omitted. The Commission maintains the right to condition any project as it deems necessary to protect any of the wetland values set forth herein.

13.0. FEES

13.1. Application Fees

At the time of a filing a Notice of Intent (NOI), Abbreviated Notice of Resource Area Delineation (ANRAD), Request for Determination of Applicability (RDA), or application for Certificate of Compliance, the applicant shall pay a filing fee specified in the Conservation Commission's Policies and Procedures Guide. The fee is in addition to that required by the Wetlands Protection Act (M.G.L. Ch. 131 § 40) and Regulations (310 CMR 10.00). The Commission is authorized to require an applicant (for an ANRAD, RDA or NOI or other filing) to pay a fee to cover the reasonable costs and expenses borne by the Commission in processing and evaluating the permit application. The fee schedule will be set by the Commission following public notice and a public hearing. The Commission may, at its discretion, waive the application fee, costs and expenses for a permit application.

Refer to the Conservation Commission's Policies and Procedures Guide for the Bylaw Application Filing Fee Schedule.

13.2. Consultant Fees

As provided by M.G.L. Ch. 44, § 53G, the Commission may impose reasonable fees for the employment of outside consultants, engaged by the Commission, for specific expert services deemed necessary by the Commission to come to a final decision on an application submitted to the Commission pursuant to the requirements of the Massachusetts Wetlands Protection Act (M.G.L. Ch. 131, § 40), the Duxbury non-zoning wetlands bylaw (Town of Duxbury Wetlands Protection Bylaw Chapter 9), Commission Act (M.G.L. Ch. 40, § 8C), or any other state or municipal statute, bylaw or regulation, as they may be amended or enacted from time to time.

Funds received by the Commission pursuant to these rules shall be deposited with the Town Treasurer who shall establish a special segregated account (Account) for this purpose.

Expenditures from this Account may be made at the direction of the Commission without further appropriations as provided in M.G.L. Ch. 44, § 53G. Expenditures from this Account shall be made only in connection with the review of a specific project or projects for which a consultant fee has been collected from the applicant. Any unused portion of the consultant fee, including interest, shall be returned to the applicant.

Specific consultant services may include but are not limited to Resource Area survey and delineation, analysis of Resource Area values, hydrogeologic and drainage analysis, impacts on municipal conservation lands, inspections during construction, any reports necessary for a Certificate of Compliance, and environmental or land use law. The consultant shall be chosen by, and report only to, the Commission and/or its Administrator.

The Commission shall give notice to the applicant of the selection of an outside consultant, which notice shall state the identity of the consultant, the amount of the fee to be charged to the applicant, and a request for payment of said fee in its entirety. Such notice shall be deemed to have been given on the date it is mailed or delivered. No such costs or expenses shall be incurred by the applicant if the application or request is withdrawn in writing within five days of the date such notice is given. The fee must be received in its entirety prior to the initiation of consulting services. Failure by the applicant to pay the consultant fee specified by the Commission within ten (10) business days of the request for payment shall be cause for the Commission to determine that the application is administratively incomplete (except in the case of an appeal).

The applicant may appeal the selection of the outside consultant to the Board of Selectmen (administrative appeal), who may disqualify the outside consultant selected only on the grounds that the consultant has a conflict of interest or does not possess the minimum required qualifications. The minimum qualifications shall consist of either an educational degree or three or more years of practice in the field at issue or a related field. Such an appeal must be in writing and received by the Board of Selectmen and a copy received by the Commission, so as to be received within ten (10) days of the date consultant fees were requested by the Commission. The required time limits for action upon the application shall be extended by the duration of this administrative appeal.

13.3 Fee Waiver

The Commission may, at its discretion, waive fees.

14.0. APPEALS

Any applicant, owner or abutter, any person aggrieved or any ten (10) residents of the Town of Duxbury may appeal an order of the Commission under the Bylaw to the Superior Court of Plymouth County within sixty (60) days following the date of issuance of the order, in accordance with M.G.L. Ch. 249 § 4.

15.0. SEVERABILITY

Should any term, condition, definition, language, section or provision of these Regulations be found invalid by competent legal authority, the validity of any other term, condition, definition, language, section or provision thereof shall not be affected, nor shall it invalidate any permit, approval, enforcement order or determination which previously has been issued.

16.0. RELATION TO OTHER FEDERAL, STATE AND LOCAL STATUTES

16.1. Relation to the Wetlands Protection Act and Other Federal, State and Local

Statutes These implementing regulations under the Town of Duxbury Wetlands Protection Bylaw are adopted under the Home Rule Amendments of the Massachusetts Constitution and the Home Rule statutes, independent of the Wetlands Protection Act M.G.L. Ch. 131 § 40 and implementing regulations, and other federal, state and local environmental statutes. Activities that may not require review or permitting under the Massachusetts Wetlands Protection Act, the Rivers Protection Act, the federal or state Clean Water Act, or other federal, state or local statutes are not assumed to be exempt from these Regulations.

16.2. Coordination of Permitting In order to ensure that various permit granting authorities review the impacts upon resources protected by these Regulations in a coordinated manner, and where the provisions of these Regulations are applicable, applicants for permits under federal, state or local statute or regulation shall comply with the requirements for filing under these Regulations within forty-five (45) days of said application made under federal, state or local statute or regulation.

PART II. PERFORMANCE STANDARDS FOR RESOURCE AREAS

Resource Area definitions and performance standards for work proposed in Resource Areas protected under the Bylaw are described in this section.

17.0. LAND UNDER WATER BODIES

17.1. Land Under the Ocean

a) Preamble

Land Under the Ocean provides feeding areas, spawning and nursery grounds and shelter for many coastal organisms related to marine fisheries and wildlife. Eelgrass is important for the prevention of pollution, protection of water quality, as well as fisheries and fish/shellfish habitat and provides an important food source for waterfowl. Nearshore Areas, and in some cases offshore areas of Land Under the Ocean help reduce storm damage, erosion, and flooding by diminishing and buffering the high-energy effects of storms. Submerged sand bars dissipate wave energy. Such areas provide a source of sediment for seasonal rebuilding of Coastal Beaches and dunes. The bottom topography and sediment type of Nearshore Areas of Land Under the Ocean are critical to erosion control, prevention of storm damage, and flood control. Water circulation and flushing rates, distribution of sediment grain size, water quality (including but not limited to turbidity, temperature, nutrients, pollutants, salinity, and dissolved oxygen), and the habitat of wildlife, finfish, and shellfish, including rare species when they occur, are all factors critical to the protection of wildlife and marine finfish and shellfish fisheries.

Land Under the Ocean in an unobstructed state is important for the protection of recreational swimming, fishing, shellfishing, boating and sailing, commercial fishing and shellfishing, aquaculture, and aesthetics which are important to Duxbury's economy. Land Under the Ocean is important for aquaculture. Land within 100 feet of Land Under the Ocean is Significant to the protection and maintenance of Land Under the Ocean and therefore to the wetland values.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon Land Under the Ocean, the Commission shall presume that such land is Significant to the protection of the following wetland values: flood control, erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; protection of aquaculture; and protection of aesthetics.

These presumptions may be overcome only upon a clear showing that the Land Under the Ocean does not play a role in protecting any of the wetland values given above.

c) Definitions – same as 310 CMR 10.25(2).

d) Performance Standards

When Land Under the Ocean, is determined to be Significant to a protected value, the following regulations shall apply:

- 1) Proposed work shall not have any Significant adverse effect or cumulative adverse effect on the wetland values of Land Under the Ocean.
- 2) Proposed work shall not destroy any portion of eelgrass beds and shall not have any adverse effect or cumulative adverse effect on eelgrass beds.
- 3) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.
- 4) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 5) Performance standards for proposed work or activities within the Buffer Zone to Land Under the Ocean are specified in DWR 22.0.
- 6) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

17.2 Land Under Salt Ponds

a) Preamble

Salt Ponds provide excellent habitat for marine fisheries and shellfish. The high productivity of plants and phytoplankton in Salt Ponds provides food for shellfish, crustaceans, and juvenile fish. Bottom sediments and shallow water are excellent habitats for many bivalves. The Salt Ponds also serve as spawning and nursery areas for crabs and fish. The productivity of Salt Ponds and the food web they support provide ideal habitat for many types of wildlife, particularly ducks and shore birds, and for rare species of plants and animals where they occur. Salt Ponds may provide suitable habitat for aquaculture. The enclosed nature of the Salt Ponds also provides shelter for wildlife. Salt Ponds and the area around them are important aesthetically and provide the public with many recreational opportunities including: shellfishing, fishing, sailing, swimming, hunting, and wildlife observation. Because of their semi-enclosed nature, Salt Ponds are sensitive to pollution or nutrient inputs. These inputs can change the plant and animal species composition of the pond, and thus can be detrimental to fish, shellfish, and wildlife. Bioaccumulation through food webs can also create dangerous levels of pollutants or toxins for wildlife and humans.

Characteristics of Salt Ponds which are critical to various wetland values include, but are not limited to, water circulation, distribution of sediment grain size, amount of freshwater and saltwater inflow, productivity of plants, and water quality (including but not limited to amounts of dissolved oxygen, nutrients, temperature, turbidity, pollutants, pH, and/or salinity). Land within 100 feet of a Salt Pond is considered to be

Significant to the protection and maintenance of a Salt Pond and the land beneath it and therefore to the protection of the wetland values of the Salt Pond.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon a Salt Pond or land within 100 feet from a Salt Pond, the Commission shall presume that the Salt Pond is Significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the Salt Pond does not play a role in protecting any of the wetland values stated above.

c) Definitions – Same as 310 CMR 10.33(2).

d) Performance Standards

When a Salt Pond or land within 100 feet of a Salt Pond is determined to be Significant to a wetland value, the following regulations shall apply:

- (1) Proposed work shall have no Significant adverse effect or cumulative adverse effect upon the wetland values of a Salt Pond.
- (2) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.
- (3) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- (4) Performance standards for proposed work or activities within the Buffer Zone to a Salt Pond are specified in DWR 22.0.
- (5) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

17.3 Land Under Inland Water Bodies and Waterways - Rivers, Creeks, Streams, Ponds, Lakes, Ditches or Flats

a) Preamble

Where Land under Water Bodies and Waterways is composed of pervious material, such land represents a point of exchange between surface and groundwater. Depending upon the hydrological conditions and water levels at a given time, these areas may serve as recharge or discharge points, or both, with groundwater. An area may serve as recharge area at one season and a discharge point at another time. This allows pollutants and nutrients easy access into private wells or the general groundwater supply. The physical nature of Land under Water Bodies and Waterways is highly

variable, ranging from deep organic and fine sedimentary deposits to gravel and large rocks. The organic soils and sediments play an important role in the process of detaining and removing dissolved and particulate nutrients from the surface water above. These also serve as traps for toxic substances (such as heavy metal compounds).

Land under Water Bodies and Waterways in conjunction with banks serve to confine floodwater within a definite channel during the most frequent storms. Filling within this channel blocks flows which in turn causes backwater and overbank flooding during such storms. Alteration of Land under Water Bodies and Waterways that causes water to frequently spread out over a larger area at lower depth increases flooding. Additionally, it results in an elevation of water temperatures and decrease in habitat in the main channel, both of which are detrimental to fisheries and shellfish, particularly during periods of warm weather and low flows. It may also flood waterfowl nesting sites which otherwise would not be disturbed. Land under ponds and lakes is vital to a large assortment of warm water fish during spawning periods. Species such as large-mouth bass (*Micropterus salmoides*), small-mouth bass (*Micropterus dolomieu*), blue gills (*Lepomis macrochirus*), pumpkinseeds (*Lepomis gibbosus*), black crappie (*Pomoxis nigromaculatus*), and rock bass (*Ambloplites rupestris*) build nests on the lake and bottom substrates within which they shed and fertilize their eggs. Land within 100 feet of any bank abutting land under a water body is Significant to the protection of the values which these water bodies serve to protect.

