



Pleasant Bay Alliance - Regional Stormwater Management Bylaw Review

Prepared by the Cape Cod
Commission on behalf of the
Southeast New England
Program (SNEP) Network

June 2021

The SNEP Network is administered by:
New England Environmental Finance Center
University of Southern Maine, UMaine System
www.snepnetwork.org | TEL: 207-228-81-64



This project has been funded, in whole or in part, by the U.S. Environmental Protection Agency's Southeast New England Program under Assistance Agreement SE-00A00655-0. The contents of the document do not necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does the U.S. EPA endorse trade names or recommend the use of any products, services or enterprises mentioned in this document

Acknowledgements

This project has been funded by the U.S. Environmental Protection Agency's Southeast New England Program (SNEP) under assistance agreement SE-00A00655-0. The SNEP Network is administered by New England Environmental Finance Center, University of Southern Maine, UMaine System (www.snepnetwork.org).

The project and report were completed by the Cape Cod Commission, as a partner organization of the SNEP Network, for the Pleasant Bay Alliance (a municipal organization formed by the Towns of Orleans, Chatham, Harwich and Brewster to coordinate the resource management plan for the Pleasant Bay ACEC watershed).

Mass Audubon's Low Impact Development Bylaw Review Tool (www.massaudubon.org/lidcost) provided the framework for this project's analysis. The OSRD best practices chart is based on the Massachusetts Executive Office of Energy and Environmental Affairs Model Open Space Design / Natural Resource Protection Zoning. The zoning, subdivision, site plan, and stormwater regulatory analysis charts were based on a checklist from the MAPC LID Toolkit. Development of the Bylaw Review Tool was funded in part by an EPA award to the New England Interstate Water Pollution Control Commission; Foundation for MetroWest; and the Massachusetts Environmental Trust.

Table of Contents

Executive Summary and Regional Recommendations	4
Introduction	4
Method	4
Notable Examples Encouraging LID.....	6
Opportunities for Improvement.....	6
Key Findings	8
Priority Actions.....	9
Conclusion	10
Brewster Bylaw and Regulation Review	11
Overview	11
Key Areas of Analysis.....	11
Stormwater Management Bylaw and Illicit Discharge Regulations	11
Zoning Bylaw & Subdivision Regulations.....	12
Wetlands Protection, Board of Health, and other Regulations.....	13
Additional Recommendations	13
Areas of Potential Inconsistency	14
Other Considerations	14
Chatham Bylaw and Regulation Review	15
Overview	15
Key Areas of Analysis.....	15
Stormwater Management Bylaw and Illicit Discharge Regulations	15
Zoning Bylaw & Subdivision Regulations.....	16
Wetlands Protection, Board of Health, and other Regulations.....	17
Additional Recommendations	18
Areas of Potential Inconsistency	18
Other Considerations	18
Harwich Bylaw and Regulation Review	19
Overview	19
Key Areas of Analysis.....	19
Comprehensive Stormwater and Illicit Discharge Regulations.....	19
Zoning Bylaw & Subdivision Regulations.....	21

Wetlands Protection, Board of Health, and other Regulations	22
Additional Recommendations	23
Areas of Potential Inconsistency	23
Other Considerations	24
Orleans Bylaw and Regulation Review	25
Overview	25
Key Areas of Analysis	25
Stormwater Management Bylaw and Illicit Discharge Regulations	25
Zoning Bylaw & Subdivision Regulations	26
Wetlands Protection, Board of Health, and other Regulations	27
Additional Recommendations	28
Areas of Potential Inconsistency	28
Other Considerations	28
Appendices	31
Appendix A – Brewster SWM Bylaw Review	32
Appendix B – Chatham SWM Bylaw Review	39
Appendix C – Harwich SWM Bylaw Review	50
Appendix D – Orleans SWM Bylaw Review	59

