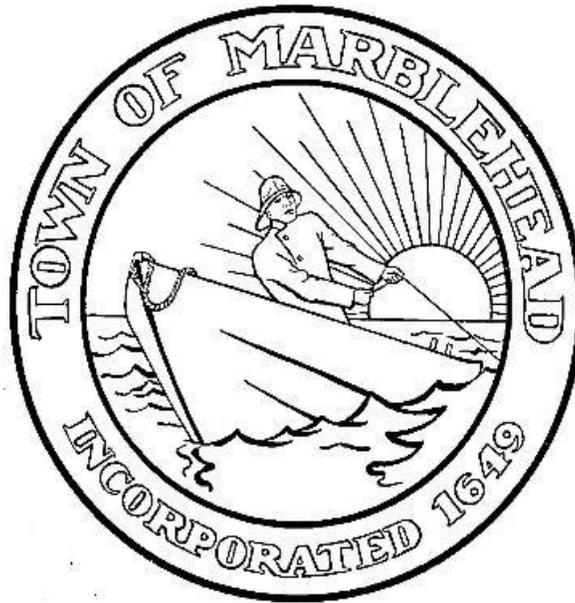


GREEN INFRASTRUCTURE FEASIBILITY REPORT

Green Infrastructure Feasibility Report

Marblehead, MA



June 2022

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Section 1 – Report Overview

Introduction

Bobrek Engineering & Construction, LLC (BEC), on behalf of the Town of Marblehead, MA has prepared this Green Infrastructure Feasibility Report as required for Year 4 as part of Minimum Control Measure (MCM) 5: Post-Construction Stormwater Management in New Development and Redevelopment. The intent of this report is to assess the current local regulations for language that permits or encourages the use of green infrastructure in private and municipal site design and as a Low Impact Development (LID) alternative to conventional stormwater management.

Green infrastructure is a method of decentralizing the stormwater management system and addressing the excessively high stormwater runoff volumes and pollutants negatively impacting natural water resources. Using strategies such as green roofs, bioswales or rain gardens, permeable paving, and preserving green space and existing vegetation helps rain to be captured and absorbed by soil and plants where it falls. This infrastructure can be incorporated into the impervious built environment, such as streets, parking lots, sidewalks, and roofs, to help manage storm water using natural processes to capture and permeate runoff on-site. The incorporation of green infrastructure in development and redevelopment projects can reduce the volume and rate as well as improve the quality of stormwater going into local waterbodies, which aligns with the goals of Marblehead’s Stormwater Management and Erosion Control Bylaw.

There are also many other benefits and opportunities for residents if green infrastructure can be more easily implemented and encouraged in the permitting processes for developments and redevelopments. The vegetation utilized with green infrastructure improves air quality, captures greenhouse gases, and reflects heat more than paved surfaces, reducing ‘urban heat island’ effects. Integrating more green infrastructure in communities can improve residents’ quality of life. For example, the use curb bump outs can slow down traffic and make shorter street-crossing areas which can improve public safety. Raingardens and such vegetated buffers can also improve property aesthetics, and public access to infrastructure such as constructed wetlands can provide recreational opportunities. Water harvesting using rain barrels and cisterns can help with water conservation and efficiency during times of drought in the summer months by reducing stormwater discharge and creating opportunities for water reuse for non-potable purposes.

This report includes an assessment of Marblehead’s town regulations that pertain to stormwater management through green infrastructure practices. The assessment compares subdivision bylaws, zoning b-laws, stormwater bylaws, and other local provisions to LID standards sourced from the Sustainable Neighborhood Road Design Guidebook for Massachusetts. Recommendations are provided for changing design requirements and language that clarifies the acceptance, encouragement, and incentivization of green infrastructure practices. The assessment was facilitated by the Pioneer Valley Planning Commission checklist, the “Assessment of Street Design and Parking Lot Guidelines and Feasibility of Allowing Green Infrastructure”. The Planning, Conservation, and Public Works Departments also cooperated to discuss current standards and revisions to be made.

Section 2 – Current Green Infrastructure Regulations

Marblehead's local by-laws were reviewed to locate language related to the permittance or encouragement of green infrastructure, as well as identify language that directly conflicts with the use of these practices. See Appendix A: Green Infrastructure Feasibility Checklist for a list of standards that was searched for within town regulations. The Planning and Conservation Departments also subjectively review site plans that may contain green infrastructure, so their review processes are also discussed in this section.

2.1 Green Roofs

There is no language in the local regulations that explicitly permit the use of green roofs. In the building code, it specifies that roofs shall be covered with a fire-resistive material such as metal, tile, slag, gravel, slate, asbestos shingles, or surfaced asphalt shingles (30-32). However, it's not specified that green roofs or alternative roofs would be acceptable options.

2.2 Infiltration practices

The Stormwater Management and Erosion Control bylaw highlights promoting infiltration and recharge of groundwater as a main objective. Infiltration practices that are identified within the subdivision bylaws are detention/retention ponds [§258-17C (3)(c)], leaching systems, and grassed swales [§258-17C(3)(d)]. Other infiltration systems, such as rain gardens and planter gardens are not acknowledged as being stormwater management options. Rain gardens have been encouraged by the Drain Department in posts on the town website to promote infiltration of stormwater, referencing to the Greenscapes' Rain Garden brochure. Permeable paving is also not specified as permitted in the local regulations. However, the Conservation Commission has reviewed special permits of site plans including rain gardens, vegetated buffer strips, and permeable driveways. These infiltration practices have been approved in the past with Order of Conditions that include maintenance plans.

Curb extensions are not overtly mentioned in the subdivision b-law on road width [§258-17B (3)(c)] and curbing [§258-20F (7)]. However, the idea of curb extensions aligns with the town's policy on Complete Streets, which encourages more compact roadways to make it safer for citizens, by making crossing distances shorter and slowing oncoming traffic.

2.3 Water-harvesting

The use of rain barrels or cisterns to collect rainwater for non-potable uses is not mentioned in the local regulations. Rain barrels have been encouraged by the town's Water and Sewer Commission for use on a homeowner level.

Section 3 – Recommended Changes

3.1 Amend Local Regulations to Include Green Infrastructure as a Permitted Option

Language on the permittance of green infrastructure should be added and referenced throughout various bylaws when referring to stormwater management and impervious surfaces. A sub-section on green infrastructure could be added to the Stormwater Management and Erosion Control Bylaw (Part I, General Bylaws, Chapter 195) that concretely permits and encourages the use of such practices. This section could also be referenced throughout the Subdivision Bylaws (Part III, Rules and Regulations, Chapter 258) when specifying standards for rights-of-way, streets, curbing, and sidewalks. Green infrastructure should be

specified as an option within the Storm Drainage System for Streets section of Design Standards for Subdivisions [§258-17C (3)].

Green infrastructure can also be referenced as an option in parking area design specifications within the Zoning Bylaw (Part II Zoning Bylaw, Chapter 200 Zoning, Article VI Parking Requirements). Water infiltration areas, such as rain gardens, may be incentivized by counting them as open space [§200-23] in parking areas, so developers may not have to apply for special permit for reductions of open space with the integration of green infrastructure practices.

Green roofs may also be allowed through a special permit or by right within the building codes for roofs (Chapter 30 General Building Requirements, Section 32 Roof Covering). Water harvesting using rain barrels and cisterns may also be specified to allow the reuse of rainwater for outdoor watering of vegetation or non-potable indoor uses, which may be mentioned within General Building Requirements and the Stormwater Management and Erosion Control Bylaw. Reference the Green Infrastructure Feasibility section of the checklist (Appendix A) for more recommendations.

The Smart Growth Overlay District may also be a good starting point for prioritizing green infrastructure within the community of Marblehead [§200-43]. The Smart Growth plan aims to concentrate growth, promote compact built environments with a mix of housing transportation and employment. Green infrastructure can easily be integrated into compact site designs with rain gardens and swales in medians and parking strips as well as permeable pavement in parking lots, streets, and walkways. Smart Growth is implemented in the two districts, the SG Pleasant Street District and the SG Vinnin Square District. Green infrastructure could be another design consideration or requirement in these areas when it is appropriate.

3.2 Provide Incentives for the Use of Green Infrastructure

The use of green infrastructure can also be incentivized for planned and existing developments. Incentives may be awarded for retrofit projects that incorporate LID practices at existing developments. Incentives may also be used a method of encouragement for developers to incorporate green infrastructure when planning, designing, and constructing their projects. The EPA recommends four common types of local incentive mechanisms: stormwater fee discounts or credits, development incentives, rebate and installation financing, and awards and recognition programs. The Drain Department as well as Water and Sewer Department could be involved in promoting and implementing some of these incentives since they have already supported the idea of green infrastructure in the past.