Characteristics of water bodies which are critical to protection of wildlife and fisheries include water circulation and flushing rates, distribution of sediment grain size, and water quality (including concentrations of dissolved oxygen, turbidity, nutrients, temperature, and pollutants). Leaving ponds and the land bordering ponds in an unobstructed state may be important to recreational swimming, fishing, and boating. Water bodies and the area around them also provide other recreational opportunities such as hunting and wildlife observation. Vegetated borders of large ponds are important in reducing shoreline erosion and storm damage by dissipating the high energy of storm waves and by anchoring the sediments. Water bodies provide important feeding and/or drinking areas for many types of aquatic wildlife, birds and animals. Ponds and other water bodies provide habitat for insects which serve as food for several species of birds, particularly swallows. Ducks, geese, swans, and herons all use water bodies and surrounding borders for feeding, shelter, and/or nesting areas. Many other birds, animals, reptiles and amphibians use Land under Water Bodies and Waterways, water bodies, and the borders of water bodies for parts of their life cycles. Such areas may be suitable for aquaculture of fresh or brackish aquatic plants or animals. Changes in sediments, water quality, water level, or species composition of food sources or ground cover may be detrimental to any of the above wildlife and to any rare species of plants or animals which occur in water bodies.

Ponds and the land surrounding them often provide aesthetically important wetland scenic views, particularly when they are in a natural condition. Ponds provide recreational swimming, boating, fishing, shellfishing, and sightseeing opportunities. The enclosed area and limited size of most fresh water bodies in the Town of Duxbury make

them particularly sensitive to pollution or nutrient inputs. These inputs can change the plant and animal species composition of the water body and thus can be detrimental to fish and wildlife. Bioaccumulation of pollutants through food webs can also create dangerous levels of pollutants or toxins for wildlife and humans.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon water bodies or the land beneath them or land within 100 feet from such land, the Commission shall presume that the water bodies and the land beneath them are Significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the water body or the land beneath it does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.56(2) with the following addition:

Pond shall include any open body of fresh water with a surface area observed or recorded within the last ten years of at least 5,000 square feet. Ponds shall contain standing water except for periods of extended drought.

d) Performance Standards

When Land Under an Inland Water Body or land within 100 feet of Land Under an Inland Water Body is determined to be Significant to a wetland value, the following regulations shall apply:

- (1) Proposed work shall not cause a Significant adverse effect or cumulative adverse effect upon the wetland values of Land Under an Inland Water Body.
- (2) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.
- (3) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- (4) Performance standards for proposed work or activities within the Buffer Zone to Land Under an Inland Water Body are specified in DWR 22.0.
- (5) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

18.0. LAND BORDERING ON THE OCEAN

18.1. Coastal Banks

a) Preamble

Coastal Banks composed of unconsolidated sediment and exposed to wave action serve as a major source of sediment for other coastal landforms, including beaches, dunes, and Barrier Beaches. The supply of sediment is removed from such sediment source banks by wave action. It is a naturally occurring process necessary to the continued existence of other protected Resource Areas including Coastal Beaches, Coastal Dunes, and Barrier Beaches. These areas protect public safety because they dissipate storm wave energy, thus protecting structures and Coastal Wetlands landward of them from storm damage, erosion, and flooding.

Coastal Banks, because of their height and stability, may act as a vertical buffer or natural wall, which protects upland areas from storm damage, erosion, and flooding. While erosion caused by wave action is an integral part of shoreline processes and furnishes important sediment to downdrift landforms, erosion of a Coastal Bank by wind and rain runoff, which plays only a minor role in beach nourishment, should not be increased unnecessarily. Disturbance to a Coastal Bank which reduce its natural resistance to wind and rain erosion causes cuts and gullies in the bank, and decrease its value as a vertical buffer. Vegetation tends to stabilize a Coastal Bank and reduce the rate of erosion due to wind and rain runoff. Undisturbed vegetated areas along banks are critical to reducing wind and rain erosion from the bank.

A particular Coastal Bank may serve as a sediment source and a vertical buffer or it may serve only one role. Coastal Banks of either type provide habitat for wildlife, particularly nesting birds and provide habitat for rare plant and animal species where these occur. Characteristics of Coastal Banks which are critical to wildlife are bank steepness (i.e., slope), height, stability, soil grain size and compaction or consolidation, and vegetation cover and type. Coastal Banks provide scenic views of the coast and in a natural condition are scenic in themselves, thus providing opportunities for birdwatching, hiking, photography, and other recreation. Land within 100 feet of the top of any coastal bank is Significant to the protection and maintenance of a bank and therefore the wetland values.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon a Coastal Bank or land within 100 feet from the top of a coastal bank, the Commission shall presume that the bank is Significant to the protection of the following wetland values: flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the coastal bank does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.30 (2) with the following additions:

Sediment Source Coastal Bank (i.e., eroding Coastal Bank) is a Coastal Bank which is or could be, as determined by the Commission, undergoing erosion or landward retreat and which is supplying sediment to a nearby Coastal Beach (including Tidal Flat), Coastal Dune, or Barrier Beach.

Vertical Buffer Coastal Bank (i.e., non-eroding Coastal Bank) is a coastal bank which is stable and does not appear to be undergoing, as determined by the Commission, erosion or landward retreat and which is not supplying sediment to a nearby Coastal Beach, Coastal Dune, or Barrier Beach.

d) Performance Standards.

- 1) When a Coastal Bank is determined to be a Sediment Source Coastal Bank (i.e., eroding Coastal Bank), the following regulations shall apply:
 - (a) Proposed work shall not cause any adverse effect or cumulative adverse effect on the wetland values of the Coastal Bank.
 - (b) All projects shall be restricted to activities as determined by the Commission to have no adverse effect and no cumulative adverse effect on the ability of the eroding Coastal Bank to serve as a sediment source to coastal Resource Areas, bank height, bank stability, bank vegetation and Wildlife Habitat.
 - (c) All projects must provide a buffer strip to the top of the Coastal Bank that is sufficient to protect the values and functions of this type of Coastal Bank and to allow such Coastal Banks continue to serve as a sediment source to coastal Resource Areas.
 - (d) Notwithstanding the above, minimal elevated walkways designed not to affect bank vegetation and sediment transport may be permitted to allow for pedestrian passage over a bank, provided that the ability of the bank to serve as a sediment source and its stability are not adversely affected.
 - (e) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
 - (f) Performance standards for activities or work proposed in the Buffer Zone to a Coastal Bank are specified in DWR 23.0.
 - (g) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.
- 2) When a Coastal Bank is determined to serve solely as a Vertical Buffer Coastal Bank, the following regulations shall apply:
 - (a) Proposed work shall not cause any adverse effect or cumulative adverse effect on the wetland values of the Coastal Bank.
 - (b) All projects shall be restricted to activities as determined by the Commission to have no adverse effect on bank height, bank stability, bank vegetation and Wildlife Habitat.

- (c) The Commission may allow projects to approach the top of such a Vertical Buffer Coastal Bank, which meet all other performance standards for the Coastal Bank, or condition such projects so that they meet all performance standards.
 - (d) Notwithstanding the above, elevated walkways designed not to affect bank vegetation and bank stability may be permitted to allow for pedestrian passage over a bank, provided that the stability of the bank and Wildlife Habitat are not adversely affected.
 - (e) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
 - (f) Performance standards for activities or work proposed in the Buffer Zone to a Coastal Bank are specified in DWR 23.0.
 - (g) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.
- 3) When a Coastal Bank is determined to serve as both a Sediment Source Coastal Bank and a Vertical Buffer Coastal Bank, the performance standards specified for Sediment Source Coastal Banks shall take precedence over the performance standards specified for Vertical Buffer Coastal Banks.
 - 4) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.

18.2 Coastal Beaches and Tidal Flats

a) Preamble

Coastal Beaches, which include Tidal Flats, dissipate wave energy by their gentle slope, their permeability, and their granular nature, which permit changes in beach form in response to changes in wave conditions. Coastal Beaches serve as a sediment source for dunes and subtidal areas. Steep storm waves cause beach sediment to move offshore, resulting in a gentler beach slope and greater energy dissipation. Less steep waves cause an onshore return of beach sediment, where it will be available to provide protection against future storm waves. Coastal Beaches also serve as sediment sources for downdrift coastal areas. Coastal Beaches serve to prevent storm damage, control erosion control, control flooding by dissipating wave energy, reducing the height of storm waves, and providing sediment to supply other coastal features, including Coastal Dunes, Land under the Ocean, and other Coastal Beaches. Interruptions of these natural processes by man-made structures reduce the ability of a Coastal Beach to perform these functions.

Coastal Beaches and Tidal Flats provide wildlife, shellfish and fisheries habitat. Characteristics of Coastal Beaches and Tidal Flats which are critical to the protection of wildlife, fisheries, and shellfish include the following: distribution of sediment grain size, movement of sediment, water quality (including turbidity, temperature, nutrients, pollutants, salinity, and dissolved oxygen), water circulation, and beach topography.

Coastal Beaches and Tidal Flats are used by coastal birds for feeding areas, nesting sites, and resting sites. Vegetative debris deposited along the drift line is vital for resident and migratory shorebirds, which feed largely on invertebrates which eat the vegetation. Infauna (invertebrates such as mollusks, polychaete worms, horseshoe crabs and crustacea) below the drift line in the lower intertidal zone are also eaten by fish and shorebirds. In addition, Coastal Beaches are important as haul-out and resting areas for seals.

Tidal Flats are also sites where organic and inorganic materials may become entrapped and then returned to the photosynthetic zone of the water column to support algae and other primary producers of the marine food web. Eelgrass beds are highly productive communities that provide food and shelter for many marine biologic communities and loss of eelgrass can result in Significant shifts in fauna, including commercial and recreational species.

Coastal Beaches and Tidal Flats are iconic features of the Town of Duxbury. They are also one of the Town's most heavily utilized recreation areas, providing opportunities for beachgoers, shellfish harvesters, anglers, boaters, and hunters, among others. Characteristics of Coastal Beaches and Tidal Flats which are critical to Recreation are topography, sediment grain size, water quality, water circulation rates and patterns, unobstructed access along shore, natural erosional and depositional cycles, and wave intensity. Characteristics of Coastal Beaches which are critical to aesthetics are natural erosion and deposition cycles, relief topography, slope and elevation, sense of openness and solitude.