Executive Summary and Regional Recommendations

Introduction

In 2019, the US Environmental Protection Agency (EPA) awarded a five-year cooperative agreement to the New England Environmental Finance Center (New England EFC) at the University of Southern Maine to establish a technical assistance network (The Network) consisting of numerous partner organizations that provide training and assistance to municipalities, organizations, and tribes across the region. The purpose of the network is to advance stormwater management, ecological restoration, and climate resilience within Rhode Island and southeastern Massachusetts. In response to a request for technical assistance by the Pleasant Bay Alliance (PBA) and its four member towns, Cape Cod Commission staff with the assistance of other network partners developed a process for review of local town regulations and bylaws and conducted reviews for Brewster, Harwich, Chatham and Orleans.

Several guiding principles that direct the Network's efforts include:

- 1) Conserving resources that already exist to preserve existing function(s),
- 2) Integrating green infrastructure and Low Impact Development strategies into all development,
- 3) Working within existing development patterns to restore functions that are lost, including natural hydrology.

In addition, within the Pleasant Bay watershed only approximately 40% of impervious cover can be directly influenced by town activities. In many sub-watersheds the fraction of impervious cover that the town can directly manage is even lower. This is important to note not only from a stormwater management perspective, but also from a cost perspective. Recent work by EPA in the Taunton River watershed found that up to 40% of future retrofit costs, which would largely be borne by towns rather than private developers, could be avoided through the administration of improved local regulations. Both the guiding principles and the characteristics of the Pleasant Bay watershed highlight the importance of combining direct planning activities that can be implemented by the town with regulatory and administrative tools to promote and incentivize enhanced stormwater management throughout the entire community.

To this end, the ability of the towns to regulate stormwater management was assessed based on existing bylaws and regulations with the goals of highlighting areas that already promote enhanced stormwater management and developing recommendations to further streamline or strengthen existing regulations. By conducting this analysis at the watershed level, opportunities for transfer among towns to create regional consistency, improve climate resiliency, and enhance stormwater management throughout the Pleasant Bay watershed were also examined.

Method

For each town in the Pleasant Bay Alliance, an online search was conducted to identify relevant bylaws and regulations, such as Zoning, Wetland Protection, Subdivision of Land, Site Plan Review,

and Stormwater Management. There was a wide variety of availability and format for the bylaws and regulations. Some were available from town department websites, others at the eCode360 library (ecode360.com), while a few could not be found or had to be obtained via direct communication with the town.

Mass Audubon's Low Impact Development Bylaw Review Tool (Tool) (www.massaudubon.org/lidcost) was used to assist with the bylaw review process. The Mass Audubon Tool provides a framework to review local bylaws and regulations pertaining to low impact development (LID) and nature-based solutions (NBS). The Tool is an excel spreadsheet with factors listed as row headers (e.g., road width, construction, erosion and sedimentation plan, etc.), and a community's bylaws and regulations as column headers. The bylaws are ranked (conventional, better, best) based on their ability to manage stormwater and encourage LIDs. The Tool is designed to identify low hanging fruit and provides a mechanism for comprehensive bylaw evaluation, which can be an overwhelming and time-consuming process.

The Tool was, however, not designed solely for stormwater management or MS4 permit compliance, so to better review municipal bylaws and regulations from that perspective additional factors and bylaws were added to the excel spreadsheet. For example, columns were added for Wetlands Bylaw and Board of Health Regulations. Rows were added for illicit discharge detection and construction stormwater runoff control, etc.

The review process involved two separate steps. Using Mass Audubon's Tool as a guide, each bylaw was read, and regulations related to stormwater management and other key factors were documented in the Tool and their location within the bylaw noted (e.g., Ch 238.B.1.c). Based on how well the regulation or standard met best practices, a color-coded rating was assigned (conventional = orange; better = yellow; best = green). The color-coded analysis provides a quick overview of rules that are out of date or are inconsistent with other bylaws, and those that offer the best protection of water resources. A color-coded analysis for each of the towns is provided in the appendix. These spreadsheets are part of the workflow process and are dynamic as they will be continually updated and edited in response to feedback and bylaw and regulation development.