Section 4 – Schedule of Implementation

The following table shows the planned schedule for reviewing, drafting, and implementing recommendations:

Tasks	FY2023	FY2024	FY2025
Review all recommended regulation changes and evaluate impacts to the Town			
Draft language for subdivision and zoning regulation revisions			
Draft language for Low Impact Development regulations			
Incorporate changes to Subdivision and Zoning regulations			
Implement Low Impact Development regulations			

It is the Town’s objective to consider all recommendations from both BEC and a regional report conducted by the Merrimack Valley Planning Commission and Greenscapes North Shore Coalition, *Municipal Stormwater Codes: A Regional Review for Northeast Massachusetts*¹. Each of these reports detail specific regulatory revisions that incorporate LID and green infrastructure, but the Town of Marblehead aims to use revisions that are within the capacity of the town staff and are practical for specific characteristics of the community. The Town’s goal is to evaluate the impacts of each recommended change in the first year of the implementation plan (FY2023). Simultaneously, as these changes are reviewed, language will be drafted for Subdivision regulations, Zoning regulations, and most likely the addition of a Low Impact Development component to the Stormwater Management and Erosion Control Bylaw (FY2023-FY2024). Finally, the Town intends to implement all changes to existing regulations and addition of a LID component by FY2025.

Section 4- Conclusions

The Environmental Protection Agency is requiring MS4 communities to make Low Impact Development (LID) more feasible for developers. Even though these communities may already encourage or incorporate LID language into public education or bylaws, subdivision and zoning bylaws tend to unintentionally limit the ability of developers to implement LID techniques. BEC has provided the Town of Marblehead with an assessment of their local rules and regulations pertaining the permittance of Green Infrastructure (GI), which includes green roofs, water-infiltration, and water harvesting. In addition, BEC has recommended amendments to local bylaws that would align with LID purposes and general suggestions for promoting and incentivizing green infrastructure for stormwater management.

¹ [Municipal Stormwater Codes: A Regional Review for Northeast Massachusetts \(greenscapes.org\)](https://www.greenscapes.org/)

Appendix A – Green Infrastructure Feasibility Checklist

INTRODUCTION

ASSESSMENT OF STREET DESIGN AND PARKING LOT GUIDELINES AND FEASIBILITY OF ALLOWING GREEN INFRASTRUCTURE



NPDES MS4 Community: Marblehead

Pioneer Valley Planning Commission, February 2022

Introduction
The United States Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts (MS4) (with modifications effective on January 6, 2021) requires the development of two local assessments within four (4) years of the effective date of the permit as follows:
2016 Massachusetts Small MS4 General Permit, Section 2.3.6.b: Assessment of Street Design and Parking Lot Guidelines
Within four (4) years of the effective date of this permit, the permittee shall develop a report assessing current street design and parking lot guidelines and other local requirements that affect the creation of impervious cover. This assessment shall be used to provide information to allow the permittee to determine if changes to design standards for streets and parking lots can be made to support low impact design options. If the assessment indicates that changes can be made, the assessment shall include recommendations and proposed schedules to incorporate policies and standards into relevant documents and procedures to minimize impervious cover attributable to parking areas and street designs. The permittee shall implement all recommendations, in accordance with the schedules, contained in the assessment. The local planning board and local transportation board should be involved in this assessment. This assessment shall be part of the SWMP. The permittee shall report in each annual report on the status of this assessment including any planned or completed changes to local regulations and guidelines.
2016 Massachusetts Small MS4 General Permit, Section 2.3.6.c: Assessment of Feasibility of Allowing Green Infrastructure
Within four (4) years from the effective date of the permit, the permittee shall develop a report assessing existing local regulations to determine the feasibility of making, at a minimum, the following practices allowable when appropriate site conditions exist: i. Green roofs; ii. Infiltration practices such as rain gardens, curb extensions, planter gardens, porous and pervious pavements, and other designs to manage stormwater using landscaping and structured or augmented soils; and iii. Water harvesting devices such as rain barrels and cisterns, and the use of stormwater for non-potable uses. The assessment should indicate if the practices are allowed in the MS4 jurisdiction and under what circumstances are they allowed. If the practices are not allowed, the permittee shall determine what hinders the use of these practices, what changes in local regulations may be made to make them allowable, and provide a schedule for implementation of recommendations. The permittee shall implement all recommendations, in accordance with the schedules, contained in the assessment. The permittee shall report in each annual report on its findings and progress towards making the practices allowable.
Compliance Recommendation: Pre-Application Meeting with Developers
Requiring project applicants to participate in a pre-application meeting with local officials can be one of the most important and cost-effective strategies to limiting impervious cover and ensuring best stormwater management approaches. For this pre-application meeting, an applicant can be asked to take some first steps in thinking about the site through a Low Impact Development lens that involves analysis of site resources, soils, and a sketch plan informed by those considerations. (See link below to PVPC checklist for developer use in preparing for this meeting). The pre-application meeting then enables a preliminary conversation about the site, stormwater management and erosion control considerations, and concept plan prior to investing in extensive professional design efforts. This pre-application meeting can be included as part of stormwater management permitting and site plan review in zoning if there are smaller projects (under 1 acre) that a municipality wishes to include.
https://thinkblueconnecticutriver.org/wp-content/uploads/2020/12/10-LID-Checklist-for-Preapplication-Meeting-PVPC-Model.docx
Benefits of Impervious Cover Reduction and Use of Green Infrastructure
While the MS4 permit requirements are aimed at water quality improvements, impervious cover and encouraging green infrastructure stormwater management can also reduce localized flooding, improve groundwater recharge, enhance neighborhood aesthetics, and reduce summer heat. Please refer to the resources provided below for additional information.
A Word About Stormwater Management in Drinking Water Supply Protection Areas
For drinking water supply protection areas—particularly recharge areas for public water supplies, but also where there is reliance on private wells for supply—it is important to carefully consider the impervious surfaces from which stormwater flows will be managed. For example, flows from non-metal rooftops could be managed to infiltrate directly into soils. The likelihood of contamination in such flows is typically low and thus the likelihood of eventual harm to groundwater sources for drinking is also low. A parking or loading area, however, is very different. In such circumstances, best practice would be to ensure that the perimeter area is curbed so that flows go through a pretreatment device prior to infiltration. The pretreatment facility should also include an emergency shutoff valve that can be activated in case of a spill to keep contaminated flows contained within the parking area and from reaching the infiltration facility. Note that the current 2008 MassDEP Stormwater Handbook does not allow for the location of any stormwater bmps in Zone 1 areas, unless necessary to manage stormwater from essential drinking water facilities.
How to Use This Checklist
This checklist can be used as a method of documenting review of existing local code for requirements that affect the creation of impervious cover and feasibility of allowing green infrastructure and it contains some notes and recommendations for potential policy and language changes. This checklist could also serve as the submission to EPA once code review assessment has been completed with additions in the column headings, "changes recommended" and "proposed schedule to incorporate changes." Best practice for review of code and potential revisions occurs through conversations with relevant boards and departments, such as the Planning Board, Public Works, Conservation Commission, Board of Health, and Fire Department.
Relevant Local Documents / Code to Review

Assuming that local stormwater bylaw/ordinance and regulations have been updated to comply with new pre and post construction MS4 permit standards, including promoting a Low Impact Development approach and advancing green infrastructure stormwater management, other key places within municipal code for review are as follows:

Subdivision Rules & Regulations	Wetland Protection Bylaws / Rules & Regulations	Local Building Codes
Zoning Bylaws	Board of Health Bylaws / Rules & Regulations	Local Plumbing Codes
General Bylaws		

Citations / Resources

Author	Title	Web Link
American Planning Association - Massachusetts Chapter and Homebuilders Association of Massachusetts	Sustainable Neighborhood Road Design: A Guidebook for Massachusetts Cities and Towns	https://www.apa-ma.org/wp-content/uploads/2018/12/NRB_Guidebook_2011.pdf
Casey Trees and Davey Tree Expert Co.	National Tree Benefit Calculator	http://www.treebenefits.com/calculator/
Center for Watershed Protection	The Code & Ordinance Work sheet: A Tool for Evaluating the Development Rules in Your Community	https://owl.cwp.org/mdocs-posts/better-site-design-code-and-ordinance-cow-worksheet-2017-update/
Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs	Smart Growth / Smart Energy Toolkit: Smart Parking Model Bylaw	https://www.mass.gov/files/documents/2017/11/03/Smart%20Parking.pdf
Massachusetts Association of Conservation Commissions	MACC Wetlands Buffer Zone Guide Book	https://www.readingma.gov/conservation-division/files/macc-wetlands-buffer-zone-guidebook
Metropolitan Area Planning Council	Massachusetts Low Impact Development Toolkit: Low Impact Development - Do Your Local Codes Allow It? A Checklist for Regulatory Review	https://www.mapc.org/resource-library/low-impact-development-toolkit/
Metropolitan Area Planning Council	Low Impact Development Toolkit	https://www.mapc.org/resource-library/low-impact-development-toolkit/
Metropolitan Area Planning Council	Once is Not Enough: Guide to Water Reuse in Massachusetts	https://www.mapc.org/resource-library/low-impact-development-toolkit/
Minnesota Pollution Control Agency	Overview for Stormwater and Rainwater Harvest and Use/Reuse	258-17 B(5)(c)- the unpaved portion of cul-de-sac shall have a min radius of 50 ft and shall be landscaped except where trees/shrubs exist or desirable natural features exist to be preserved.
Pioneer Valley Planning Commission	Low Impact Development Checklist	https://thinkblueconnecticutriver.org/wp-content/uploads/2020/12/10-LID-Checklist-for-Preapplication-Meeting-PVPC-Model.docx
Pioneer Valley Planning Commission	Green Infrastructure Fact Sheets	http://www.pvpc.org/content/green-infrastructure-toolkit
Pioneer Valley Planning Commission	Pioneer Valley Sustainability Toolkit	http://www.pvpc.org/plans/pioneer-valley-sustainability-toolkit
U.S. Environmental Protection Agency	Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales	https://www.epa.gov/sites/default/files/2014-04/documents/water-quality-scorecard.pdf
U.S. Environmental Protection Agency	Assessing Street and Parking Design Standards to Reduce Excess Impervious Cover in New Hampshire and Massachusetts	https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ImperviousAssessment.pdf
U.S. Environmental Protection Agency	General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts Authorization to Discharge under the National Pollutant Discharge Elimination System (with modifications effective January 6, 2021)	258-20 F(8)(b-c)- sidewalk gravel subbase with bituminous concrete
U.S. Environmental Protection Agency	Overcoming Barriers to Green Infrastructure	https://www.epa.gov/green-infrastructure/overcoming-barriers-green-infrastructure
U.S. Environmental Protection Agency	Incorporating Low Impact Development into Municipal Stormwater Programs	https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/IncorporatingLID.pdf
U.S. Environmental Protection Agency	Encouraging Low Impact Development: Incentives Can Encourage Adoption of LID Practices in Your Community	https://www.epa.gov/sites/default/files/2015-09/documents/bbfs7encouraging.pdf
U.S. Environmental Protection Agency	Soak Up the Rain Outreach Tools	https://www.epa.gov/soakuptherain/soak-rain-outreach-tools
U.S. Forest Service	The Sustainable Urban Forest Guide: A Step-by-Step Approach	https://urbanforestrysouth.org/resources/library/ttresources/the-sustainable-urban-forest-guide-a-step-by-step-approach/at_download/file