Land within 100 feet of a Coastal Beach or tidal flat is considered to be important to the protection and maintenance of Coastal Beaches and Tidal Flats, and therefore to the protection of the wetland values.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering, building upon or degrading a Coastal Beach or flat or within 100 feet of a Coastal Beach or flat, the Commission shall presume that the beach or flat is Significant to the protection of the following wetland values: flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; **coastal resiliency**; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the Coastal Beach or tidal flat does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.27 (2)

d) Performance Standards

When a Coastal Beach, Tidal Flat or land within 100 feet of a Coastal Beach or Tidal Flat is determined to be Significant to a wetland value, the following regulations shall apply:

- (1) Any project or Activity on a Coastal Beach shall not cause an adverse effect or cumulative adverse effect by increasing erosion, decreasing the volume or changing the form of any such Coastal Beach or an adjacent or downdrift Coastal Beach.
- (2) Notwithstanding the above, beach nourishment with clean sediment of a grain size compatible with that on the existing beach may be permitted provided there is no permanent adverse effect upon the wetland values or upon submerged aquatic vegetation.
- (3) Any use or storage of vehicles including marine, land, or amphibious shall not cause an adverse effect or cumulative adverse effect on the wetland values of the Coastal Beach, nor shall that use or storage increase erosion, decrease the volume or change the form of any such Coastal Beach.
- (4) When Tidal Flats are Significant to protection of shellfish, shellfish habitat, fish or fisheries, the performance standards for Land Containing Shellfish (DWR 18.5) shall apply.
- (5) In addition to complying with the requirements of DWR 18.5, a project on a tidal flat shall have no adverse effect or cumulative adverse effect, on fisheries, vegetation, and/or Wildlife Habitat caused by alterations in water circulation, alterations in the distribution of sediment grain size, and changes in water quality, including, but not limited to, other than natural fluctuations in the levels of dissolved oxygen, temperature or turbidity, or the addition of pollutants.
- (6) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect or cumulative adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.
- (7) Refer to Section DWR 23.0 et seq. for additional project-specific performance standards.
- (8) Performance standards for activities or work proposed in the Buffer Zone to a Coastal Beach or Tidal Flat are specified in DWR 22.0.
- (9) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

18.3 Coastal Dunes

a) Preamble

Coastal Dunes aid in storm damage prevention, erosion control, and flood control by supplying sand to Coastal Beaches. Coastal Dunes protect inland coastal areas from storm damage and flooding by storm waves and elevated sea levels because such dunes are higher than the Coastal Beaches which they border. Vegetated cover contributes to the growth and stability of Coastal Dunes by providing conditions favorable to sand deposition. On retreating shorelines, the ability of Coastal Dunes bordering a Coastal Beach to move landward at the rate of shoreline retreat allows these dunes to maintain

their form and volume. Characteristics of Coastal Dunes which are critical for storm damage prevention, flood control, and erosion control include: ability of dune to erode and change in response to Coastal Beach conditions; dune volume, sediment grain size, and slope; dune form which can change with wind and natural water flow; amount, continuity, and density of vegetative cover; and ability of the dune to move landward or laterally.

Coastal Dunes are important habitats for a wide variety of wildlife, particularly birds and rare species of plants and animals where these occur, for feeding and nesting areas. Amount of vegetation, dune height and slope, and sediment grain size are all features of dunes which are critical characteristics for the protection of wildlife. The pervious nature of Coastal Dunes allows for the infiltration of surface waters and therefore recharges groundwater and public and private water supplies, and also filters out pollutants. Characteristics of Coastal Dunes which are critical to protection of aesthetic values and wetland scenic views are dune form, slope, elevation, size of dunefield, proportion and scale of dunes in relationship to other land forms. Land within 100 feet of a Coastal Dune is considered to be Significant to the protection and maintenance of Coastal Dunes, and therefore to the protection of the wetland values which these areas contain.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon a Coastal Dune or within 100 feet of a coastal dune, the Commission shall presume that the dune is Significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; coastal resiliency; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the dune does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.28 (2)

d) Performance Standards

When a Coastal Dune or land within 100 feet of a Coastal Dune is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) Any alteration of, or structure on, a Coastal Dune or within 100 feet of a Coastal Dune shall not have an adverse effect on the Coastal Dune by:
 - (a) Affecting the ability of waves to remove sand from the dune;
 - (b) Disturbing the vegetative cover so as to destabilize the dune;
 - (c) Causing any modification of the dune form that would increase the potential for storm or flood damage;
 - (d) Interfering with the landward or lateral movement of the dune;

- (e) Causing removal of sand from the dune artificially; or
 - (f) Interfering with mapped or otherwise identified bird nesting habitat.
- 2) With the exception of engineered Coastal Dunes, no new coastal revetments or coastal engineering structures of any type shall be constructed on a Coastal Dune.
 - 3) The following projects may be permitted:
 - (a) Pedestrian walkways, designed to minimize the disturbance to the vegetative cover and traditional bird nesting habitat;
 - (b) Fencing and other devices designed to increase dune development; and
 - (c) Plantings compatible with the natural vegetative cover.
 - 4) Any use or storage of vehicles including marine, land, or amphibious shall not cause an adverse effect or cumulative adverse effect on the wetland values of the Coastal Dune, nor shall that use or storage increase erosion, decrease the volume or change the form of any such Coastal Dune.
 - 5) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.37.
 - 6) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
 - 7) Performance standards for activities or work proposed in the Buffer Zone to a Coastal Dune are specified in DWR 22.0.
 - 8) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

18.4 Salt Marshes

a) Preamble

A Salt Marsh is a highly productive type of coastal wetland that produces large amounts of organic matter and provides valuable habitat. A significant portion of this material is exported as detritus and dissolved organics to estuarine and coastal waters, where it provides the basis for a large food web that supports many marine organisms, including fish and shellfish. Salt Marshes also provide spawning and nursery habitat for several important estuarine forage fish. Salt Marsh plants and substrate remove pollutants from surrounding waters. The network of Salt Marsh vegetation roots and rhizomes bind sediments together. The sediments adsorb hydrocarbons, heavy metals and other pollutants. The Salt Marsh also helps retain nitrogen and phosphorus compounds which can cause algal blooms and changes in ocean plankton and plant communities, particularly eelgrass.

The underlying peat serves as a barrier between fresh groundwater landward of the marsh and the ocean, thus helping to maintain the level of the groundwater and protecting public and private water supplies by preventing saltwater intrusion.

A notable feature of Salt Marshes is the development of Tidal Creeks within the marsh itself. The flow in Tidal Creeks is bidirectional, the channels tend to remain fairly stable and do not meander as much as streams that are subject to unidirectional flow. Tidal Creeks provide important spawning and nursery habitat for fish, invertebrates and birds and provide a conduit for energy and material exchange between the Salt Marsh and the adjacent estuary. Tidal Creeks shall be considered an element of the Salt Marsh system.

Salt Marsh vegetation, cord grass, and underlying peat and soils are resistant to erosion and dissipate wave energy, thereby providing a buffer that reduces wave damage and coastal erosion. Salt Marshes are important feeding areas for many types of fish, shellfish, invertebrates, and aquatic and terrestrial wildlife. The marsh, including its creeks and open water, also provides important shelter for many aquatic and migratory birds. Where rare species of plants and animals occur, Salt Marsh provides important Rare Species Habitat.

Salt Marshes help absorb pollutants, but there is a careful balance of nutrient and pollutant input. Because the marsh is the basis for such a large food web, bioaccumulation of pollutants and toxins can mean that relatively low levels of pollutants may be detrimental. Some of the characteristics of Salt Marshes which are critical to their health and ability to protect wetland values include: the growth, composition, and distribution of Salt Marsh vegetation; the amount of flow and level of both tidal and fresh water; the water quality (including but not limited to turbidity, temperature, nutrients, pollutants, salinity, and dissolved oxygen) of both tidal and fresh water; the presence and depth of peat; rate of marsh productivity; and the diversity of the animals and plants making up the marsh community. Salt Marshes provide excellent areas for recreational activities such as bird watching, boating, hunting, fishing and shellfishing which are important to Duxbury's economy. Salt Marshes in a natural condition are aesthetically valuable. Land within 100 feet of a Salt Marsh is considered to be Significant to the protection and maintenance of Salt Marshes, and therefore to the protection of the wetland values.

Salt Marshes serve two important roles in reducing climate change: Carbon Sequestration and Carbon Storage. Carbon Sequestration is the process of capturing carbon dioxide from the atmosphere; measured as the rate of carbon uptake per year. Carbon Storage is the long term confinement of carbon in plants and sediment and is measured as total weight of carbon stored. Coastal Wetlands may sequester carbon at the rate of two to four times greater than mature tropical forests and store three to four times more carbon per equivalent area than tropical forests. Destruction of coastal habitats has a two-fold consequence: carbon sequestration capacity is lost, and stored carbon would be released to greenhouse gasses in the atmosphere.

[\[Consider adding an additional paragraph describing the benefits of salt marshes mitigating coastal erosion and flooding and providing coastal resiliency.\]](#)

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon a Salt Marsh or within 100 feet of a Salt Marsh, the Commission shall presume

that the Salt Marsh is Significant to the protection of the following protected values:
protection of public or private water supply; protection of groundwater; flood control;

erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the Salt Marsh does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as CMR 310 10.32 (2)

d) Performance Standards

When a Salt Marsh or land within 100 feet of a Salt Marsh is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) A proposed project or Activity shall not cause any adverse effect or cumulative adverse effect upon Salt Marsh productivity and wetland values of a Salt Marsh. Alterations in growth, distribution, and composition of salt marsh vegetation shall be considered in evaluating adverse effects on productivity.
- 2) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.37.
- 3) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 4) Performance standards for activities or work proposed in the Buffer Zone to a Salt Marsh are specified in DWR 22.0.
- 5) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

18.5 Shellfish Habitat

a) Preamble

Shellfish are one of the wetland values protected by the Bylaw. Further, the protection of Shellfish Habitat is critical to the protection of shellfish regardless of the presence of shellfish at any one point in time. Shellfish Habitat is found within many of the Resource Areas protected by the Bylaw. In addition to the regulations for those Resource Areas as given above in the DWR, this section discusses additional protection for shellfish and shellfish habitat. Shellfish Habitat is important to the protection of marine fisheries in addition to the protection of shellfish. Shellfish in the Town of Duxbury are a very important recreational and commercial resource and an important economic commodity for fishermen and the Town. Shellfish used as a human food resource need very clean, uncontaminated water, since they have the ability to concentrate very low levels of pollutants. Shellfish are a valuable renewable resource. The maintenance of productive shellfish beds not only assures the continuance of shellfish themselves but also plays a direct role in supporting fish stocks by providing a major food source. Young

shellfish in the planktonic larval stage during the spring and summer months are an important food source for juvenile marine fish and many crustaceans.

Characteristics of Shellfish Habitat which are critical to the protection of shellfish include, but are not limited to: water circulation patterns, rates of water flow, and amounts of water; the relief, elevation, distribution, grain size, and pollutant load of the sediments; water quality (including turbidity, temperature, pollutants, nutrients, salinity, and dissolved oxygen); and public access to the site for the purpose of shellfishing, fishing, hunting, or navigating.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon Shellfish Habitat or the water over Shellfish Habitat or within 100 feet of such land, the Commission shall presume that the Shellfish Habitat is Significant to the protection of the following wetland values: prevention of water pollution; fisheries; shellfish; Wildlife Habitat; Recreation; aquaculture; and aesthetics. These presumptions may be overcome only upon a clear showing that Shellfish Habitat does not play a role in protecting any of the values given above.

c) Definitions

Shellfish Habitat means (1) Land Containing Shellfish or (2) the area below mean high water in any coastal Resource Area that provides or has provided characteristics including but not limited to sediment type and grain size, circulation patterns, hydrologic regime, water chemistry, plant communities and food supply, necessary to support shellfish species. Shellfish habitat shall include organisms that make up part of the food chain/web regardless of commercial value. Further, Shellfish Habitat shall be defined as those areas with currently productive shellfish populations regardless of their commercial value, areas deemed historically productive, and areas of municipal shellfish propagation efforts. Evidence of shell fragments shall be deemed as being located in shellfish habitat.

d) Performance Standards

When Shellfish Habitat or land within 100 feet of Shellfish Habitat is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) A proposed project or Activity shall not cause any adverse effect or cumulative adverse effect on Shellfish Habitat and shall not contaminate, damage, or impair shellfish, its food supply, habitat, or plant communities in that area.
- 2) Any use of amphibious vehicles shall not cause an adverse effect or cumulative adverse effect on land containing shellfish, shellfish, Shellfish Habitat, or plant communities.
- 3) A proposed project shall not adversely affect water quality (including but not limited to changes in turbidity, temperature, salinity, dissolved oxygen, nutrients and pollutants), water circulation, or natural drainage from adjacent land.