The second step entailed doing a search for key words associated with stormwater management (e.g., drainage, infiltration, impervious surface, etc.). However, this was only possible with documents that were in a searchable format (scanned documents are often not searchable). Additionally, every town uses different terminology, so every search had to be catered to the specific language used in that town (and sometimes different language was used between bylaws within a town). For example, some towns use "stormwater," others use "storm water," while still others use "drainage," and / or "runoff." These types of complications illustrate part of why comprehensive bylaw review can be a time-consuming process for municipal staff even when resources like Mass Audubon's bylaw review tool are available to streamline the process.

While invaluable in allowing internet access to numerous local bylaws the eCode Library presented several challenges of its own. Not being able to isolate a particular chapter of a bylaw for a word search made it difficult to keep track of the review process. To address this limitation, Commission staff developed a systematic approach by manually tracking specific chapters and concepts to glean

information not yielded via the word search process of the pdf versions. An additional benefit offered by the eCode Library was the ability to search all of the bylaws within a town to gauge whether overall concepts are consistently carried through town-wide regulations, and to quickly determine the presence or absence of specific bylaws.

Using the Cape Cod Commission's Stormwater BMPedia (<https://www.capecodcommission.org/our-work/stormwater-bmpedia/>), staff checked each town for public demonstration projects and examples of best management practices that advanced stormwater management goals and can be utilized to educate the public about stormwater best practices.

Once the review of the bylaws and regulations was complete, the spreadsheet-based information in the Tool was summarized in a written report for each town (see subsequent sections) to review and provide feedback. Updates were made to individual town reports as needed.

Additionally, trends or inconsistencies noted in more than one town were compiled into a regional stormwater bylaw review report (this document) to provide an executive summary and regional recommendations.

Notable Examples Encouraging LID

Towns within the Pleasant Bay region have already made important strides to improve stormwater management as highlighted below:

- Brewster's Zoning Bylaw incentivizes the use of stormwater LID components by allowing density bonuses if three or more LID practices are part of the site design.
- Harwich's Zoning Bylaw encourages impervious reductions in OSRD by allowing reductions in roadway standards in exchange for at least 50% open space.
- Chatham's Zoning Bylaw allows for easy siting of LID features in business and industrial districts by allowing drainage in green space / area.
- Orleans' Subdivision Rules and Regulations require an analysis of surface versus underground drainage system alternatives for a subdivision within 300 feet of a wetland resource or if it contains two or more lots of land within the Groundwater Protection District 2.
- All four of the PBA towns have an open space residential design (OSRD), or similar development option which encourages more sustainably designed subdivisions. This type of development is good for preserving natural landscapes, conserving open space, and minimizing lot clearing, all key components of LID.

Opportunities for Improvement

There were several areas of inconsistency for stormwater management that were observed in multiple towns within the Pleasant Bay watershed. Consistent regulations within a town, or among neighboring towns in a region, will reduce confusion and make incorporating LID design easier for

town staff and developers. Potential recommendations for consistent and streamlined stormwater management include:

- In the interest of consistency, efficiency, and maximizing environmental benefit the same performance standards should apply to both upland projects and wetland projects. Consider allowing projects that require a wetlands protection permit to bypass a separate stormwater permit review so long as the substantive performance standards of the stormwater regulations are met. The new edition of the MA Stormwater Handbook is expected to require one inch water quality volume for stormwater treatment regardless of location.
- For towns with standalone stormwater management bylaws and regulations, it is recommended that other bylaws or regulations remove specific stormwater guidelines or requirements and instead refer the reader to the town's stormwater management bylaw and regulation. This will help make the requirements and standards clearer, eliminate inconsistencies, and minimize confusion. Having all stormwater related regulations consolidated will also streamline future updates as they become necessary. For example, "Erosion and sediment control shall be provided for all development and redevelopment as required by the Town of Orleans Drainage and Erosion and Sedimentation Control Bylaw, Chapter 88."
- Careful language choice can strengthen the effectiveness of many regulations. For example, indicating roadside swales are "preferred" as opposed to "allowed." Providing specific criteria for preferred designs and adopting or providing technical specifications and design templates for green or nature-based infrastructure can streamline inclusion of these features. SNEP Network resources may be available to provide or create examples of these standard plans where necessary.
- Adding LID and nature-based stormwater treatments as permissible uses for the open space within an OSRD could further increase the effectiveness of these development patterns at limiting stormwater and climate change impacts.
- Concerning the interdepartmental communication and coordination component of the MS4 compliance, local coordination between municipal boards and permits is important for supporting and successfully implementing effective stormwater management. Sustainable development through the application of LID in all aspects of land and water management is a multi-faceted issue that can only be addressed by working together among different departments and perspectives. It is critical that every department involved in site and or staff review be on the same page in terms of stormwater management. Towns may realize better outcomes if they involve varied staff in stormwater management reviews in a way that is tailored to the site and development proposal. Various staff that may be identified for project reviews could include the town planner, building inspector, natural resource, public works, and conservation agent.

Key Findings

The following key findings were identified as providing opportunities for incorporating LID designs to improve stormwater management across the Pleasant Bay region. The four towns of the Pleasant Bay region are uniquely positioned with a mechanism in place, through the PBA, for region-wide coordination, communication, and implementation.

- 1) Due to the prevalence of surface water bodies, the region's reliance on groundwater for drinking water, and the sandy, inorganic soils, virtually every area on Cape Cod is critical to protecting the quality of water resources. Considering this, many of the more stringent regulations and standards set for specific areas or districts could further protect sensitive water resources if their applicability was broadened. The area of applicability could include the area of a town within the Pleasant Bay watershed, the area within any coastal embayment watershed, or anywhere within the town. Requirements to minimize loss of recharge, provide onsite infiltration, and maintain annual recharge from post-development to approximate pre-development conditions provide additional protections within specific districts or overlays. Requiring similar performance for new and redevelopment throughout the entire town or Pleasant Bay watershed would further emphasize the importance of water resources of the Pleasant Bay region. The PBA offers its member towns a regular forum and a regional mechanism through which regional regulatory consistency could be assessed and implemented more easily than in many shared watersheds.
- 2) All four towns have mechanisms in place through OSRD, and the like, to encourage preferred development designs that include LID features such as preserving open space and minimizing disturbance to existing topography and natural features. These can be further incentivized through mechanisms such as streamlining the permit process for projects utilizing preferred site designs to both encourage the use of these LID design concepts and reduce time burdens on town staff and local boards. Making the OSRD a by-right option would encourage developers to choose conservation design as the preferred and easiest path for permitting.
- 3) Consistency to the application of stormwater management bylaws and regulations can be enhanced by aligning processes and administration authority to be consistent with the town's stormwater management plans. For example, if the director of the DPW is the stormwater management authority, make them the authority for determining whether a site requires an erosion and sediment control plan, instead of, for example, the building inspector. Additional uniformity can be achieved for stormwater standards and administration by referencing the stormwater management bylaw in non-stormwater bylaws. Regional coordination across municipal boards and permits is also important for supporting LID. Implementation of these practices can result in significant savings in infrastructure maintenance costs as well as improved water quality and protection of water resources.

Priority Actions

The following are top priority action items, either because they are low hanging fruit that will easily and quickly improve stormwater management, they are Year 4 requirements for the Massachusetts Small Municipal MS4 permit (June 30, 2022), or because they, although more difficult to implement, will provide exponential outcome for improved quality of stormwater runoff.