Acronyms/Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Trips
BMP	Best Management Practice
EPA	Environmental Protection Agency
LID	Low Impact Development
LUHPPL	Land Uses with Higher Potential Pollutant Loading
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
ROW	Right of Way

INTRODUCTION

ASSESSMENT OF STREET DESIGN AND PARKING LOT GUIDELINES AND FEASIBILITY OF ALLOWING GREEN INFRASTRUCTURE

NPDES MS4 Community: Marblehead

Within Subdivision Regulations, standards for the following are critical for consideration: right of ways; utilities; roadway widths and lengths; cul-de-sacs; curbs; sidewalks; and bus waiting areas.

Street Standards in Subdivision Regulations					
Right of Ways					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y (Lane), N (Minor Street)	Is the minimum right of way width less than 45 feet for a residential street? (For 500 ADT, between 33 and 36 feet?)	258-17B (3)(c)- Minor Street: 50 feet right-of-way and 24 feet pavement; 258-17 B(3)(d)- Lane: 40 feet right-of-way and 24 feet pavement	See table from Sustainable Neighborhood Road Design Guidebook for MA provided in this workbook at Tab 5 - Reference Tables and Figures. <i>Good design has not so much to do with the width of the right of way itself, but considerations of context and what makes for efficient and effective use of the right of way. What makes sense for the elements of a right of way on a busy suburban road will likely not make sense for a low volume rural road.</i>		
Unsure	Are street cross sections provided to show how elements of a right of way might vary given different contexts?	Cross-sections in Planning Board Office 258-17C(1)(a); Complete Streets Policy not directly referenced in Subdivision Regulations- https://www.marblehead.org/sites/g/files/vyhlf4661/f/loads/complete_streets_policy_201806191001_0.pdf	<i>Such drawings can provide a clear understanding about objectives and efficient and effective use of the right of way area in different contexts, bringing together "complete streets" considerations of accommodating different modes of transportation with "green streets" objectives of reducing impervious surface and improving stormwater management.</i>	Reference Complete Streets Policy to highlight the different contexts and situations that affect the design of right-of-ways 258-17C(1)(a)	
Y	Do the regulations limit clearing and grubbing within the right-of-way to the minimum necessary?	258-16 B(1)-Objective of the town is to reduce are over which existing vegetation will be disturbed. 258-20 B(2-3) Clearing and Grubbing- Entire area of each street and way within its exterior lines and adjoining slopes shall be cleared of all stump, brush, boulders, etc. not intended for preservation. Planning Board can require boulders or trees be removed if they constitute a future hazard. Remaining trees shall be protected from mechanical injury during construction.	Developers are encouraged to limit clearing within the right-of-way to the minimum necessary to construct the roadway, drainage, sidewalk, and utilities, and to maintain site lines. Under this approach, it is not required to clear and grub the entire right-of-way.		
Y	Are street trees required for new streets?	258-16 B(1)(c)- reduce # mature trees removed- doesn't mention specifically street trees in subdivisions; 258-20 E(4)- street trees of a species approved by PB shall be planted on each side, except where there are existing trees. 75-ft interval and 12 ft tall when planted	<i>In addition to requiring the planting of street trees, it is a good idea to specify that the tree belt can be designed for stormwater management. Tree belts may include bioretention areas or other vegetated stormwater systems. Bioretention areas should utilize noninvasive species (not on any Massachusetts invasive plant list) that can tolerate cycles of drought and inundation.</i>	Allow tree belts to include bioretention or vegetated stormwater systems in addition to street trees 258-20 E(4)	
Utilities					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Not specified, perhaps shown in cross-section	Does the code allow utilities to be placed under the paved section of the ROW?	258-17 C(1)(A)- All storm drains and electric and telephone facilities within the limits of a way shall be placed underground per utility company specifications in locations shown on typical street cross sections (Appendix at Planning Board office)	Utilities (electric, telephone, cable TV, fiber optic, and all other conduits) may be located under the roadway or immediately adjacent to the roadway so as to optimize use of the right of way area for swales and other stormwater management facilities, sidewalks, and street trees.	Allow utilities to be placed under roadway or within 1-2 ft of the pavement to allow for most efficient use of right-of-way and create more space for stormwater management facilities 258-17 C(1)(A)	
Not specified	Does the code allow utilities to be placed immediately adjacent to the paved section of the ROW?	not clearly stated, see cross-section	<i>Often there is concern that such placement of utilities under the road will result in traffic delays and additional costs to utility companies. In the Rhode Island LID Site Planning and Design Guidance for Communities, however, authors from the Horsley Witten Group note that the reality is, "The amount of pavement needed to be removed during such operations can be decreased through better diagnostic tests and trenchless technologies for utility construction and repair." If the idea of putting utilities under the road edge is too great a concern for Departments of Public Works, then the next best strategy is to place utilities directly abutting roadway pavement, within 1 to 2 feet.</i>		
Roadway Widths and Lengths					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
N	Is paved roadway width between 18 and 22 feet in low density residential developments with no bicycle lanes present? Low density residential neighborhoods are those with less than 400 average daily trips according to AASHTO, 2001.	258-17 B (3)(c)- Minor Street: 50 feet right-of-way and 24 feet pavement; 258-17 B(3)(d)- Lane: 40 feet right-of-way and 24 feet pavement	Refer to table from Sustainable Neighborhood Road Design Guidebook for MA provided in this workbook at Tab 5 - Reference Tables and Figures. <i>Many existing standards are based on universal application of guidelines for highways or very large-scale subdivisions planned more than 50 years ago. Revised standards should involve the minimum required pavement width and derive from careful considerations with public works and emergency response officials of traffic volume, on-street parking (where required), and passage of emergency vehicles and school buses.</i>	Allow a minimum paved width of 18-22 for low-density, low-traffic residential areas 258-17 B (3)(c)	
Not specified	At higher densities, are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?	not clearly stated			
Not specified	Are narrower pavement widths allowed on road sections where there are no houses, buildings, intersections, or on-street parking spaces?	not clearly stated in bylaw, but aligns with the Complete Streets Policy and Smart Growth Overlay Districts	<i>Revise local street standards to consider design speed, street type, and traffic volume on arterial and residential roads to allow for more compact roadways and intersections.</i> <i>If not currently permitted, allow for curb extensions such as pinchpoints, gateways, and chicanes to narrow roadways and utilize street space for pervious pavement or bioretention.</i>	Reference Complete Streets Policy to highlight the different contexts and situations that affect the design of arterial and residential roads to allow for more compact roadways and intersections. Allow curb extensions.	
Not specified	Are reductions in frontage distances allowable where appropriate (i.e. open space developments, around cul-de-sacs, and along outside sideline of curved streets) to increase number of homes per unit length and to minimize street length?	not clearly stated in bylaw, but aligns with the Complete Streets Policy and Smart Growth Overlay Districts	Reduce street length in residential neighborhoods to minimize overall impervious cover creation and land disturbance.		
Not specified	Are developers encouraged to explore alternative street layouts to increase the number of homes per unit length and minimize the length of the roadway?	not clearly stated in bylaw, but aligns with the Complete Streets Policy and Smart Growth Overlay Districts	Exploration of alternative street layouts to increase the number of homes per unit length and minimize the length of the roadway is encouraged.		