- 4) A proposed project shall not obstruct or limit the ability of the public to gather shellfish recreationally or the ability of commercial fishermen to harvest shellfish or obstruct or limit an existing aquaculture project.
- 5) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.
- 6) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 7) Performance standards for activities or work proposed in the Buffer Zone to Shellfish Habitat are specified in DWR 22.0.
- 8) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

19.0. LAND SUBJECT TO FLOODING OR INUNDATION BY GROUNDWATER OR SURFACE WATER

19.1 Land Subject to Flooding (Bordering and Isolated Land and Vernal Pools)

a) Preamble

Bordering Land Subject to Flooding provides a temporary storage area for floodwater, which has overtopped the bank of the main channel of a creek, river, or stream or the basin of a pond or lake. During periods of peak stormwater run-off, flood waters are both retained (i.e., slowly released through evaporation and percolation) and detained (slowly released through surface discharge). Over time, incremental filling of these areas causes displacement of flooding effects and increases the extent and level of flooding by eliminating flood storage volume or by restricting flows, thereby causing increases in damage to public and private properties due to flooding and erosion. Pollutants or contaminants located on Bordering Land Subject to Flooding may be washed into surface waters and subsequently into ground water, or percolate directly into ground water. Sources of pollutants within these areas will have widespread effect on wetland values.

Bordering Land Subject to Flooding provides an important source of microscopic plant and animal material which enriches the nearby water body and serves as the basis for a food web which supports fish and wildlife. Bordering Land Subject to Flooding provides important Wildlife Habitat and wildlife access to surface water resources. Bordering Land Subject to Flooding is often low and level and thus helps prevent erosion of soil into water bodies due to surface water runoff. The topography and location of Bordering Land Subject to Flooding is critical for protection of flood control capabilities. Isolated Land Subject to Flooding provides a temporary storage area where run-off and high ground water collects and slowly evaporates or percolates into the ground. These areas, often small, are usually numerous and thus very important in preventing more serious flooding somewhere else. Filling causes lateral displacement of ponded water or increased runoff onto contiguous properties, which may result in damage to those

properties or other properties. The additive nature of the flood protection provided by isolated land subject to flooding and the fact that filling one may redirect water so as to radically change watershed sizes means that small changes in one area may have a direct impact on another area. Isolated land subject to flooding helps prevent erosion by breaking up watersheds so that runoff does not become so great as to have enough force to erode soil. Areas where the isolated land subject to flooding is pervious are likely to serve as Significant recharge points to the ground water aquifer.

Contamination in these area may easily migrate into ground water and neighboring wells. Isolated land subject to flooding which is covered by a mat of organic peat or muck may help remove contaminants before the flood water enters the ground water.

Isolated Land Subject to Flooding may provide important habitat for amphibians, particularly during their breeding period, and some rare species. It may also provide important habitat for wildlife and in particular waterfowl. Both Bordering and Isolated Land Subject to Flooding are aesthetically attractive in a natural condition and provide opportunities for passive recreational activities such as hiking, wildlife-viewing, or birding. Land within 100 feet of land subject to flooding is Significant to the protection and maintenance of land subject to flooding and therefore to the wetland values of this land.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon land subject to flooding or within 100 feet of such land, the Commission shall presume that the land is Significant to mitigating the impacts of climate change and Significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation, protection of agriculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that land subject to flooding does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.57 (2) with the following addition:

Isolated Land Subject to Flooding shall include an area, depression, or basin that holds at minimum one-eighth acre-foot of water and at least six inches of standing water once a year. The Buffer Zone for Isolated Land Subject to Flooding shall extend 100 feet from the highest extent of flooding.

Vernal Pool shall include any confined basin or depression not occurring in existing lawns, gardens, landscaped areas, or driveways which, at least in most years, holds water for a minimum of two continuous months during the spring and/or summer, contains at least 200 cubic feet of water at some time during most years, is free of adult predatory fish, and provides essential breeding and rearing habitat

functions for amphibian, reptile, or Vernal Pool community species, regardless of whether the wetland site has been certified as a Vernal Pool by the Massachusetts Division of Fisheries and Wildlife and Fisheries. The presumption of essential Vernal Pool habitat value may be overcome by the presentation of credible evidence which in the judgment of the Commission demonstrates that the basin or depression does not provide the habitat functions as specified in the Bylaw regulations. The Buffer Zone for Vernal Pools shall extend 100 feet from the mean annual high-water line defining the depression.

d) Performance Standards

When Land Subject to Flooding (Bordering and Isolated Land or Vernal Pools or land within 100 feet of Land Subject to Flooding (Bordering and Isolated Land or Vernal Pools) is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) A proposed project shall not cause any adverse effect or cumulative adverse effect on the wetland values of Land Subject to Flooding.
- 2) Projects on Land Subject to Flooding shall be permitted only in connection with such procedures determined by the Commission as not having the effect of reducing the ability of the land to provide floodwater storage.
- 3) The Commission may require compensating or greater flood storage capacity in the same watershed if it permits any filling of land subject to flooding, and all filling of areas subject to flooding shall be strictly minimized. Except as stated in the preceding sentence, no proposed projects shall be permitted to displace or direct floodwaters, through fill or other means, to other areas.
- 4) Projects shall not have any adverse effect on Vernal Pools, whether certified or uncertified, provided such wetlands meet the physical and biological requirements for certification as described in the Massachusetts Division of Fisheries and Wildlife 2009 Guidelines for Certification of Vernal Pools. The Commission may require more than the minimum protective undisturbed buffer strip. These performance standards are also applicable to Vernal Pools which are Isolated Vegetated Wetlands (see DWR 19.3).
- 5) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.59.
- ~~5)6)~~ [Consider adding a standards that: Projects must show that they have taken into consideration the impacts of climate change on activities proposed on land subject to flooding.]
- ~~6)7)~~ Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- ~~7)8)~~ Performance standards for activities or work proposed in the Buffer Zone to Land Subject to Flooding are specified in DWR 22.0.

8) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

19.2 Inland Banks and Beaches

a) Preamble

Banks are areas where ground water discharges to the surface and where, under some circumstances, surface water recharges the ground water. Where Banks are partially or totally vegetated, the vegetation serves to maintain the Bank's stability, which in turn protects water quality by reducing erosion and siltation. Banks act to confine floodwaters during most storms, preventing the spread of water to adjacent land. Bank alterations which allow water to frequently and consistently spread over a larger and shallower area result in an increase in the amount of land routinely flooded and elevated water temperatures.

Banks may provide shade that moderates water temperatures as well as providing breeding habitat, escape cover and feeding areas, all of which are important for the protection of fish and wildlife, including any rare species which may occur. Banks may also help channel water and thus maintain a water depth which helps keep the water temperatures cool in warm weather, thus providing habitat necessary for both fish and the food sources for fish. Inland Banks may act as a sediment source for inland beaches. By confining floodwaters, Banks decrease the erosion of topsoil from adjacent land surfaces and help prevent flood and storm damage to buildings and roads. Confining floodwaters also decreases water pollution and helps to protect public or private water supplies by preventing floodwaters from mixing with many contaminants found on roads, near and in dwellings, from fertilized soil, from farm animals and from septic tanks. Banks may provide nesting habitat for some species of birds. Banks and particularly beaches provide wildlife and human access to water bodies for Recreation and for aesthetic enjoyment of the scenery. Land within 100 feet of inland Banks and beaches is Significant to the protection and maintenance of inland Banks and beaches and therefore to the wetland values of these Resource Areas. Land within 100 feet of a bank is likely to be Significant to the protection and maintenance of the bank, and therefore to the protection of the wetland values of these Resource Areas.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon an inland bank or beach or within 100 feet of an inland bank or beach, the Commission shall presume that the bank or beach is Significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries, protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the inland bank or beach does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.54 (2) (a), (b) and (c).

d) Performance Standards

When an Inland Bank or Beach or land within 100 feet of an Inland Bank and Beach is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) A proposed project shall not cause any adverse effect or cumulative adverse effect upon the wetland values of Inland Bank or Inland Beach.
- 2) A proposed project shall be permitted only if there is no adverse effect on bank stability, bank height, ground water and surface water quality, the water carrying capacity of an existing channel within a bank, and the capacity of the bank to provide habitat for fisheries and/or wildlife.
- 3) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.59.
- 4) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 5) Performance standards for activities or work proposed in the Buffer Zone to an Inland Bank or Inland Beach are specified in DWR 22.0.
- 6) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw

19.3 Bordering and Isolated Vegetated Wetlands (Wet Meadows, Marshes, Swamps, Bogs)

a) Preamble

Bordering and Isolated Vegetated Wetlands are areas where ground water discharges to the surface and where, in some circumstances, surface water discharges to the ground water. The profusion of vegetation and the low, flat topography of Vegetated Wetlands slow down and reduce the passage of stormwater runoff and flood waters during periods of peak flows by providing temporary flood water storage, and by facilitating water removal through evaporation and transpiration. This reduces downstream flood crests, erosion, sedimentation, and resulting damage to private and public property. During dry periods the water retained in Vegetated Wetlands is essential to the maintenance of base flow levels in streams or into the groundwater which in turn is important to the protection of water quality, public and private water supplies, fisheries and wildlife.

Wetlands are important for the prevention of pollution. The plant communities, soils, and associated low, flat topography of Vegetated Wetlands remove or detain sediments, nutrients (such as nitrogen and phosphorus), and bacteria and toxic

substances (such as heavy metal compounds) that occur in runoff and flood waters. Some nutrients and toxic substances are retained for years in plant root systems or in soils. Bordering Vegetated Wetlands in coastal areas act to filter out pollutants in flood waters and stormwater runoff, thereby protecting water quality and protecting shellfish beds in adjacent coastal Resource Areas.

Wetlands provide critical fish and Wildlife Habitat. Isolated Vegetated Wetlands can provide critical Vernal Pool habitat and Rare Species Habitat, just as Isolated Land Subject to Flooding (see DWR 19.1). Wetland vegetation provides shade that moderates water temperatures important to fish life. Vegetated Wetlands that are always wet or that are flooded by adjacent water bodies and waterways provide food, breeding habitat and cover for fish. Fish populations in the larval stage are particularly dependent upon food provided by these wetlands since they provide large quantities of microscopic plant and animal food material. Wetland vegetation provides habitat for a wide variety of insects, reptiles, amphibians, mammals and birds. Many of these, particularly insects, are food sources for fish.

Vegetated Wetlands, together with land within 100 feet of a vegetated wetland, serve to moderate and alleviate thermal shock and pollution resulting from runoff from impervious surfaces which may be detrimental to wildlife, fisheries, and shellfish downstream of the vegetated wetland. The maintenance of base flows by Vegetated Wetlands is Significant to the maintenance of a proper salinity ratio in estuarine areas downstream of the vegetated wetland. Proper water chemistry is essential to the ability of fish and shellfish to spawn successfully and for the success of fisheries and shellfisheries. A proper salinity ratio is also important for many species of fish.

Vegetated Wetlands are excellent places for birdwatching, hunting, fishing, and other recreational activities. Some Vegetated Wetlands, particularly bogs, provide habitat for rare plants and animals. Vegetated Wetlands along pond edges can prevent erosion by wind driven waves. Land within 100 feet of a vegetated wetland is considered to be Significant to the protection and maintenance of Vegetated Wetlands, and therefore to the protection of the wetland values of these Resource Areas.