Three of the four PBA towns currently have a separate stormwater management bylaw. In the fall of 2021 Brewster will adopt a finalized stormwater bylaw. The recommendation moving forward is to implement more stringent stormwater management regulations for the Pleasant Bay watershed. Improvements could include requiring LIDs to the maximum extent practicable and incentivizing LID and green infrastructure BMPs through “by right” processes making the permitting and implementation easier for town employees, boards, and developers. They could also include requiring that stormwater management BMPs be specifically designed to remove the contaminant of concern (e.g., phosphorus or nitrogen) depending on nearby resource areas and the concentration and speed of transport of contaminants. Any of these improvements should include adequate mechanisms to enforce LID maintenance agreements, including the ability to levy fines for non-compliance.

Given that the Pleasant Bay watershed has nitrogen loading thresholds (TMDLs) for 19 subembayments, a primary action item identified during this process is to apply, within the Pleasant Bay watershed, mechanisms for adoption or amendment of the regulation to include a requirement that new development and redevelopment stormwater management BMPs be optimized for nitrogen removal (MS4 §2.3.6).

More widespread installation of LID stormwater management techniques (bioretention, swales, filter strips) can be facilitated by permitting their construction on land held in common, such as open space in OSRDs.

Providing options to reduce impervious surfaces in new and redevelopment projects is a priority action item that aligns with the year four MS4 permit requirement to identify and assess the potential for reducing impervious areas (MS4 §2.3.6). Suggestions for ways to facilitate this include:

- allowing use of permeable paving
- creating formulas for shared parking for uses with different peak demand periods
- establishing landscaping requirements for parking areas that include designing non-bermed vegetated islands with bioretention functions
- reducing the required radii for cul-de-sacs (35 feet is optimal).

To best adapt stormwater treatment designs to improve climate resilience, regulations should reference the most updated data on storm intensities from the Northeast Climate Center at <http://www.nrcc.cornell.edu/> or the NOAA 2014 Atlas at https://hdsc.nes.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ma. More generally, applying green infrastructure strategies such as bioretention areas, blue or green roofs, and permeable pavement in a distributed fashion allows for better attenuation of runoff to better accommodate future precipitation amounts and intensities.

An important part of this exercise is to consider how current design standards were formulated for stormwater management in your community. As changes to design standards are contemplated, each community should weigh the following questions to determine the solution that fits best. What is the risk tolerance of the community? What level of damage or disruption can the community tolerate and at what costs? Can performance be enhanced for projects using existing or slightly modified current design standards? Come to a consensus on a threshold that is informed by historic data and the most recent storm intensity data to update design standards to prepare for a particular storm that would better define the communities risk threshold.

Conclusion

All four PBA towns utilize language that promotes LID in some parts of their local regulations. The recommendations provided in this summary are not necessarily to add something new or different, but rather to apply these good concepts that already exist in a more efficient or widespread manner. More specifically, applying them watershed-wide throughout Pleasant Bay could mitigate increases in impervious area and corresponding nitrogen loads from new development, and reduce impervious area through redevelopment. Both cases will obviate to some degree the need for additional growth-related nitrogen mitigation on the parts of the towns.

The recommendations for LID advancement provide opportunities for improving stormwater management, ecological restoration, and climate resilience across the Pleasant Bay region. The summary also provides potential ways to expand PBA's role to facilitate communication and coordination. Through the PBA, towns have a means to coordinate support for water quality restoration and climate resilience. Implementing best management practices minimizes the alteration of existing natural green infrastructure, reduces impervious surfaces, minimizes alterations to natural flow patterns, and supports the use of LID techniques as the preferred, most easily permitted method for managing stormwater.