Not specified	Can permeable paving be used for residential roads, shoulders, and parking lanes?	195-4 A(3)- regulate paving or other change in surface material over an area of 40,000 sq ft that causes significant reduction of permeability; Not clearly stated that permeable paving may be used	Where appropriate, use of permeable paving is allowed for road shoulders/parking lanes in residential neighborhoods and for sidewalks as compatible with Americans with Disabilities Act and Massachusetts Architectural Advisory Board design standards. <i>This approach could involve combining a traditional asphalt surface for the travel lanes and an adjacent porous surface for the shoulder/parking lanes or bike lane area. Snow and ice management for the roadway must avoid sand so as to avoid clogging of the porous shoulder area.</i>		
N	Do alignments specify: Streets ought to be located in order to protect important natural features, avoiding low areas and steep slopes in particular?	258-16 B(1)- Objective of the town is to reduce the area over which existing vegetation will be disturbed, the number of healthy, mature trees removed, disturbance of important wildlife habitats, outstanding botanical features, geologic features, etc.; Not mentioned in the Horizontal Alignment section 258-17 B(2)	Streets shall be located and designed to minimize: 1. disturbance of the site's natural features and environmentally sensitive areas, including low areas and steep slopes, native vegetation, and trees with a trunk diameter measured at 4.5' DBH (Diameter at Breast Height), breast height of 8 inches or more; 2. cut and fill, thereby reducing disturbance of native soils; 3. unnecessary contouring of the site to preserve natural topography. <i>Another possible consideration here (though unrelated to MS4 permit) : Street lay out along east-west or north-south axes is encouraged. This allows building siting to take advantages of passive solar heat gain and accommodate future solar electric installations on south-facing roofs.</i>		
Cul-de-Sacs					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
N	Are dead ends discouraged by the regulations? (e.g. by encouraging or requiring connected streets or one-way loop streets)?	258-17 B(5)- length of a dead-end street shall be no longer than 500 ft and no shorter than 250 ft measured from the center line of the intersecting street.	A connected road network is of great importance to functioning and efficient road network, reducing response time for public safety officials. Dead-end streets are discouraged. An applicant should make every effort to avoid the creation of dead-end streets and should connect proposed subdivisions to existing dead end streets wherever reasonable and practicable. An applicant may demonstrate that a dead end street is appropriate when they can demonstrate that a future connection to an existing street is not possible or practicable, or when the surrounding property will never need a street connection because of extremely sensitive or permanently protected natural resources.	Discourage dead-end streets by requiring developers to prove that a street connection is not possible or practical 258-17 B(5)	
Not specified	Are landscaped/bioretenion islands allowed in the center of cul-de-sacs?	258-17 B (5)(c)- the unpaved portion of cul-de-sac shall have a min radius of 50 ft and shall be landscaped except where trees/shrubs exist or desirable natural features exist to be preserved.	All dead-end streets with turnaround islands may be planted with trees and/or other vegetation or left with natural tree growth in lieu of paving the entire area of the island. The maintenance of the inner circle shall be the responsibility of developers, their successors and assigns, or a homeowners' association.		
Not specified	If curbing for cul-de-sacs is required, is it allowed to be perforated or notched to enable the flow of stormwater into the island area?	258-20 F(7)(a)- Bituminous concrete curb or sloped granite edge per MDPW standards, required curbing for the island 258-17 B(5)(c)	Where soils are conducive to infiltration (Natural Resource Conservation Service hydrologic soils group A or B), the center island may serve as a stormwater bioretention area with notched or perforated curbing to allow for entry of storm flows. Invisible curbing, where granite curbing forms an at-grade edge with the asphalt, may also be permitted in this situation.	Allow perforated or notched curbing when appropriate to allow for drainage to vegetated center island 258-17B (5)(C)	
N	Is minimum required radius for a cul-de-sac set for LID purposes?	258-17 B(5)(c)- the unpaved portion of cul-de-sac shall have a min radius of 50 ft and shall be landscaped except where trees/shrubs exist or desirable natural features exist to be preserved.	<i>Sustainable Neighborhood Road Design recommends 50-foot outside radius with vegetated center island. Massachusetts Fire Code 527 CMR requires 20-foot drive lanes and minimum inside turning radius of 25 feet.</i>	Require 50-foot outside radius of cul-de-sac 258-17B (5)(c)	
Not specified	Are alternative turnarounds such as hammerhead allowed on short streets in low density residential developments?		<i>Hammerheads use less pavement overall than cul-de-sacs. Example below is per Sustainable Neighborhood Road Design: A hammerhead turnaround having a thirty (30) foot minimum curb radii; forty-five (45) foot minimum center lane radii, a head adequate for three point turn maximum, and a length to accommodate local firefighting vehicle.</i>	Allow alternative turnarounds, such as hammerheads 258-17B (5)(c)	
Sidewalks					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y	In lower density residential contexts, are sidewalks allowed on just one side of a street? (As opposed to always required on both sides of residential streets.)	258-20 F(8)(a)- sidewalk width of 4 ft on each side of street for major and secondary streets. Minor-sidewalk on one side, lanes don't require sidewalks	<i>For low density neighborhoods, consider allowing sidewalks on just one side of street. See table from Sustainable Neighborhood Road Design Guidebook for MA provided in this workbook at Tab 5 - Reference Tables and Figures.</i>		
N	Is permeable paving allowed for sidewalks?	258-20 F(8)(b-c)- sidewalk gravel subbase with bituminous concrete	If the site permits infiltration, sidewalks may be constructed of permeable paving materials. If using permeable materials, the developer must work in consultation with the Department of Public Works and an engineer with experience in this field, and materials must be evaluated at regular intervals as they age. Pervious asphalt should be based on specifications such as those found in the University of New Hampshire Stormwater Center Design Specifications for Porous Asphalt Pavements and Infiltration Beds. Sidewalks or pedestrian areas may also be constructed to direct stormwater runoff to a swale or other BMP. Permeable pavements provide increased traction when wet because water does not pool, and the need for sal and plowing is reduced during winter due to low/no black ice development. Compared to traditional paving methods, long-term maintenance costs may be lower in cold climates since permeable pavements resist cracking and buckling in freeze-thaw conditions. Nevertheless, permeable paving requires regular maintenance including: annual inspection of paver blocks for deterioration; periodic replacement of void material (gravel, etc.) if part of the facility; and annual industrial vacuuming of pavements to unclug sand and debris that have accumulated on the surface over time.		
Not specified	Are alternative pedestrian network layouts allowed (rather than placement in ROW)?	258-17 C(5)(d)- Footpath easements- when streets in excess of 750ft in length are incorporated in subdivision, footpaths shall be laid out and constructed to connect subdivision street with adjacent street, public land, or park, approximately midway between streets, intersections or turnarounds.	For certain developments, it may be more sensible for pedestrian circulation to make use of common areas rather than street right of ways.	Specify that paths through open spaces can be used in place of sidewalks in right-of-way when it is appropriate 258-20F(8)	
Y	Is sidewalk width standard set for LID purposes?	258-20F(8)(a)- sidewalk width of 4 ft on each side of street for major and secondary streets.	<i>LID standard = 4 feet or less</i>		
Y	Where curb and gutter streets are required for stormwater drainage, are sidewalks allowed to be disconnected from the stormwater drainage system?	258-20D(2)- The area in back of the sidewalk within the right-of-way shall be sloped at a maximum slope of 3:1 (H:V) and shall be loamed and seeded or kept natural, neat and maintained	Grading of impervious sidewalk surfaces should be done so as to direct stormwater runoff to bioretention areas or other such facilities to eliminate or keep flow out of the municipal storm drain system.		
Bus waiting areas					