Vegetated wetlands serve two important roles in reducing climate change: Carbon Sequestration and Carbon Storage. Carbon Sequestration is the process of capturing carbon dioxide from the atmosphere; measured as the rate of carbon uptake per year. Carbon Storage is the long term confinement of carbon in plants and sediment and is measured as total weight of carbon stored.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon a vegetated wetland or within 100 feet of a vegetated wetland, the Commission shall presume that the vegetated wetland is Significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection

of Rare Species Habitat, including rare plant and animal species; protection of Recreation; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the vegetated wetland does not play a role in protecting any of the wetland values given above.

c) Definition

Vegetated Wetlands are freshwater wetlands, including both bordering Vegetated Wetlands (i.e., bordering on freshwater bodies such as on creeks, rivers, streams, ponds and lakes, and bordering on coastal Resource Areas such as Salt Marshes and estuaries) and isolated Vegetated Wetlands which do not border on any permanent water body. The types of freshwater wetlands include but are not limited to wet meadows, marshes, swamps, bogs and vernal pools. Vegetated Wetlands are areas where soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground water and surface water hydrological regime, soils and the vegetation which occur in each type of freshwater wetlands, including both bordering and isolated Vegetated Wetlands, are defined under the Bylaw based on M.G.L. c. 131 s. 40, and the Massachusetts Department of Environmental Protection Guidance for Delineating Bordering Vegetated Wetlands (1995).

The boundary of Vegetated Wetland, whether Bordering or Isolated, is the line within which 50% or more of the vegetation consists of wetland indicator plants and saturated or inundated conditions exist. Wetland indicator plants shall include but not necessarily be limited to those plant species identified in the Act. Wetland indicator plants are also those classified in the indicator categories of Facultative, Facultative+, Facultative Wetland-, Facultative Wetland, Facultative Wetland+, or Obligate Wetland in the National List of Plant Species That Occur in Wetlands: Massachusetts Fish & Wildlife Service, U.S. Department of the Interior, 1988 or plants exhibiting physiological or morphological adaptations to life in saturated or inundated conditions.

The boundary shall be defined or delineated by the following:

- 1) Areas containing a predominance of wetland indicator plants are presumed to indicate the presence of saturated or inundated conditions. Therefore, the boundary as determined by 50% or more wetland indicator plants shall be presumed accurate when:
 - (a) All dominant species have an indicator status or of obligate, facultative wetland+, facultative wetland, or facultative wetland- and the slope is distinct or abrupt between the upland plant community and the wetland plant community; or
 - (b) The Commission determines that sole reliance on wetland indicator plants will yield an accurate delineation.
- 2) When the boundary is not presumed accurate as described in DWR 19.3(c)(1) or to overcome the presumption, credible evidence shall be submitted by a competent source demonstrating that the boundary of Vegetated Wetlands is the line within which 50% or more of the vegetation consists of wetland indicator plants and saturated or inundated conditions exist. The issuing authority must evaluate vegetation and indicators of saturated or inundated conditions and/or may require evidence of saturated or inundated conditions

sufficient to support wetland indicator plants, which shall include one or more of the following:

- (a) Groundwater, including the capillary fringe, within a major portion of the root zone;
 - (b) Observation of prolonged or frequent flowing or standing surface water; or:
 - (c) Characteristics of hydric soils.
- 3) Where an area has been disturbed (e.g., by cutting, filling, or cultivation), the boundary is the line within which there are indicators of saturated or inundated conditions sufficient to support a predominance of wetland indicator plants, a predominance of wetland indicator plants, or evidence that the area supported, or would support under undisturbed conditions, a predominance of wetland indicator plants prior to the disturbance or characteristic of hydric soils.

d) Performance Standards

When a Vegetated Wetland, whether Bordering or Isolated, or land within 100 feet of a Vegetated Wetland is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) A proposed project shall not cause any adverse effect or cumulative adverse effect upon the wetland values of a Vegetated Wetland.
- 2) Where an Isolated Vegetated Wetland meets the criteria for a vernal pool, whether or not it has been certified, as described in DWR 19.1, a proposed project shall not cause any adverse effect or cumulate adverse effect upon the wetland values of vernal pool habitat. Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.59.
- 3) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 4) Performance standards for activities or work proposed in the Buffer Zone to a Vegetated Wetland are specified in DWR 22.0.
- 5) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

5)6) [Consider adding a standard that: Project must show that they have taken into consideration the impacts of climate change if replication of a wetland is required including mitigation of extreme heat, resilience to extreme storm events, and changes in precipitation.]

20.0. LAND SUBJECT TO COASTAL STORM FLOWAGE

20.1. Land Subject to Coastal Storm Flowage (LSCSF)

a) Preamble

Land Subject to Coastal Storm Flowage (LSCSF) is Significant to storm damage prevention and flood control. LSCSF is also likely to be Significant to the protection of Wildlife Habitat and the prevention of water pollution.

Velocity zones (V-zones) and overwash zones (AO-zones) of LSCSF are areas which are subject to hazardous flooding, wave impact, and, in some cases, Significant rates of erosion as a result of storm wave impact and scour. V- and AO-zones in coastal areas are generally subject to repeated storm damage which can result in loss of life and property, increasing public expenditures for storm recovery activities, historic taxpayer subsidies for flood insurance and disaster relief, and increased risks for personnel involved in emergency relief programs. Alteration of land surfaces in ~~Stillwater zones- (A-zones)~~ could change drainage characteristics that could cause increased flood damage on adjacent properties.

A number of complex and inter-related factors determine the wave height and the landward extent of wave run-up in V- ~~A-~~ and AO-zones, including shoreline orientation, nearshore/offshore bathymetry, onshore topography, wave fetch, storm frequency and magnitude, and the presence of coastal engineering structures. The topography, soil characteristics, vegetation, erodibility and permeability of the land surface within V- ~~A-~~ and AO-zones are critical characteristics which determine how effective an area is in dissipating wave energy and in protecting areas within and landward of these zones from storm damage and flooding. The more gentle and permeable a seaward-sloping land surface is, the more effective that land surface is at reducing the height and velocity of incoming storm waves. Wave energy may be expended by eroding and transporting materials comprising the land surface within the V- ~~A-~~ and AO-zones, as well as by percolation or the downward movement of the stormwater runoff through more permeable land surfaces, thereby lessening the effects of backrush, scour and erosion.

Development and alteration of the LSCSF can Alter or destroy those characteristics cited above which are critical to the Resource Area values.

Dredging or removal of materials within V- ~~A-~~ and AO-zones acts to increase the landward velocity and height of storm waves, thereby allowing storm waves to break further inland and to impact upland and wetland Resource Areas which might not otherwise be impacted. Filling and the placement of solid fill structures within V- ~~A-~~ and AO-zones may cause the refraction and /or reflection of wave energy onto adjacent properties, natural resources, and public or private ways. When struck with storm waves, solid structures within V- ~~A-~~ and AO-zones also may increase localized rates of erosion and scour (Shore Protection Manual, U.S. Army Corps of Engineers, 1984, V.1, pp.5-3 and 5-5).

LSCSF (the coastal floodplain) buffers and protects upland areas from severe storm conditions. Since the floodplain contains areas where the water table is close to the surface (as well as other wetland Resource Areas) pollutants in a flood plain, including contents of septic systems and fuel tanks, may affect public or private water supplies, groundwater quality, wildlife, fisheries and shellfish during a storm. Wave impacts, inundation by floodwaters and storm-driven debris may cause direct and collateral damage to man-made structures in the floodplain. Hardened surfaces deflect wave energy; they do not dissipate it. Soft structures and surfaces dissipate wave energy and protect property. Activity Certain portions of LSCSF are Significant to the protection of Wildlife Habitat. Coastal floodplain areas are often low-lying areas that are ecologically

transitional areas between marine/estuarine ecosystems and upland areas. Resource

Areas within the 10-year floodplain are important habitats for a large variety of wildlife species, including a number of rare species. Salt Marshes provide habitat for many crustaceans and mollusks and serve as critical nursery areas for numerous finfish species which in turn provide food for species higher in the food chain, including birds, mammals, and humans. These Resource Areas provide important over-wintering and stopover areas for many species of waterfowl.

Areas of coastal floodplains adjacent to wetland Resource Areas provide important wildlife functions, such as nesting and roosting habitat, Rare Species Habitat, and wildlife corridors connecting coastal resources with freshwater wetland resources. LSCSF may be Significant to the prevention of pollution. These Significant pollution prevention areas include all areas within the 100-year floodplain that are within 100 feet of any other coastal or freshwater Resource Area. These areas can mitigate adverse effects associated with human disturbance and pollutants.

Natural or relatively undisturbed coastal floodplains can reduce erosion and sedimentation, and in a vegetated state can prevent pollutants contained in surface runoff from directly entering waterways and other wetland areas during flood events. While erosion of stream banks and shorelines is an important natural process, the design and management of activities in the floodplain should aim to avoid excessive erosion (and thus possible pollutant-laden runoff) due to human activities.

Areas of coastal floodplains which are immediately landward of Salt Marshes, coastal beaches, Barrier Beaches, Coastal Dunes or Coastal Banks are likely to be in a state of transition as the entire complex of Coastal Wetland resources gradually moves landward as a result of climate change and sea level rise. For thousands of years, relative sea level has been rising in Massachusetts, and it is still rising resulting in gradual inundation of landward area.

As sea level rises, the shoreline may retreat, and areas of the coastal floodplain will successively be inundated more frequently by storm and tidal Activity. Activities carried out within these transitional areas of coastal floodplains may interfere with the natural landward migration of the adjacent coastal Resource Areas. Maintaining these transitional areas in their natural state is Significant to the protection of the interests of other wetland resources.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon on LSCSF, the Commission shall presume that the land is Significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; coastal resiliency; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; and protection of Rare Species Habitat, including rare plant and animal species. These presumptions may be overcome only upon a clear showing that LSCSF does not play a role in protecting any of the wetland values given cited above.

c) Definitions

Land Subject to Coastal Storm Flowage (LSCSF) means land subject to any inundation caused by coastal storms up to and including that resulting from a 100 year flood as designated by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), surge of record, or flood of record, whichever is greater. An 100 year flood (or base flood as it is also referred to) means the flood having a one percent chance of being equaled or exceeded in any given year. The seaward limit is mean low water.

Velocity Zones (including V-, VE-, and Va-30) are those portions of LSCSF which are coastal high hazard areas or areas of special flood hazard extending from the mean low water line to the inland limit within the 100 year floodplain supporting waves greater than three feet height.

AO-Zones are those portions of LSCSF which are subject to inundation by moving water (usually sheet flow on sloping terrain) where average depths are between one and three feet. In Massachusetts, coastal AO-Zones are commonly associated with 'overwash' and generally border on the landward side of V-zones.

A-Zones (including A-, AE-, A1-30 and A99) are those portions of LSCSF which are subject to inundation within the 100 year floodplain by moving water and breaking waves less than 3 feet in height. The A Zone has been further divided into Moderate Wave Action (MoWA) areas and the Minimal Wave Action (MiWA) areas to reflect the different level of hazards that may occur. The boundary between these two zones is designated as the Limit of Moderate Wave Action (LiMWA). "types of 100-year flooding where stillwater flooding predominates.

AH-Zones are those portions of LSCSF which are subject to shallow flooding, usually ponding resulting from overwash, where average water depths are between one and three feet.

Moderate Wave Action (MoWA) Areas are areas of the A Zone with waves less than 3 feet in height but greater than 1.5 feet.

Minimal Wave Action (MiWA) Areas are areas landward of the LiMWA where wave heights are less than 1.5 feet.

Overwash is that portion of storm wave uprush that carries over the crest of a berm, dune bank, or man-made structure, often times depositing sediment or other storm laden material.

d) Performance Standards

When a LSCSF is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) A proposed project shall not cause any adverse effect or cumulative adverse effect upon the wetland values of LSCSF.