Brewster Bylaw and Regulation Review

Overview

In an effort to understand Brewster's ability to regulate stormwater and promote development that minimizes runoff and maximizes recharge, and to determine compliance with the 2016 EPA Massachusetts Small MS4 General Permit, the Cape Cod Commission reviewed a variety of the Town's regulatory mechanisms. The following bylaws and regulations were reviewed:

- General Bylaws (2019)
- Zoning Bylaws (Ch 179, 1979)
- Wetlands Protection Bylaw (Ch 172, 1984) & Regulations (1986, amended 2013)
- Subdivision Rules & Regulations (Ch 290, 2009)
- Illicit Connections and Discharges Bylaw (Ch 115, 2011)
- Site Plan and Staff Review Regulations (S 179-66 & 83 of the Zoning Bylaws)

Key Areas of Analysis

- Compliance with MS4 Permit
- Protection of existing natural resources and open space
- Promotion of compact, efficient development patterns and designs that reduce impervious cover
- Standards that encourage wider adoption of low impact design (LID) and use of green infrastructure (GI)
- Consistency among town regulations

Stormwater Management Bylaw and Illicit Discharge Regulations

The MS4 Permit requires regulated communities to develop or modify, as appropriate, its regulatory mechanism for post-construction stormwater management by the end of Year 2 (June 2020) of the permit term, however that deadline was moved to the end of Year 3, June 2021.

Brewster does not currently have a separate stormwater bylaw. A stormwater management bylaw has been drafted and reviewed. The zoning bylaw amendment process has begun with the goal of adopting a finalized stormwater bylaw, consistent with the new MS4 permit requirements and other best management practices, in the fall of 2021.

A stormwater bylaw can reduce confusion from overlapping and potentially conflicting regulations and create a single set of standards to regulate stormwater management and discharges. Stormwater bylaws can also be used to promote environmentally sensitive development such as low impact development (LID) techniques that both filter stormwater and promote local

groundwater recharge. Stormwater bylaws define the administration and enforcement of the six minimum control measures:

- 1) Public Education and Outreach - MCM 1
- 2) Public Involvement and Participation – MCM 2
- 3) Illicit Discharge Detection and Elimination – MCM 3
- 4) Construction Site Stormwater Runoff Control – MCM 4
- 5) Post-construction Stormwater Management in New and Redevelopment – MCM 5
- 6) Good House Keeping and Pollution Prevention for Permittee Owned Operations – MCM 6

The review of these bylaws and regulations by Commission staff focused primarily on MCM 3 through MCM 5.

Brewster has an Illicit Connections and Discharges Bylaw which is intended to eliminate non-stormwater discharges to the Town's Municipal Separate Storm Sewer System (MS4). The regulation of illicit connections and discharges is necessary for the protection of water bodies and groundwater. Additionally, the bylaw provides authority to ensure compliance through inspection, monitoring, enforcement, and is an important element of compliance with the MS4 permit.

Zoning Bylaw & Subdivision Regulations

Several of Brewster's bylaws and regulations have stormwater management components and standards that are effective. The Zoning Bylaw provides incentives to encourage the use of LIDs, for example there are density bonuses on a multi-family lot if a minimum of three LIDs are included as components of the site design. It also requires runoff from impervious surfaces to be recharged on site and diverted toward vegetated areas for surface infiltration.

Several areas in the Zoning bylaw encourage reduction of impervious surfaces and conservation of open space and natural features of the land. Shared access to driveways is allowed where it is feasible. Development that avoids topographic change and unnecessary tree and vegetation removal is recommended. New development stormwater discharge rates cannot exceed predevelopment rates and must maximize recharge.

The Zoning Bylaw protects natural resources and open spaces and allows the green areas required in multi-family developments to be used for stormwater drainage treatment systems (179-34.C)

Within the Water Quality Protection District (WQPD) shared driveways are allowed, as are reduced parking spaces for locations with different peak demand times, stormwater must be recharged on site, and recharge areas must be maintained in full working order by the owners. We recommend that these requirements be applicable town-wide and that all stormwater treatment systems have an operation and maintenance plan that ensures maintenance through the lifetime of the treatment.

If a Special Permit is granted for any use that has impervious cover greater than 15% or 2,500 square feet of the lot, whichever is greater, nonresidential projects must provide a system for groundwater recharge that will not degrade groundwater quality. Recharge must be by vegetated infiltration basins or similar system (179-56 D(2)(c)).