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Not specified	Do bus waiting areas require use of permeable paving unless infeasible?	No bus stop specifications in bylaw- MBTA Design Standards https://d2o8eokkim9o8.cloudfront.net/sites/default/files/engineering/001-design-standards-and-guidelines/2018-04-01-bus-stop-planning-and-design-guide.pdf	<i>Permeable paving must be used for bus waiting areas in locations where soils are indicated to be in Natural Resource Conservation Service hydrologic soils group A or B.</i>		
Curbs					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y	Do street standards allow for LID stormwater management approaches (i.e. swales or other such BMPs instead of curb and gutter)? Or are curbs and gutters REQUIRED improvements?	258-17 C(3)(c) detention/retention ponds shall be designed by registered civil engineer based on latest edition of Urban Hydrology for Small Watersheds. 258-17 C(3)(d)- Storm water drainage system shall include catch basins, manholes, culverts, drain lines, leaching systems, headwalls, flared ends and other structures. Grassed swales are considered part of the storm drainage system.	<i>In low or medium density developments where topography, soils, and slope permit, allow conveyance and treatment of stormwater runoff in the street right-of-way via vegetated open channels that incorporate runoff reduction practices such as dry swales, bioretention, biofilters, or vegetated swales, rather than requiring the use of curb and gutter stormwater conveyances.</i>	Specify that the conveyance and treatment of stormwater run-off is allowed via vegetated open channels within a street right-of-way that incorporate practices such as dry, swales, bioretention, biofilters, or vegetated swales 258-17C (3)	
Not specified	Where curbs are necessary/required, are curb cuts/perforated curbs that allow runoff into swales or other stormwater BMPs allowed?	258-20 F (7)- Curbing is required on both sides of major, secondary and minor streets. Curbs/cuts/perforated curbs not specified.	<i>Where curbing is needed, think about specifying granite curbing as a way to help keep roads narrow overall. (With asphalt curbing it is hard to plow to the curb since material can be easily damaged. The tendency is to account for this extra width needed in winter months.</i> <i>If pursuing LID design standards, curbs should either be eliminated or, when deemed necessary to protect the roadway edge, they should be interrupted or invisible. Interrupted curbs are curbs with gaps that allow stormwater to move from the street through to a stormwater management facility, such as planters, swales, rain gardens, or tree filter boxes. Invisible curbs are buried along the street edge so as to allow stormwater to flow over into a stormwater management facility. All LID curb options should be implemented in connection with stormwater management facilities. In shared streets, curbs should either be eliminated or be invisible.</i>	Allow curb cuts, perforated or notched curbs 258-20 F (7)	
Y	Does the town have criteria for design of roadside swales?	258-17 C(3)(r)- Grassed swales within road ROW may be designed. Shall be able to carry ten-year storm without spillage on abutting property. Min. longitudinal slope shall be 0.5% and maximum slope designed so that velocities do not exceed 3 ft per sec.	<i>Refer to the design standards presented in the Massachusetts Stormwater Management Handbook: Volume Two. Potential design considerations / limitations: - Depending on land use and soil type, each grassed swale can treat a relatively small drainage area of a few acres. Large areas should be divided and treated using multiple swales. - Swales are impractical both in areas with steep slopes and with very low slopes. - Soil compaction can reduce infiltration capacity. - Pre-treatment practices may be required in areas with higher potential pollutant loading.</i>		
N	Where curb and gutter systems are installed, are inlets / drains required to have a notice regarding discharge to receiving waters?		<i>Could require that developers install standard signage indicating that waters drain to _____ River, etc.</i>	Require developers to install signage indicating that waters drain to _____ River, etc. 258-17C (3)	
Ensuring Soil Permeability					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
		195-1 B(6)- objective of promoting infiltration and recharge of groundwater	<i>Important note: These suggested standards on ensuring soil permeability might serve better under standards required for a stormwater management permit/and or under the zoning bylaw/ordinance - site plan review for projects that do not trigger stormwater permit requirements. They are included here to underscore the importance of soils in performance of infiltration facilities, but also in ensuring that runoff curve numbers used in calculations remain as accurate as possible post construction.</i>		
Not specified	Is it clear that topsoil removal from the site should not diminish the infiltration characteristics of the site?	200-45 F(3)(b)- The Design Review Board shall consider the extent to which the character of the is preserved such as the minimization of tree and soil removal.	Applicants must describe how their project will minimize and limit topsoil removal from the site.	Applicants must describe how their project will minimize topsoil removal 200-45 F(3)(b)	
Not specified	Is it clear that any new soils brought on site should not diminish the infiltration characteristics of the site?		Applicants must describe how they will ensure that any new fill or soils brought to the site will not diminish the infiltration characteristics of the site.	Applicants must describe how they will ensure that any new fill or soils on site will not diminish the infiltration characteristics of the site 200-45 F(3)(b)	
No	Is there any mention of avoiding compaction of soils by construction vehicles and restoring permeability of soils for infiltration if compacted?	no	Ensure that all work is planned and executed so as to avoid compaction of topsoil and subsoils, including such best practices as reducing the number of trips required over area of disturbance, laying down soil protective mats for trafficked areas, and avoiding work after rain or snowmelt that soaks soils. For construction equipment, best practices should include using vehicles with low axle loads, reduced tire pressures, and use of flotation tires, doubles, radial tires, and/or large-diameter tires. For areas where such practices are not possible and soils are to be compacted by heavy equipment, subsurface restoration must occur prior to final landscaping activities	Applicants must describe how the work is planned and executed to avoid compaction of topsoil and subsoils using best practices, such as reducing number of trips over an area of disturbance, etc. 200-45 F(3)(b)	
Green Infrastructure Feasibility					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
	Are the following practices allowable when appropriate site conditions exist:	Not clearly stated			
Not specified	Green roofs		<i>Green roofs are particularly appropriate for structures with a wide roof area, and typically are installed on flat or low angle rooftops. Design and maintenance considerations are described in more detail in PVPC's Green Infrastructure Fact Sheet on "Green Roofs." See: http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets</i>	Allow green roofs when appropriate site conditions exist	
Not specified	Infiltration practices such as rain gardens, curb extensions, planter gardens, porous and pervious pavements, and other designs to manage stormwater using landscaping and structured or augmented soils		<i>Rain gardens, also referred to as bioretention areas, use soil, plants and microbes to treat stormwater before it is infiltrated or discharged, and function effectively on small sites or on large sites divided into multiple small drainages. Common applications include parking lot islands, median strips, and traffic islands. Limitations, design considerations, and maintenance requirements are described in more detail in PVPC's Green Infrastructure Fact Sheets on "Bioretention Areas," "Green Streets," and "Tree Box Filters." See: http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets</i>	Allow rain gardens when appropriate site conditions exist	

			<p>Porous/permeable paving is appropriate for pedestrian-only areas and for low- to medium-volume, low-speed areas such as overflow parking areas, residential driveways, alleys, and parking stalls. If the underlying soils have a permeability of less than 0.3" per hour, use of an underdrain will be required. Permeable paving is not ideal for high traffic/high speed areas because it generally has lower load-bearing capacity than conventional pavement. Design and maintenance requirements are described in more detail in PVPC's Green Infrastructure Fact Sheet on "Porous Asphalt." See:</p> <p>http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets</p>	<p>Allow porous/permeable paving for pedestrian-only areas or for low- to medium- volume, low-speed areas such as overflow parking areas, residential driveways, alleys, and parking stalls.</p>	
			<p>Encourage both preservation of existing stands of trees and mature trees on site as well as plans that incorporate trees into stormwater management practices. This can be done through specific requirements and through a system of credits. Calculating stormwater benefits of certain species based on size can be done through the National Tree Benefit Calculator. See calculator at:</p> <p>http://www.treebenefits.com/calculator/</p>	<p>Allow use of LID stormwater practices, such as bioretention and vegetated swales, where street trees are required</p>	
			<p>Allow for bioretention areas or other vegetated stormwater facilities within treebelt areas and to count toward other required landscaping features, including site, parking or perimeter screening. This creates areas that function on several levels, including aesthetics and stormwater management.</p>		
Not specified	Water harvesting devices such as rain barrels and cisterns, and the use of stormwater for non-potable uses		<p>Cisterns and rain barrels are used to store rooftop runoff for later use for landscaping and other non-potable uses such as car washing. Water stored in cisterns is even used in some cases for toilet flushing and/or irrigation of planters within buildings. Cisterns and rain barrels can be used in most commercial and residential properties where rooftop runoff is directed to a gutter and downspout. Design and maintenance requirements are described in more detail in PVPC's Green Infrastructure Fact Sheet on "Rain Water Harvesting." See:</p> <p>http://www.pvpc.org/content/green-infrastructure-individual-fact-sheets</p>	<p>Allow harvesting of rainwater via cisterns and rain barrels to use for non-potable uses, such as for landscaping or car-washing</p>	
	If no, please describe impediments:				
	If yes, are there developer incentives for utilizing green infrastructure practices?		<p>The use of green infrastructure practices can be encouraged by offering incentives such as stormwater utility fee discounts or credits, waived or reduced permit fees, recognition programs for successful green infrastructure sites, and/or exemptions from portions of the local stormwater permitting requirements. For additional ideas on types of incentives and implementation, please refer to the EPA's Encouraging Low Impact Development Fact Sheet:</p> <p>https://www.epa.gov/sites/default/files/2015-09/documents/bbfs7encouraging.pdf</p>	<p>Offer incentives for using green infrastructure, such as stormwater utility fee discounts or credits, waived or reduced permit fees, recognition programs for successful green infrastructure sites, etc.</p>	