- 2) When LSCSF is Significant to protection of Wildlife Habitat, a proposed Activity shall not impair the capacity of LSCSF to provide important Wildlife Habitat functions. A proposed Activity shall not reduce the ability of the resource to serve as a Wildlife Habitat and migration corridor through activities such as, but not limited to, the removal of substantial vegetative cover and/or installation of fencing and other structures which prevent wildlife migration across property.
- 3) When LSCSF is Significant to pollution prevention, a proposed Activity shall not cause ground, surface or salt water pollution triggered by coastal storm flowage or flooding. For those areas within at least 100 feet of another Resource Area,

activities shall Minimize Adverse Effects in order to maintain the capability to remove suspended solids and other contaminants from runoff before it enters other Resource Areas.

- 4) For activities proposed in A-Zones, the predicted rate of relative sea level rise in Massachusetts of 2.8 feet per 100 years (based on the US National Climate Assessment) shall be incorporated into the project design and construction.
- 5) The following activities proposed within Velocity Zones (V-Zones) are likely to have an adverse effect on the protected values and are therefore prohibited:
 - (a) New construction or placement of new structures, including buildings, sheds, and garages. Existing buildings may be renovated or reconstructed with no increase in square footage but must be built using flood-resistant construction.
 - (b) Additions to existing structures, including additional floors on the existing structures.
 - (c) Paving or placement of brick or concrete block for new or existing roads, driveways and parking lots.
 - (d) New or proposed expansion of coastal engineering structures unless such structures are of a loose, sloped-stone design or greeninfrastructure and living shorelines.
 - (e) New or expanded septic systems.
- 6) The following activities proposed within AO-Zones are likely to have an adverse effect on the protected values and are therefore prohibited:
 - (a) New construction or placement of new structures, including buildings, sheds, and garages, or walls on vacant lots.
 - (b) New or proposed expansions of coastal engineering structures unless such structures are of a loose sloped-stone design or greeninfrastructure and living shorelines.
 - (c) New or expanded septic systems.
- 7) Notwithstanding the above, the Commission may permit the following activities in V-Zones and AO-Zones provided that the applicant demonstrates to the satisfaction of the Commission that best available measures are utilized to avoid or Minimize Adverse Effects on all wetland values of all Resource Areas:
 - (a) Beach, dune and bank nourishment and restoration projects that incorporate natural vegetative cover and do not otherwise impede the landward migration of these landforms or salt marsh over time.
 - (b) Elevated pedestrian walkways that are minimal.
 - (c) Piers, provided they meet the performance standards specified in DWR 23.5.
 - (d) Projects to restore Salt Marsh, freshwater wetland, shellfish habitat or fisheries.
 - (e) Improvements necessary to maintain the structural integrity or stability of

| existing coastal engineering structures.

~~(e)~~(f) Projects and activities associated with water-dependent uses such as boat yards, yacht clubs, and maritime schools.

~~(f)~~(g) Dredging, including maintenance dredging.

8) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.

~~8)~~9) [Consider adding a performance standard that: Projects must take into consideration areas of the LSCF immediately landward of coastal beach, coastal dune, salt marsh and coastal bank and their gradual lanward migration as a result of sea level rise.]

~~9)~~10) Refer to DWR 23.0 et seq. for additional project-specific performance standards.

~~10)~~11) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

20.2 Barrier Beaches

a) Preamble

Barrier Beaches protect landward areas from flooding and erosion because they provide a buffer to storm waves and to sea levels elevated by storms. Barrier Beaches provide protection from wave action for such highly productive areas as Salt Marshes, estuaries, Tidal Flats, lagoons, harbors, Salt Ponds, and freshwater marshes and ponds, which are in turn important to fisheries, shellfish, wildlife and rare species where they occur. The along-shore movement of beach sediment caused by wave action maintains Barrier Beaches. The Coastal Dunes, Coastal Beaches, and Tidal Flats of a barrier beach system are made up of sediment supplied by wind action, storm wave overwash, and tidal inlet deposition. Barrier Beaches in Massachusetts undergo a landward or along-shore migration caused by the landward and along-shore movement of sediment by wind, waves, and currents. The continuation of these processes maintains the volume of the landform which is necessary to carry out its storm and flood buffer functions. The ability of Barrier Beaches to respond to wave action, including storm overwash sediment transport is critical to the protection of the wetland values of Barrier Beaches. Barrier Beaches in a natural condition are aesthetically attractive and provide opportunities for recreational fishing, shellfishing, swimming, navigation and passive Recreation.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon a Barrier Beach or within 100 feet of a Barrier Beach, the Commission shall presume that the Barrier Beach is Significant to the protection of the following wetland values: flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; protection of aquaculture; and

protection of aesthetics. These presumptions may be overcome only upon a clear showing that the Barrier Beach does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.29 (2).

d) Performance Standards

When a Barrier Beach or land within 100 feet of a Barrier Beach is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) No proposed project which may cause an adverse effect or cumulative adverse effect upon the wetland values of a Barrier Beach shall be permitted.
- 2) No new coastal revetments or hard coastal engineering structures of any type shall be constructed on a Barrier Beach.
- 3) No activities or structures shall be permitted which prohibit the natural movement of sand and water along the beach, or which prohibit the inland migration of the Barrier Beach. The following projects may be permitted:
 - (a) Pedestrian walkways, designed to minimize the disturbance to the vegetative cover and traditional bird nesting habitat;
 - (b) Fencing and other devices designed to increase dune development; and
 - (c) Plantings compatible with the natural vegetative cover.
- 4) No activities or structures shall be permitted which increase storm damage, erosion, sedimentation, flooding of adjacent properties or Resource Areas, or which cause adverse effects on the wetland values.
- 5) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.37.
- 6) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 7) Performance standards for activities or work proposed in the Buffer Zone to a Barrier Beach are specified in DWR 22.0.
- 8) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

21.0. RIVERS

21.1. Riverfront Area

a) Preamble

Riverfront Areas are likely to protect private or public water supply, groundwater, Shellfish Habitat and fisheries. In addition, Riverfront Areas provide flood control, erosion and sedimentation control, storm damage prevention, pollution prevention, wildlife and Wildlife Habitat, Rare Species Habitat and recreational and aesthetic values. Land adjacent to rivers and streams can protect the natural integrity of these water

bodies. The presence of natural vegetation within Riverfront Areas is critical to sustaining rivers as ecosystems and providing these public values.

Riverfront Areas can be important to the maintenance of water quality and quantity for both humans and wildlife. Land along rivers in its natural state with a high infiltration capacity increases the yield of a water supply well. When Riverfront Areas lack the capacity to filter pollutants and toxins, contaminants can reach human populations served by wells near rivers or by direct river intakes, and can reach coastal estuaries where they contaminate shellfish beds. The capacity of Riverfront Areas to filter pollutants is equally critical to surface water supplies, reducing the need for treatment of drinking water. In the watershed, mature vegetation within Riverfront Areas provides shade to moderate water temperatures and slow algal growth, also improving drinking water quality.

Within Riverfront Areas, surface water interaction with groundwater significantly influences the riverine ecosystem. The dynamic relationship between surface and groundwater within the “hyporheic zone” sustains communities of aquatic organisms which regulate the flux of nutrients, biomass and the productivity of organisms including fish within the stream itself. The hyporheic zone extends to greater distances horizontally from the channel in large, higher order streams with alluvial floodplains, but the interaction within this zone is important in smaller streams as well.

By providing recharge and retaining natural flood storage, as well as by slowing surface water runoff, Riverfront Areas can mitigate flooding and damage from storms. The root systems of riverfront vegetation keep soil porous, increasing infiltration capacity and preventing erosion. Vegetation also removes excess water through evaporation and transpiration. This removal of water from the soil allows for more infiltration when flooding occurs. Increases in storage of floodwaters can decrease peak discharges and reduce storm damage. Vegetated riverfronts also dissipate the energy of storm flows, reducing damage to public and private property.

Riverfront Areas are critical to fisheries. Vegetation along rivers provides cover, increases food and oxygen, decreases sedimentation, and provides spawning habitat. Loss of surface water flow recharge as a result of impervious surfaces within the Riverfront Area may lower water levels and increase water temperatures, harming fisheries. In some cases, summer stream flows are maintained almost exclusively from groundwater recharge. Small streams are most readily impacted by removal of trees and other vegetation along the shore.

Riverfront Areas are important Wildlife Habitat, providing food, shelter, breeding, nesting, migratory, and overwintering areas for wildlife. Even some predominantly upland species use, and may be seasonally dependent on, Riverfront Areas. Riverfront Areas promote biological diversity by providing habitats for a wide variety of upland and wetland species, including bald eagles, osprey, and kingfishers. Large dead trees provide nesting sites for bird species that typically use the same nest from year to year. Sandy areas along rivers may serve as nesting sites for turtles and water snakes. Riverfront Areas provide food for species such as wood turtles which feed and nest in

uplands but use rivers as resting and overwintering areas. Riverfront Areas provide corridors for the migration of wildlife for feeding or breeding. Loss of this connective function, from activities that create barriers to wildlife movement within and across Riverfront Areas, results in habitat fragmentation and causes declines in wildlife populations.

Riverfront Areas in a natural condition are aesthetically valuable and offer opportunities for fishing, hunting, canoeing, camping, swimming and other recreational activities

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering or building upon a Riverfront Area, the Commission shall presume that the land is Significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the Riverfront Area does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.58 (2).

d) Performance Standards

When a Riverfront Area is determined to be Significant to a protected value, the following regulations shall apply:

- 1) Except as stated below, the Commission hereby incorporates 310 CMR 10.58 in its regulations for all matters related to Bylaw jurisdiction in lands within 200 feet of rivers and streams.
- 2) Notwithstanding the above, a river is any natural flowing body of water that empties to any ocean, lake, pond, other river, stream or wetland and which flows throughout the year. Perennial rivers, streams and creeks are rivers; intermittent streams are not. Notwithstanding 310 CMR 10.58, the burden of proof shall be on any applicant to show that a river, stream or creek is not perennial (i.e., is intermittent).
- 3) Notwithstanding any provisions of 310 CMR 10.58, the Commission shall presume that the mean annual high water line of a non-tidal river is coincident with the outer (landmost) boundary of any Bordering Vegetated Wetland (as defined in the DWR) that may be adjacent to the river. This presumption may be overcome upon a clear showing that the mean annual high water line is closer to the river. Such evidence may include hydrological measurements and calculations prepared by a registered professional engineer and/or hydrologist, and/or stream flow stage data from U.S. Geological Survey stream gauges and survey. For non-tidal rivers lacking any

Bordering Vegetated Wetland, the inner boundary of the 200-foot Riverfront Area shall be the top of Inland Bank as determined by the first observable break in slope or the mean annual flood level, whichever is lower. For tidal rivers, the inner boundary of the 200-foot Riverfront Area shall be the mean annual high water line.