Brewster has Planned Residential Development (PRD) and Cluster Residential Development (CRD) which require conserving significant tracts of common open space and preservation of natural features (179-35&36). Stormwater management in PRD is required but it is not mentioned in CRD. Requirements to treat stormwater by recharging via vegetated infiltration practices on site and allowing stormwater LIDs to be located in the open space, like in the multifamily dwelling, would improve preservation of natural features and existing ecosystems.

Subdivision Rules and Regulations (Ch 290) protect and preserve open space and natural resources through such requirements as not allowing the removal of topsoil from a site and preserving existing trees. Maintenance of drainage systems on a road is required for at least two years or until the road is accepted by the Town. However, there are no incentives for reducing impervious surfaces, low impact development of stormwater treatment systems is not encouraged, and, other than within WQPD, recharge is not required on the site.

Wetlands Protection, Board of Health, and other Regulations

The Wetlands Protection Regulations recommend planting to be compatible with natural vegetative cover. We recommend this language be updated to require native vegetation that is compatible with surrounding vegetative cover.

The wetland regulations require that drainage and runoff not be altered from preexisting patterns within areas subject to Brewster's wetlands bylaw. There are no other references to stormwater management performance standards.

In the interest of consistency, efficiency, and maximizing environmental benefit the same performance standards could apply to both upland projects and wetland projects. Consider allowing projects that require a wetlands permit to bypass a separate stormwater permit review so long as the substantive performance standards of the stormwater regulations are met.

Staff Review Regulations require development to be designed so that resulting stormwater patterns resemble, as nearly as possible, preexisting stormwater drainage patterns. Erosion control is required to minimize disturbance and to permanently stabilize nonpaved areas with vegetation within 60 days of exposure. An erosion control plan is required for disturbances greater than 60,000 square feet with written requirements.

The Board of Health Regulations were not reviewed as they were not available on the town website or on eCode360 (ecode360.com). They are only available on file in the office of the Town Clerk.

Additional Recommendations

Stormwater Calculations – Regulations should reference the most updated data on storm intensities from the Northeast Climate Center at <http://www.nrcc.cornell.edu/> or the NOAA 2014 Atlas at https://hdsc.nes.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ma

Landscaping and Recommended Trees – local regulations should require native, pollinator friendly species such as those listed here:

[https://grownativemass.org/sites/default/files/documents/Native Plants for Cape%20Cod Lands cape.pdf](https://grownativemass.org/sites/default/files/documents/Native%20Plants%20for%20Cape%20Cod%20Lands%20cape.pdf) or https://www.nrcs.usda.gov/Internet/FSE_Documents?nrcs144p2_015043.pdf

Take advantage of redevelopment and road repaving projects to improve stormwater management in existing areas through BMP retrofits.

Areas of Potential Inconsistency

As Brewster proceeds to finalize a stormwater management bylaw, we recommend reviewing other non-stormwater management bylaws and regulations for stormwater management language. To avoid potential areas of inconsistency consider replacing the stormwater management language with a reference to consult the stormwater bylaw and associated regulations for standards and requirements. For example, replace with “stormwater management should conform to the standards and requirements of the stormwater management bylaw and associated regulations.”

Other Considerations

Create mechanisms for enforcement of maintenance agreements through fines for property owners who fail to maintain stormwater facilities.

Implement LID demonstration programs at municipal owned property.

Consider changing local plumbing codes to allow the use of clean (e.g., rooftop) rainwater for landscape irrigation and interior non-potable uses such as toilet flushing.