Development Policies in Subdivision Regulations

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y	Does the preliminary plan processes promote an LID approach?	258-9 Submission procedures, 258-10 Plan contents- do not specify LID approach. 195-1B- Objectives of By-law- Comply with state and federal statutes and regulations relating to stormwater discharges and ensure low impact development site planning and design strategies are implemented as defined in latest MA Stormwater Handbook	<p><i>At the outset, encourage developers to undertake a Low Impact Development (LID) approach in their projects by requiring an LID plan for preliminary subdivision applications. The City/Town could help by providing a developer with a standard site analysis checklist that will help during the early stages of the project to maximize design and functionality of LID strategies and stormwater management practices. As part of this analysis and reporting, the applicant could identify proposed LID strategies and stormwater BMPs. Use of PVPC checklist could be part of this early review. See:</i></p> <p>https://thinkblueconnecticutriver.org/wp-content/uploads/2020/12/10_LID-Checklist-for-Preapplication-Meeting-PVPC-Model.docx</p>	<p>Incorporate Low Impact Development strategies into Subdivision Bylaw or include it more in Stormwater Management Bylaw to then be referenced in Subdivision Bylaw</p>	
			<p><i>Important note : It is best to include this early review element as part of stormwater management permit requirements for larger projects and site plan review requirements for smaller projects, but good to reinforce that process in Subdivision Regulations.</i></p>		
			<p><i>Under Preliminary Plan/General: To the fullest extent reasonable and practicable, all subdivisions shall be designed and constructed to incorporate the most recent LID and stormwater management design standards, best practices, policies and design elements.</i></p> <p><i>To include in Preliminary Plan Contents (some of these elements go beyond the PVPC LID checklist, but are worthwhile considerations for this stage of subdivision review):</i></p> <p><i>Location and limits of soil types consistent with the soils classification maps prepared by the Natural Resources Conservation Service.</i></p> <p><i>Areas where the depth of natural soil to bedrock is four (4) feet or less.</i></p> <p><i>The extent of any Interim Wellhead Protection Areas and Recharge Areas.</i></p> <p><i>Delineation of slopes of twenty-five percent (25%) or greater.</i></p> <p><i>Areas delineated as "BioMap Core Habitat" or "Supporting Natural Landscape" on the Massachusetts BioMap Project developed by the Massachusetts Natural Heritage & Endangered Species Program.</i></p>	<p>Preapplication Meeting with Developers: applicants must meet with local officials to go over ways to implement LID design that involves analysis of site resources, soils, and sketch plan of considerations. Meeting can also be included as part of stormwater management permitting or site plan review in zoning. Provide PVPC LID Checklist to developers to include within their site plans</p>	
Y	Is the definitive plan process coordinated with the stormwater management and erosion and sediment control permit process requirements?	195-10- Operation and maintenance plan for the permanent stormwater management system is required for all projects at the time of application. Designed to ensure compliance with by-law and MA Surface Water Quality Standards	<p><i>Define a process that combines submissions for stormwater management permits with Definitive Plans to avoid duplication.</i></p> <p><i>Possibly state: An Application for a Stormwater Management and Erosion and Sediment Control Permit, in accordance with Section _____ of the _____, along with all required plans and supporting information and documentation, must be included as part of the submission for a Definitive Subdivision Plan. No work shall commence on the construction of a Definitive Subdivision Plan until a Stormwater Management and Erosion and Sediment Control Permit has been approved and issued.</i></p>		
Y	Is there a section within the subdivision regulations that addresses drainage?	258-17.C(3)- Storm Drainage System in Subdivision streets	<p><i>Consider removing specific stormwater management language from subdivision regulations and referring out to standards in the stormwater management ordinance/bylaw and regulations is recommended. It is best not to describe requirements in subdivision regulations to avoid conflict and inconsistencies as standards are updated from time to time.</i></p>		
Not specified	Do the site development standards explicitly permit LID stormwater management approaches?	Not clearly stated	<p><i>Review any additional standards carefully to ensure they enable LID stormwater management approaches and do not present barriers to such development strategies.</i></p>		

INTRODUCTION

ASSESSMENT OF STREET DESIGN AND PARKING LOT GUIDELINES AND FEASIBILITY OF ALLOWING GREEN INFRASTRUCTURE

NPDES MS4 Community: Marblehead

Within Zoning, the following elements are critical considerations: parking ratios; parking lots and driveways (stall sizes, travel lanes, landscaping, etc.); dimensions and density; and landscaping.

Parking Ratios					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
N	Are parking maximums used in any instances (to prevent too much parking)?	200-17A through D- just minimum number of spaces for each type of facilities- residential (2 per dwelling unit), hotel/motel (1 per room available to use/rent), restaurant (1 per 200 ft floor area), other uses (1 per 300 ft floor area or 2 per separate store/shop/office)	<i>Consider the following:</i> <i>1. Establishing both minimum and maximum parking ratios to provide adequate parking while reducing excess impervious coverage. Parking reductions could be allowed for factors such as: mixed land uses, access to alternative transportation, demographics, and utilization of Transportation Demand Management (TDM) Programs including subsidized mass transit and parking cash out programs. Flexibility is a key component to providing adequate but not excessive parking.</i>	Establish maximum parking ratios. Parking reductions may be considered for other factors: mixed land uses, access to alternative transportation, demographics, etc. 200-17A-D	
			<i>2. Requiring a Special Permit for an increase in maximum parking allowance. Some onsite parking requirements could be met off-site particularly in redevelopment sites and compact mixed use centers.</i>	Require Special Permit for an increase in parking past the maximum allowance.	
			<i>For useful language on parking, see the MA Smart Parking Model Bylaw at: https://www.mass.gov/files/documents/2017/11/03/Smart%20Parking.pdf</i>		
Y	Does zoning require <u>more than 3 off street parking spaces</u> per 1,000 sq. ft. of gross floor area for office uses?	200-17D- one parking space per 300 ft of floor area OR two parking spaces for each separate store, shop, office, etc within the same building	<i>For recommended parking requirements per 1,000 sq ft of Gross Floor Space, see table provided in this workbook at Tab 5 - Reference Tables and Figures.</i>		
N	Does zoning require <u>more than 4.5 off street parking spaces</u> per 1,000 sq. ft. of gross floor area for shopping centers?	200-17D: 3.3 parking spaces per 1000 ft (1 per 3000ft)			
Y	Does zoning <u>vary parking requirement by zone</u> to reflect places where more trips are on foot or by transit?	200-44 H(1)- Off-street parking in Smart Growth Districts			
Y, somewhat	Does zoning have reduced off-street parking requirements for its downtown zoning district?	200-44 H(1) 1-2 bedroom dwelling unit in Pleasant St requires only 1 or 1.5 spaces compared to 2.			
N	Does zoning have lower parking requirements for properties near transit stops?				
N	Does zoning allow reduced parking requirements for properties within walking distance to multiple services?				
N	Does zoning have lower parking requirements for properties in the more densely developed residential districts?				
N	Does zoning allow <u>alternative measures</u> such as custom parking demand calculations, transportation demand management or in-lieu payments to reduce required parking?				
Y	Does zoning have provisions allowing for <u>shared parking</u> to reduce parking requirements?	200-44 H(5)- Shared use of required parking by intermittent use establishments (churches, assembly halls, theaters)	<i>Refer to the Smart Parking Model Bylaw for bylaw language around three strategies for shared parking: opportunities to share parking between competing and non-competing uses on the same site, locating parking off-site on other privately owned lots or public parking facilities, and/or for using a "fee-in-lieu" approach. See:</i>		
Y	Are shared parking provisions by right?	Formal agreement shall be made in writing by the owners of the uses involved	https://www.mass.gov/files/documents/2017/11/03/Smart%20Parking.pdf		
N	Does the municipality provide model shared parking arrangements for private use?		<i>See model for shared parking here:</i>	Provide model for shared parking	
N	Does zoning require <u>more than 2 off-street parking spaces per residential unit</u> ?	200-17A- Residential- two exterior parking spaces for each dwelling unit, require parking spaces on the same lot as the building or adjoining lot under same ownership	https://www.gardinermaine.com/sites/g/files/vyhlif611f/news/appendix_d_sampleparkingagreement_0.pdf		
Y	Does zoning require 2 off-street parking spaces per residential unit?	Yes			
Y, only in SG district	Does zoning require <u>less than 2 off-street parking spaces</u> per residential unit?	only Pleasant St SG district for 1-2 BR dwellings			
Not specified	Does zoning require more than 1 off-street parking space for an accessory dwelling unit?				
Y, only in SG district	Does zoning have lower parking requirements for smaller residential units?	only Pleasant St SG district for 1-2 BR dwellings			
Parking Lots and Driveways					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y	Is requirement for standard parking lot stall consistent with LID purposes?	200-21- Each parking space shall be at least nine feet wide and 18 feet long	<i>LID Standard = 9 feet or less by 18 feet or less</i>		
Unsure	Is requirement for drive lane width consistent with LID purposes?	Drive Lane width?- 200-21- as much space as is needed for vehicular access and maneuvering	<i>LID Standard = 9 feet wide for one lane / 18 feet wide for two lanes</i>	Specify drive lane width as 9 feet for one lane/ 18 feet for two lanes in parking areas 200-21	
N	For larger parking lots, are there provisions requiring compact car spaces?				