- 4) Notwithstanding any provisions of 310 CMR 10.58, the alternatives analysis shall include only lots adjacent to the lot(s) being proposed for development, or located in the near vicinity.
- 5) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.59.
- 6) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 7) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

21.2 Fish Runs

This section applies to Anadromous/Catadromous Fish Runs, Banks along Fish Runs, and Lands Under Fish Runs

a) Preamble

Fisheries are one of the wetland values under the Bylaw. Anadromous and catadromous fish are renewable natural resources that provide recreational and commercial benefits. In addition, throughout their life cycle such fish are important components of freshwater, estuarine, and marine environments and are food sources for other organisms. Fish Runs provide habitats for other fish, shellfish and wildlife. Characteristics of Fish Runs which are critical to the protection of anadromous/catadromous fish include: ease of fish passage upstream and downstream, accessibility of spawning and nursing grounds to fish, volume and rate of water flow in both migratory and spawning areas, and water quality (including turbidity, temperature, pollutants, nutrients, salinity, pH, and dissolved oxygen). Fish Runs are important for recreational and commercial fisheries, and provide aesthetically valuable areas for such activities.

b) Wetland Values and Presumption of Significance

Whenever a proposed project involves removing, filling, dredging, altering, or building upon a Fish Run or within 100 feet of a Fish Run, the Commission shall presume that the Fish Run is Significant to the protection of the following wetland values: prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the Fish Run and the land under a Fish Run does not play a role in protecting any of the wetland values given above.

c) Definitions – Same as 310 CMR 10.35 (2).

d) Performance Standards

When a Fish Run or land within 100 feet of a Fish Run is determined to be Significant to a wetland value, the following regulations shall apply:

- 1) A proposed project shall not cause an adverse effect or cumulative adverse effect upon the wetland values of a Fish Run.
- 2) Proposed projects shall not be permitted to fill a Fish Run, impede the upstream or downstream migration of fish, or change the volume, rate or quality of water flow or water quality in a Fish Run.
- 3) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.37 for Coastal Resource Areas or 310 CMR 10.59 for Inland Resource Areas.
- 4) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 5) Performance standards for work or activities proposed in the Buffer Zone to a Fish Run are specified in DWR 22.0.
- 6) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

22.0. BUFFER ZONE

a) Preamble

The 100-foot Buffer Zone to Resource Areas specified in the Bylaw and in DWR 2.0 (1-5) provides critical protection for Resource Areas. Most human activities likely to come under the review of the Commission take place in the Buffer Zone.

Adverse effects to Resource Area buffers are likely to have an adverse effect on the wetland values. Buffers reduce the adverse effects of adjacent land uses on wetlands. Wetlands with important functions and values or wetlands which are sensitive to disturbance will require greater buffers to reduce the risk of disturbance. Wetland functions, values, and sensitivity are attributes that will influence the necessary level of protection for wetlands. Where wetland systems are rare or irreplaceable (e.g., high quality estuarine wetlands, mature swamps, and bogs) larger buffer widths will ensure a lower risk of disturbance. A buffer is necessary to protect a wetland from direct human disturbance in the form of human encroachment (including, but not limited to, foot traffic, trampling, debris, noise). The appropriate width to prevent direct human disturbance depends on the type of vegetation, the slope, and the adjacent land use.

A Buffer Zone in a Naturally Vegetated Condition can act like wetlands in removing nitrogen and phosphorus from entering receiving waters by serving as sinks, filters and transformers of suspended and dissolved nutrients. As nutrient concentrations in water

increase, the likelihood of algal blooms and eutrophication increases, resulting in lower oxygen levels. A buffer can remove 50-100% of sediments via filtration through natural organic litter. Absorption of ground water via mature trees can take up 14 times more water than an equivalent area of grass. Bank and stream channel stability is dependent on the anchoring ability of root systems and slowing of runoff velocity and flow diffusion provided by the buffer. Vegetation in the buffer can act to moderate water column temperatures and levels of dissolved oxygen.

The buffer provides corridors and connector and dispersal routes for wildlife, as well as habitat for breeding, nesting, development, feeding, basking, cover, hibernation, aestivation, and migratory activities.

Buffers reduce wetland impacts by moderating impacts of stormwater runoff including stabilizing soil to prevent erosion; filtering suspended solids, nutrients, and harmful or toxic substances; and moderating water level fluctuations. Buffers help to prevent water pollution and protect public or private water supplies. They reduce the adverse impacts of human disturbance on wetland habitat including blocking noise and glare; reducing sedimentation and nutrient input; reducing direct human disturbance from dumped debris, cut vegetation, and trampling; and providing visual separation. They also provide essential habitat for wetland-associated species for use in feeding; roosting; breeding and rearing of young; and cover for safety, mobility and thermal protection.

Uplands immediately adjacent to wetlands vary in their ability to reduce adverse effects of development, most importantly in relationship to slope and vegetative cover. Buffers with dense vegetative cover on slopes less than 15% are most effective for protection of water quality. Dense shrub or forested vegetation with steep slopes provide the greatest protection from direct human disturbance. Appropriate vegetation for Wildlife Habitat depends on wildlife species present in the wetland and buffer.

Land uses associated with Significant construction and post-construction impacts need greater buffers. Construction impacts include erosion and sedimentation, debris disposal, vegetation removal and noise. Post-construction impacts are variable depending on the land use, but residential land use, in particular, can have Significant impacts. Residential land use is associated with yard maintenance debris, domestic animal predation, removal of vegetation and trampling, nitrogen and phosphorus loading, and excessive herbicide and pesticide application. Buffers in a natural condition are aesthetically and economically valuable. Buffers provide recreational opportunities for hunting, fishing, walking, photography and other recreational activities.

To retain wetland-dependent wildlife in important wildlife areas, buffers need to retain plant structure. This is especially true where open water exists or where the wetland is used extensively by migratory or overwintering birds or rare species. Priority species may need even larger buffers to prevent their loss due to disturbance or isolation of subpopulations.

[Uplands immediately adjacent to coastal Resource Areas are likely to be in a state of](#)

transition as sea levels rise, and the entire complex of coastal wetland resources gradually moves landward. Therefore, maintaining these areas in their natural state is necessary to protect the interests of other wetland resources.

Notwithstanding the critical importance of the Buffer Zone for protection of Resource Area values, there may be some minor or temporary work or activities which may have no adverse effect or cumulative adverse effect upon the wetland values. Such work or activities may be allowable within the outer portion of the Buffer Zone, provided the Commission finds that there is no adverse effect or cumulative adverse effect upon the wetland values.

b) Wetland Values and Presumptions of Significance

The Buffer Zone is Significant to the wetland values of the Resource Area which it borders. In addition, where rare species or vernal pools occur in the Buffer Zone, the Buffer Zone itself is Significant for protection of rare species, Rare Species Habitat, vernal pool organisms, and vernal pool habitat, respectively.

Where a project involves removing, building upon, degrading, or otherwise altering a Resource Area buffer adjacent to a Resource Area specified in DWR 2.00 (1-5), the Commission shall presume that such area is Significant to, or will have a cumulative effect upon, the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of wildlife and Wildlife Habitat; protection of Rare Species Habitat, including rare plant and animal species; protection of Recreation; and protection of aesthetics. This presumption may be overcome upon a clear showing that said land does not play a role in protecting any wetland values given above.

If the Resource Area buffer has already been altered and/or encroached upon, the Commission shall presume that there already exists a Significant adverse effect or cumulative adverse effect upon the wetland values of the Resource Area. This presumption may be overcome upon a clear showing that there is no Significant or cumulative effect the protection of said wetland values.

c) Definition

Buffer Zone is the area within 100 feet of any Resource Area specified in DWR 2.0 (1-5), excluding the Buffer Zone itself, Land Subject to Coastal Storm Flowage, and the Riverfront Area. The buffer width shall be measured horizontally in a landward direction from the Resource Area boundary as surveyed in the field.

Special Transitional Areas are areas within the Buffer Zone that are located immediately landward of coastal beaches, coastal dunes, barrier beaches, coastal banks, or salt marshes, extending from the edge of the Resource Area to the edge of the Buffer Zone.

d) Performance Standards

- 1) The intent of the Commission is to move all structures and activities as faraway

as possible from any Resource Area, in order to protect the wetland values of Resource Areas.

- 2) Buffer zones shall be retained and maintained in a Naturally Vegetated Condition. Where Buffer Zone disturbance has occurred during construction, revegetation with native vegetation may be required.
- 3) Fences shall not significantly hinder wildlife movement.
- 4) Pruning or selective cutting of vegetation for vista viewing or control of invasive or noxious plants may be permitted.
- 5) Herbicide/pesticide use shall be with the permission of and at the discretion of the Conservation Commission or the Commission's designee.
- 6) The Commission may require that already-altered Buffer Zone be restored in order to protect or improve Resource Area values. Restoration means planting native vegetation, grading, improving site drainage, removing debris, or other measures which will improve, restore and protect the wetland values of the Resource Area.
- 7) [Consider adding a standard that requires elevating structure on piles within certain areas of the LSCF]
- 8) [Considering adding a standard: To allow natural migration of resources in Special Transitional Areas:
 - No ground level structures will be placed in areas that would inhibit migration of coastal resources.
 - 6) Vegetated areas be preserved in location anticipated to allow migration of coastal resources.
- 7) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.37 for Coastal Resource Areas or 310 CMR 10.59 for Inland Resource Areas.
- 8) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- 9) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

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23.0. PROJECT-SPECIFIC PERFORMANCE STANDARDS

The following performance standards shall be applied to projects that are proposed in any of the Resource Areas as defined herein. The Commission has frequently reviewed certain activities and as a result has developed standards that the Commission feels are sufficient in most cases to protect the wetland values of each affected Resource Area. In addition to the following specific performance standards, the Commission may require a Conservation Restriction on land associated with new projects in any Resource Area defined herein, if the Commission deems it necessary to protect the wetland values of the Resource Area.

Each project is evaluated on its own merits and any previously approved project does not set any precedent.

23.1. Septic Systems

a) Subsurface Disposal of Sanitary Sewage (Title 5)

The State Environmental Code (310 CMR 15.00 et seq.), administered locally by the Town of Duxbury Board of Health, is a minimal public health regulation that may be supplemented at the local level. This code was developed to protect public health against bacteria-caused disease; it was not designed to protect public health from viral contamination nor was it designed to protect environmental quality from septic-derived

nutrient and toxic contamination. The use of septic systems is likely to have a Significant or cumulative adverse effect on the protection of public and private water supply; protection of ground water; flood control; erosion and sedimentation control; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and Wildlife Habitat; protection of rare species, including rare plant and animal species; protection of Recreation; protection of agriculture; protection of aquaculture; and protection of aesthetics.

b) Presumptions concerning Septic Systems

- 1) A septic system is presumed to protect the wetland values when it is sited according to the provisions of Title 5 and the Duxbury Board of Health regulations and when it meets the Duxbury Conservation Commission standards for setbacks outlined in Section 23.1(b)(3).
- 2) Any proposed septic system or repair to an existing septic system that does not meet the provisions of Title 5 or the Duxbury Board of Health Regulations or the Duxbury Conservation Commission standards for setbacks from Resource Areas shall be presumed to have a Significant or cumulative adverse effect on the wetland values specified in DWR 2.0.
- 3) **Septic System Location.** A septic system is considered to be properly sited only if all of the following conditions are met:
 - (a) None of the septic system components is located within any Resource Area as defined in DWR 2.00 (1-6) or within 100' of a river.
 - (b) The leaching field is not located in the V-Zone portion of LSCSF.

Commented [RK1]: The supplementary regulations for Title V have different setbacks (example: 150 ft from salt marsh, etc.)

c) Existing Septic Systems

The minimum 100-foot setback requirement shall not be required for the renovation or routine replacement of septic systems provided that no alternative location is available on the lot or other parcel under the ownership or control of the owner of the system proposed for upgrade, and, where applicable, provided that variance of property line and/or street layout setbacks have been applied for from the Town of Duxbury Board of Health.

The setback requirement from the wetland Resource Areas listed in DWR 23.0 shall be required for any enlargement of a system which accompanies expanded scope of use, or an increase in flow.

d) Presumption Concerning Board of Health Variance

If a proposed septic system requires a variance from the requirements of 310 CMR 15.00 and/or the Duxbury Board of Health regulations, it is presumed that the septic system does not protect the wetland values of the Resource Area.