	If yes, are at least 30% of parking spaces required to have smaller dimensions for compact cars?				
No	Is there a minimum percentage of a parking lot required to be landscaped?	not clearly stated			
Not specified	Do landscaping requirements for parking areas allow for vegetated areas with bioretention functions?	not clearly stated	If landscaped islands are located in an area with existing soils classified in the NRCS hydrologic soil groups A/B, such that the existing soils are suitable for infiltration stormwater runoff, the internal landscape areas may/shall be installed at a lower grade than the parking lot pavement, and curbing shall allow drainage from the pavement to enter and percolate through the landscaped areas while simultaneously protecting the landscape materials.	Landscaped areas in parking lots shall be installed at a lower grade than the parking lot pavement if the soil is classified as NRCS hydrological soil groups A or B. Curbing shall allow drainage from the pavement to enter and percolate through landscaped island	Encourage landscaped areas with bioretention when it is appropriate
Not specified	Do landscaping requirements for parking areas encourage vegetated areas with bioretention functions?	no			
Not specified	Is the use of pervious surfacing materials allowed for parking stalls, spillover parking areas, shoulders, etc.?	not clearly stated	Pervious materials such as porous asphalt or concrete, porous pavers, and reinforced grass blocks may be allowed in lower volume stalls or overflow parking areas. Note that snow storage should not coincide with these areas as plow piles may include sand, which will clog pervious pavement and prevent infiltration.	Allow use of pervious surface materials when it is appropriate for the site	
Not specified	Is the use of pervious surfacing materials encouraged for parking stalls, spillover parking areas, shoulders, etc.?				
Not specified	Are pervious materials for single family driveways (porous pavers, paving stones, pervious asphalt or concrete), and/or use of two-track design for residential driveways allowed?				
Not specified	Does zoning allow for common or shared driveways?		Example from Hadley – through special permit: <i>The Planning Board may issue a special permit permitting a common driveway (a single curb cut and driveway providing vehicular egress/access to more than one lot) when, in its judgment, such action is in the public interest and not inconsistent with the intent of this Zoning Bylaw, provided: 5.7.1. Said common driveway shall not service more than three residential lots. In the case of commercial/retail and industrial/manufacturing uses in Business and Industrial zoned Districts a common driveway may serve more than three lots, but the total shall be set by the Planning Board in the issuance of their special permit.</i>	Allow common or shared driveways through Special Permit	
	If yes, are they allowed by right?				
		200-23- Parking impact on open area- any increase in parking which reduces the open area in any lot below that required shall require special permit for use and dimension from Board of Appeals			

Dimensions and Density

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y	Are there any special districts or flexible design opportunities that enable clustering of buildings and greater protection of open space areas on a site?	200-15- Dimensional Regulations- District Regulations- Nearly all properties require one square foot of open area for each one square foot of gross floor area; only in Business 1 Zone District and for nonresidential uses in the Business Residential District is there the requirement of one square foot of open area for each two square feet of gross floor area; 200-44 Smart Growth Overlay District- promotion of low-impact, green, and sustainable development that is pedestrian friendly; doesn't outright mention clustering and flexible design opportunities or protection of open space.	<i>Open Space Residential Development (OSRD), Open Space Design (OSD), Conservation Development and Natural Resource Protection Zoning (NRPZ) are the current zoning models for what was previously called cluster or flexible development. These models reverse the typical subdivision planning process by utilizing LID site design strategies for conserving natural hydrologic functions and reducing impervious surfaces for preventing runoff, and integrating green infrastructure as a fundamental design element. Resulting development plans typically retain native vegetation and natural areas, and structure site layout to greatly reduce street infrastructure. It has been noted that the open space set aside should be based on resource values, not by formula such as X% of the development.</i>		
	Is this type of development allowed by right?		<i>Permit such development as a "by right" form of development, where no special permit is required.</i>		
	Are the submittal or review requirements for such developments greater than for conventional development?				
N	Are there any other regulations that allow for reductions in dimensional requirements to increase flexibility in building placement?	200-15 Dimensional Regulations- District regulations; 200-44 Smart Growth District	<i>Allow flexible site design criteria such as reduced setbacks and smaller lot sizes. Reductions in frontages would allow for reduced road length/paved area, perhaps where appropriate such as in open space residential developments, at the outside sideline of curbed streets, and around cul-de-sacs.</i>		
Not specified	Is the use of bioretention and other stormwater practices allowed in setback areas?		<i>Explicitly allow bioretention areas, rain gardens, filter strips, swales, and constructed wetlands within required setback areas for front, rear, and side yards based on site-specific conditions such as soils, depth to groundwater table and slope.</i>	Allow bioretention, rain gardens, filter strips, swales, and constructed wetlands within required setback areas for front, rear, and side yards if conditions allow it.	
			<i>In a mixed-use district, setbacks should include enough space for a substantial vegetated buffer adjacent to the residential use as screening that can also serve as stormwater green infrastructure.</i>		

Landscaping

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Not specified	Is the use of bioretention and other stormwater practices allowed within landscaped areas for parking lots (versus requirement for curb and gutter management of stormwater)?		Edging and curbing in parking lots can be notched or perforated to allow stormwater flows into infiltration and bioretention areas. For larger parking lots, parking rows may be separated with planting strips that function to manage stormwater. Shade tree requirements in planting strips should also take into consideration stormwater treatment. Note that shade in parking lots will also help to reduce the "heat island" effect.	Allow edging and curbing of parking lots to be notched or perforated	
N	Does language on screening and buffers indicate that these areas could be used for stormwater management?	200-37B (4)- screening of parking areas with plantings- doesn't mention SWM	Depending on site-specific conditions such as soils, depth to groundwater table and slope, buffer and landscaped areas may include bioretention areas and other green infrastructure stormwater management facilities.	Allow bioretention or green infrastructure in buffer and landscapes areas of parking lots	
Not specified	Is the use of bioretention and other stormwater practices explicitly allowed within landscaped areas?	not clearly stated			

			<i>Consider also including design standards for landscaping and screening that encourage the use of green stormwater management infrastructure facilities. In the same way that architectural design standards serve a town, design standards for landscaping can support placemaking within neighborhoods and across a community.</i>		
			<i>Important note: Suggested standards on ensuring soil permeability below serve best under standards required for a stormwater management permit/and, but they may also be appropriate under zoning bylaw/ordinance - site plan review for projects that do not trigger stormwater permit requirements. They are included here to underscore the importance of soils in performance of infiltration facilities, but also in ensuring that curve runoff numbers used in calculations remain as accurate as possible post construction.</i>		
Not specified	Is it clear that topsoil removal from the site should not diminish the infiltration characteristics of the site?	not clearly stated, 200-26 Earth Removal- removal of soil, loam, gravel is prohibited unless authorized by special permit for use and dimension	Applicants must describe how their project will minimize and limit topsoil removal from the site.	Applicants must describe how their project will minimize topsoil removal 200-45 F(3)(b)	
Not specified	Is it clear that any new soils brought on site should not diminish the infiltration characteristics of the site?	not clearly stated		Applicants must describe how they will ensure that any new fill or soils on site will not diminish the infiltration characteristics of the site 200-45 F(3)(b)	
Not specified	Is there any mention of avoiding compaction of soils by construction vehicles and restoring permeability of soils for infiltration if compacted?	not clearly stated	Ensure that all work is planned and executed so as to avoid compaction of topsoil and subsoils, including such best practices as reducing the number of trips required over area of disturbance, laying down soil protective mats for trafficked areas, and avoiding work after rain or snowmelt that soaks soils. For construction equipment, best practices should include using vehicles with low axle loads, reduced tire pressures, and use of flotation tires, doubles, radial tires, and/or large-diameter tires. For areas where such practices are not possible and soils are to be compacted by heavy equipment, subsurface restoration must occur prior to final landscaping activities.	Applicants must describe how the work is planned and executed to avoid compaction of topsoil and subsoils using best practices, such as reducing number of trips over an area of disturbance, etc. 200-45 F(3)(b)	
Development Policies in Zoning Regulations					
Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (shown in italics)	Change(s) recommended	Proposed schedule to incorporate changes
Y	Are standards and requirements within the zoning code consistent with the Stormwater Management Bylaw/Ordinance and Regulations?	200-38 B (3)(a-c)- Special permit for site plan approval- a report on the impact of stormwater runoff on adjacent and downstream surface water bodies, subsurface groundwater and the watertable; soils- potential danger of erosion and sedimentation caused by operation and maintenance of proposed development; general environmental impact. Required to submit no later than 40 days prior to the final date that a decision must be rendered.	<i>A best practice for eliminating conflicting standards is to reference the local stormwater bylaw or regulation within needed sections of the zoning code for appropriate drainage standards, thereby keeping all drainage standards and specifications in one section of the local code. All zoning standards for drainage should be consistent with the purpose and standards identified in any local stormwater management bylaw, regulation or policy to provide a seamless process for promoting LID site planning. Conserving the natural hydrologic function of a site, reducing impervious surfaces and preventing runoff are key principles in ensuring post development peak flows do not exceed predevelopment peak flows. Green infrastructure facilities should be explicitly encouraged for treatment, attenuation, and infiltration of stormwater at decentralized locations around a site to capture stormwater at its source.</i>		
N	Does the site plan approval process promote and enable an LID approach?		<i>Critical to effective implementation of green infrastructure facilities is the site inventory and analysis process which should occur before any design work. Existing site conditions may offer opportunities to minimize impacts as well as the costs of stormwater management and can be identified through careful site analysis. Local zoning and permitting can promote a thoughtful process by defining the planning process and providing standards for green infrastructure, especially for smaller projects that do not trigger review for a stormwater management permit.</i>	Preapplication Meeting with Developers- PVPC LID Checklist	
None	What elements count toward meeting open space requirements? (indicate all that apply)		<i>Consider allowing applicants to count <u>green infrastructure</u> stormwater management facilities as open space, especially if their project goes above and beyond requirements for stormwater management.</i>	Allow applicants to count green infrastructure stormwater management facilities as open space	
	Bioretention areas				
	Constructed wetlands				
	Green roofs				
	Other: _____				