23.2 Pools, Tennis Courts, and Sport Courts

- a) The intent of the Commission is to move all structures and activities as far away as possible from any Resource Area.
- b) The Commission may at its discretion allow a proposed pool, tennis court, or sport court and all associated structures and facilities including associated grading if they are at least 50 feet from a Resource Area, as defined in DWR 2.0 (1-5) if it is satisfied that mitigation required in the Order of Conditions is sufficient to protect the Resource Area.
- c) No mitigation is sufficient to allow a pool, tennis court, or sport court and all associated structures and facilities including associated grading less than 50 feet to a Resource Area, as defined in DWR 2.0 (1-5).

23.3 Landscaping

No lawns, patios, walkways, driveways, or similar structures may be constructed within 25 feet of any Resource Area, as defined in DWR 2.00 (1-5). [\[Assuming this doesn't include walkways permitted in specific section. Consider saying "Except as permitted under Sections XX, XX, XX."\]](#)

23.4 Coverage

Total coverage of any type shall not exceed 15% in residential zoned areas in the Buffer Zone to any Resource Area as defined in DWR 2.00(6). Coverage calculations shall include, but not be limited to, all structures, impervious driveways, impervious walkways, impervious roadways, decks, pools, tennis courts, and any other similar surfaces that cover the ground. For the purpose of coverage calculations, all roof overhangs, eaves, cantilevered portions of buildings or other structures onto which precipitation may be redirected shall be considered in the coverage calculation. For the purpose of coverage calculations, any hardened surface shall be considered impervious regardless of its ability to absorb precipitation or runoff. The Commission may consider greater than 15% coverage on a lot where both the wetlands resource and the Buffer Zone are located substantially outside of the lot.

23.5 Hardened Surfaces in Land Subject to Coastal Storm Flowage

The Commission wishes to limit hardened surfaces in Town of Duxbury coastal areas that contain AO-zone and V-zone flood hazard areas. The energy in these flood zones is dissipated by soft, relatively flat surfaces. Limiting the amount of hard impervious surfaces is necessary to preserve the values of flood control, prevention of storm damage, prevention of pollution, and public safety. In light of this, an application must be filed with the Commission prior to the installation or replacement of hardened surfaces including patios, walkways, driveways or similar structures in FEMA floodmap AO and V Zones.

- a) For the purposes of coverage calculations any hardened surface shall be considered impervious regardless of its ability to absorb precipitation or runoff.
- b) The total combined area of the impervious patios, walkways, driveways, or similar structures shall not exceed 500 square feet.
- c) Impervious walkways shall be no more than 36 inches wide.

23.6 Piers

The construction, use and maintenance of Piers may cause Significant, immediate and or cumulative adverse effect on the following Resources: shellfish, fisheries and Wildlife Habitat. The construction and use of Piers may also have an adverse effect related to aesthetics, erosion and sediment control, aquaculture, and Recreation and may increase the risk to coastal resources from storm damage.

Turbulence and prop dredging generated by boat traffic can significantly increase local turbidity levels. High turbidity levels attenuate the sunlight necessary to sustain benthic macrophytes (e.g., eelgrass and widgeon grass) and benthic microalgae. The suspended sediments may settle on shellfish beds, smothering existing shellfish and altering the quality of the sand bottom essential for spat (mollusk larvae) settlement. Resuspension of bottom sediments may cause redistribution of sediments, alteration in sediment grain size distribution, and changes in bottom topography relief, elevation and grade, including creation of depressions on the bottom. Resuspension of sediments during the period of shellfish larval settlement may hinder or prevent the effective settlement of shellfish larvae. Boat traffic generated from Piers may add to this disruption and may cause erosion of banks and marshes. The compacting of sediment by vehicular traffic will affect the productivity of Shellfish Habitat.

While a pier may be the least environmentally destructive method of crossing a marsh, it may adversely affect the physical characteristics and functional value of a marsh. Marsh plants provide the major energy flow (detritus food chain) between the autotrophic and heterotrophic levels in a marsh-estuarine system. Many species of sport and commercial fish and shellfish are dependent upon this system. Plants adapted to high ambient light intensity, such as marsh grasses, are ill-adapted to the shaded conditions created by a Pier. Shading may result in the loss of vegetative biomass (decreased plant height, population density, and leaf thickness) or alteration of species composition. Reductions in plant density result in the loss of sediment normally trapped by roots and culms. Tidal washout of sediment could result in localized depressions which, through evaporation of trapped water, concentrate salt. High sediment salt levels effectively preclude recolonization by original vegetation. Localized tidal washout may lead to further vegetative regression, extension, and disruption of natural communities in the area.

Propeller turbulence near or in areas of submerged aquatic vegetation, such as eel grass, or Salt Marsh damages vegetation.

Cumulative impacts of the construction, maintenance and use of Piers threaten to decrease the overall productivity of the marsh ecosystem, to reduce its ability to absorb storm wave energy, and to reduce its contribution to groundwater and surface water quality.

Piers placed in Shellfish Habitat may have an adverse impact on the Resource Area value of aquaculture. The placement length and size of the Pier and the floats can interfere with the harvesting of shellfish.

Piers, depending on their length, can have an adverse impact on Recreation by interfering with recreational boating activities and if not properly designed, Piers can interfere with intertidal lateral access for recreational fishing and fowling. Any proposal that affects Navigation is likely to have a Significant or cumulative adverse effect on Recreation. Depending on their height, length, compatibility with surrounding environs and overall visibility, Piers can create an adverse impact to the aesthetics of the area.

No Pier may cause an adverse effect or cumulative adverse effect to any Resource Area, except as permitted below:

- a) No more than one Pier shall be permitted to be constructed or located on any residential property or parcel of land at any time.
- b) In addition to meeting performance standards for Resource Areas, construction of Piers shall not adversely affect the following: shoreline movement of sediments, shellfish habitat, fisheries and fish habitat, water quality, nor shall it obstruct shellfishing or obstruct the reserved public rights of fishing, fowling, navigation, or passage, or significantly destroy a public view or degrade aesthetic value. No solid fill Piers shall be permitted. No creosote wood or CCA-treated wood (i.e., copper-chromium-arsenate-treated wood) shall be permitted.
- c) Any pilings permitted shall be driven, not washed or jetted, into any Salt Marsh.
- d) In areas or locations where a Pier extends over Salt Marsh, no Pier shall extend any greater distance than necessary to reach just beyond the Salt Marsh. In order to protect the wetland values of Salt Marshes, to protect Navigation, and to protect the Salt Marsh from erosion, no Piers will be allowed within tidal creeks. In areas where the Pier does not extend over Salt Marsh, the Pier length shall be minimized to the greatest extent possible and shall not extend into shellfish habitat.
- e) The intent of the Commission is to have the size of all Piers be as small as possible to avoid or Minimize Adverse Effects and cumulative adverse effects upon the wetland values. The Commission may allow at its discretion, a walkway no greater than 4 feet wide at any point; a walkway and platform up to 200 feet long from the landward limit to the seaward edge of the platform (including the pilings, walkway, platform, and any tie-off pilings); a platform no greater than 6 feet by 8 feet including the walkway; and only one float no greater than 10 feet by 20 feet.
- e)f) [\[Consider allowing a higher elevation for resilience\]](#)
- f)g) Railings and walkways shall be as unobtrusive as possible and their construction shall be of such material, color, shade and tone as to blend in with the natural

surroundings.

- g)h) No oil or hazardous material shall be stored on any element of the Pier structure.
- h)i) No floats may be stored in a wetland Resource Area.
- i)j) Piers shall be constructed using procedures determined by the Commission to be the best available measures to Minimize Adverse Effects and cumulative adverse effects on wetland values of the Bylaw.
- j)k) Float stop piles are not permitted.
- k)l) Boat lifts are not permitted.

23.7. Underground Storage Tanks

No underground storage tank for oil or hazardous material is permitted in any Resource Area as described in DWR 2.00 (1-5, 7) or within the Riverfront Area.

23.8. Filling

- a) No fill shall be placed in any Resource Area or any Buffer Zone so as to Alter the flow of surface water in a way that the Commission feels will adversely affect the wetland values of the Resource Area(s).
- b) No filling or excavation or other alteration of Salt Marshes shall be permitted.
- c) The Commission at its discretion may allow the filling of up to 2,500 square feet of Vegetated Wetland for a Limited Project, if satisfied that mitigation required in the Order of Conditions is sufficient to protect the Resource Area. If filling is allowed, the Commission may require replication of the wetland at a ratio of at least 2:1 in an area that is hydrologically suitable for supporting wetland functions, hydrologically connected to the altered wetland and must be accomplished by using wetland soils and by using native wetland plant species removed from the area to be filled. The replicated wetland must be established prior to commencing the upland Activity. The replicated wetland must be monitored for at least two growing seasons and must be maintained as a functional wetland with wetland values at least equaling those of the filled wetland for at least five years following the completion of the main project.
- d) A bridge covering a Resource Area is considered fill.
- e) Compatible fill shall be used for beach and dune nourishment projects. Compatible fill means clean sediment of a grain size that is approximately the same as the area being nourished (e.g., if the area being nourished consists of gravel, sand, silt or clay, then the fill brought in for nourishment should be gravel, sand, silt or clay). Clean means the sediment does not contain contaminants and is free of debris.
- f) Dumping of lawn wastes, brush or leaves or other materials or debris is considered filling and is not permitted in any Resource Area.

g) The Commission is authorized to deny any filling of any Resource Area in order to protect the wetland values of the Resource Area.

h) [Consider adding an additional provision for flood control structure otherwise permitted by state and federal law]

i) [Consider adding an exemption for restoration projects]

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23.9 Structures

- a) The intent of the Commission is to move all structures and activities as far away as possible from any Resource Area.
- b) The Commission may at its discretion allow a proposed structure on a wall-type foundation within 50 feet of the Resource Area, as defined in DWR 2.0 (1-5), if satisfied that mitigation required in the Order of Conditions is sufficient to protect the Resource Area. This measurement is made from the Resource Area to the part of the structure that is closest to the Resource Area.
- c) No mitigation is sufficient to allow a structure on a wall-type foundation less than 50 feet to a Resource Area, as defined in DWR 2.0 (1-5). This measurement is made from the Resource Area to the part of the structure that is closest to the Resource Area.
- d) The Commission may at its discretion allow a structure on an open pile foundation within no closer than 35 feet of a Resource Area, as defined in DWR 2.0 (1-5). This measurement is made from the Resource Area to the part of the structure that is closest to the Resource Area.
- e) No mitigation is sufficient to allow a structure on an open pile foundation less than 35 feet to a Resource Area, as defined in DWR 2.0 (1-5).
- f) New structures and substantially renovated or reconstructed structures on any Barrier Beach are required to be constructed on an open pile-type foundation.

23.10 Sheds

Sheds up to 192 square feet built on open-pile foundations and located 75 feet or more from the edge of Bordering Vegetated wetlands (BVW) do not require a permit under this Bylaw.

23.11 Decks

Reconstruction of an existing deck with no increase in size on an open-pile foundation that is located 75 feet or more from Bordering Vegetated Wetlands (BVW) does not require a permit under this Bylaw.

23.12 Rain Gardens and other Stormwater Absorbtion Structures

Rain gardens and other constructed stormwater retention and treatment systems shall be considered protected Resource Areas subject to protection under the DWR upon completion and establishment of wetland vegetation or habitat unless it can be demonstrated that, but for the continued contribution of runoff through the

stormwater system, the rain garden and associated vegetation and habitat would not exist.

23.13 Other – RESERVE

23.14 Hardened Surfaces in LSCF

[Consider adding an additional section for hardened surfaces in LSCF] “Limiting the amount of hard impervious surface is necessary to preserve the wetland values of flood control, prevention of storm damage, prevention of pollution, and public safety. In light of this, a request for a Notice of Intent must be filed with the Commission prior to the installation or replacement of hardened surfaces including patios, walkways, driveways or similar structures in FEMA flood map AO and V Zones flood areas.”

23.13

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