INTRODUCTION

ASSESSMENT OF STREET DESIGN AND PARKING LOT GUIDELINES AND FEASIBILITY OF ALLOWING GREEN INFRASTRUCTURE

NPDES MS4 Community: Marblehead

Y/N	Checklist Item	Location in code and any standards	Example Language/Notes (<i>shown in italics</i>)	Change(s) recommended	Proposed schedule to incorporate changes
Board of Health Bylaw and Regulations					
Not specified	Do regulations exceed Title 5 requirements, requiring oversized septic systems or larger setback distances?		<i>Regulations should not require additional setbacks or classify stormwater structures so as to increase minimum setback distances (e.g. some towns require dry wells and bioretention areas to meet the same setbacks as a septic system).</i>		
Not specified	Do regulations allow the use of stormwater for non-potable uses?		<i>The type of and quantity of pollution in stormwater depends on the composition of the surfaces over which stormwater runoff flows and the activities within the drainage area that generate pollution. The water quality requirements of common beneficial uses of stormwater and the level of treatment needed for various types of harvested stormwater to meet these requirements are summarized in the Minnesota Stormwater Manual's Water Harvesting and Use System Matrix:</i> https://stormwater.pca.state.mn.us/index.php?title=Water_harvesting_and_use_system_matrix		
Wetlands Bylaw and Regulations					
Unsure	Do regulations increase the required buffer above beyond what is required by the Wetlands Protection Act and/or establish more protective standards for buffer zones?		<i>Increased wetland buffer zones improve sediment filtration and nutrient removal from stormwater, and decrease potential flooding by providing additional opportunities for stormwater infiltration. However, the Wetlands Protection Act does not include performance standards for the buffer zone, and not all resource areas are afforded a buffer zone under the definitions of the Wetlands Protection Act. Through local wetlands bylaws and/or regulations, municipalities can claim jurisdiction over the 100-foot Buffer Zone (or larger areas) as a Resource Area in and of itself; expand the definition of Buffer Zone to include buffer zones to resource areas not currently included in the Wetlands Protection Act; and/or extend the 200-foot Riverfront Area to intermittent streams, brooks, and ponds.</i> <i>Additional information regarding the science behind the importance of buffer zones and bylaw/ordinance considerations can be found in the MACC Wetland's Buffer Zone Guidebook (link provided below), which includes a standard Burden of Proof statement that can apply to Buffer Zones if such areas are defined as within the local Conservation Commission's area of jurisdiction: The applicant for a permit shall have the burden of proving by a preponderance of the credible evidence that the work proposed in the permit application will not have unacceptable significant or cumulative effect upon the resource area values (i.e., ecosystem services and functions) protected by this bylaw. Failure to provide adequate evidence to the Conservation Commission supporting this burden shall be sufficient cause for the Commission to deny a permit or grant a permit with conditions.</i> https://www.readingma.gov/conservation-division/files/macc-wetlands-buffer-zone-guidebook		
Municipal Policies and Programs					
N	Does the municipality have a plan for water efficiency that includes reuse?		<i>MAPC's Guide to Water Reuse in Massachusetts includes limitations, benefits, and design considerations for different types of water reuse systems. See:</i> http://www.mapc.org/wp-content/uploads/2017/11/3-1-Once-is-Not-Enough-Guide-to-Water-Reuse-10-05.pdf		
Y (Stormwater Runoff), N (LID)	Does the municipality have a program to address stormwater runoff and/or LID?				
Y	Does the municipality provide information brochures / manual for homeowners describing rainwater harvesting and stormwater	https://www.marblehead.org/sites/g/files/vyhlif4661/f/uploads/appendix_viii_public_outreach_and_involvement	<i>PVPC's Green Infrastructure fact sheets include a guide to Rainwater Harvesting:</i> http://www.pvpc.org/sites/default/files/files/PVPC-Rain%20Water%20Harvesting.pdf		
Y	Does the municipality have policies that promote complete streets or LID considerations within capital improvement plans or in ranking road construction projects?	Capital Improvement Plan- pg20&46, Complete Streets grant submitted, for Rail Trail- surface and drainage improvements, invasive veg. removal, and street crossings			
Y	Do municipal policies require new street trees as part of road reconstruction projects?		<i>Trees are effective in capturing and promoting absorption of stormwater. For more information, see the US Forest Service Report, entitled The Sustainable Urban Forest Guide: A Step-by-Step Approach at:</i> https://urbanforestrysouth.org/resources/library/tresources/the-sustainable-urban-forest-guide-a-step-by-step-approach/at_download/file		
N	Do capital improvement plans include tree planting as part of project budgets?				
N	Has there been any review of emergency services policies or building and fire regulations to ensure that they allow LID techniques?				
Local Building / Plumbing Codes					
Not specified	Do local building codes allow the use of permeable paving, narrow driveways, green roofs or other LID techniques?				
Not specified	Do local building codes allow the use of harvested rainwater for interior non-potable uses?				
Not specified	Do local plumbing codes allow the use of harvested rainwater for interior non-potable uses such as toilet flushing?				

INTRODUCTION

ASSESSMENT

Pioneer Valley Planning
Commission, February 2022

OF STREET DESIGN AND PARKING LOT GUIDELINES AND FEASIBILITY OF ALLOWING GREEN

INFRASTRUCTURE

Example of Parking Requirements per 1,000 sq ft of Gross Floor Space from *Assessing Street and Parking Design Standards to Reduce Excess Impervious Cover in New Hampshire*

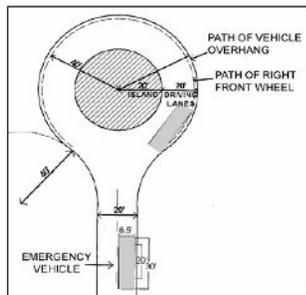
Land Use	Maximum	Minimum
Bank	3	2
Large Scale Retail	4	2
General Office Building	4	2
Medical Building	8	2
Nursing Home	3	2
Restaurants	10	6
Shopping Centers	4	3
Bed and Breakfast	1.2 spaces per guest room or suite	1 space per guest room or suite
Personal Services	3	2
Churches and Places of Worship	1 space per 3 seats in the service portion of the building	1 space per 5 seats in the service portion of the building
Museums and Libraries	2	1
Public and Private Educational Institutions	1 space per 3 seats in the classroom	1 space per 5 seats in the classroom

General Parameters for Residential Road Design from *Sustainable Neighborhood Road Design: A Guidebook for Massachusetts Cities and Towns*

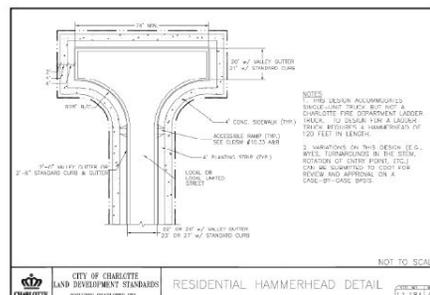
Parameter	Single Use Residential	Single Use Residential	Single Use Residential	Single Use Residential
	Wide	Medium	Narrow	Alley
Traveled Way				
Typical ADT	4,999 < 1,500	1,499 < 400	399 < 0	100 < 0
Design Speed	25 - 30 mph	20 mph	20 mph	15 mph
Operating Speed	20 - 25 mph	20 mph	15 - 20 mph	15 - 20 mph
Number of Through Lanes	2	2	2	1
Lane Width	10 - 12 feet	10 - 12 feet	10 feet	9 - 10 feet
Shoulder	2 feet	2 feet	2 feet	2 feet
Bike Lanes	Shared road or 6 feet wide	Shared road	Shared road	Shared road
Utility Easement Width	--	--	10 feet	10 feet
Range of ROW Width	40 - 50 feet	36 - 40 feet	33 - 36 feet	20 feet

Parameter	Single Use Residential	Single Use Residential	Single Use Residential	Single Use Residential
	Wide	Medium	Narrow	Alley
Roadside				
Desirable Roadside Width (pedestrian, swale, and planting strip)	5.5 - 12 feet	5.5 - 10 feet	5.5 feet	None
Grass Plot / Planting Strip	0 - 6 feet	0 - 6 feet	0 - 6 feet	None
Minimum Sidewalk Width	4 feet; one side OK	4 feet / shared road	Shared road	Shared road
Street Lighting	At intersections and pedestrian-scale lighting at residential driveways	At intersections and pedestrian-scale lighting at residential driveways	At intersections and pedestrian-scale lighting at residential driveways	At intersection with road
Intersections				
Traffic Control	Stop signs, 4-way yield	4-way yield	4-way yield	Yield exiting alley
Curb Radii	15 - 25 feet	15 - 25 feet	15 - 20 feet	15 feet

Example of Cul-de-Sac Designs and Dimensions, from *Sustainable Neighborhood Road Design: A Guidebook for Massachusetts Cities and Towns*



a. Cul-de-sac with vegetated island



b. Hammerhead turnaround design