Chatham Bylaw and Regulation Review

Overview

In an effort to understand Chatham's ability to regulate stormwater and promote development that minimizes runoff and maximizes recharge, and to determine compliance with the 2016 EPA Massachusetts Small MS4 General Permit, the Cape Cod Commission reviewed a variety of the Town's regulatory mechanisms, including the following bylaws, regulations, and guidelines:

- Zoning Bylaws (1993, revised 2019) – includes Site Plan Review
- Wetlands Protection Bylaw (Ch 272, 1997) and Regulations (2014)
- Rules and Regulations Governing the Subdivision of Land (adopted under the subdivision control law Section 81- GG Inclusive, Ch 41, GL) (1966, revised 2006?)
- Stormwater Management (Ch 238, 2019)
- Board of Health Regulations – Nitrogen Loading Regulation; Fertilizer Regulation

Key Areas of Analysis

- Compliance with MS4 Permit
- Protection of existing natural resources and open space
- Promotion of compact, efficient development patterns and designs that reduce impervious cover
- Standards that encourage wider adoption of Low Impact Design (LID) and use of green infrastructure (GI)
- Consistency among town regulations

Stormwater Management Bylaw and Illicit Discharge Regulations

The MS4 Permit requires regulated communities to develop or modify, as appropriate, its regulatory mechanism for post-construction stormwater management by the end of Year 2 (June 2020) of the permit term, however that deadline was moved to the end of Year 3, June 2021.

The town of Chatham has a separate stormwater regulation, titled Stormwater Management Bylaw (Ch 238) that was recently adopted, 2019. The objectives for the bylaw are well written and include prevention, prohibition, inspection, removal, and enforcement of illicit connections and complies with state and federal laws and regulations regarding stormwater discharges.

Stormwater bylaws can reduce confusion from overlapping and potentially conflicting regulations and create a single set of standards to regulate stormwater discharges. Stormwater bylaws can also be used to promote environmentally sensitive development such as LID techniques that both filter stormwater and promote local groundwater recharge. Stormwater bylaws define the administration and enforcement of the six minimum control measures:

- 1) Public Education and Outreach - MCM 1

- 2) Public Involvement and Participation – MCM 2
- 3) Illicit discharge detection and elimination – MCM 3
- 4) Construction Site Stormwater Runoff Control – MCM 4
- 5) Post-construction Stormwater Management in New and Redevelopment – MCM 5
- 6) Good House Keeping and Pollution Prevention for Permittee Owned Operations – MCM 6

The review of these bylaws and regulations by Commission staff focused primarily on MCM 3 through MCM 5.

Chatham's Stormwater Management Bylaw was adopted to better handle stormwater runoff and impose more stringent regulations, however its protection of the MS4 and waters of the commonwealth would be improved with associated regulations.

Stormwater management regulations that better define drainage standards and reflect the requirements outlined in the Massachusetts 2016 MS4 permit, such as requirements for construction projects greater than or equal to 1 acre of disturbance, requiring runoff to be recharged onsite by diverting to vegetated areas, and using LID practices to the maximum extent feasible, would be helpful. Providing guidance on how or where to site LIDs and siting recommendations as part of a design guideline document or some other method will help to promote further adoption of these approaches.

Regulations could encourage use of LID by allowing practices to be sited on lots, green spaces/areas, common open spaces, or road right of ways and by providing design criteria for green infrastructure and encouraging minimizing impervious surfaces.

Within the Stormwater Bylaw discharges and illicit connections are prohibited, and it requires notification of spills. The bylaw provides authority to ensure compliance through inspection, monitoring, enforcement, and is an important element of compliance with the MS4 permit.

Zoning Bylaw & Subdivision Regulations

Regulations within zoning districts only require erosion control if the building inspector determines it necessary and they must only be adequate to prevent damage when a project, building, or structure will alter land within 300 feet of a Conservancy District. They must be adequate to prevent erosion into or siltation of wetlands within a Conservancy District. We recommend erosion controls be consistent with or reference complying with standards and regulations provided in the town's Stormwater Management Bylaw and be applicable in areas outside of the Conservancy District.

No increase in impervious surfaces is allowed on a residential lot above 15% or 2,500 SF, whichever is greater, unless artificial drainage is provided. This standard could improve stormwater management by incentivizing other reductions in impervious surfaces and recommending low impact designs be used to the maximum extent feasible in commercial and industrial zones. For example, the possible exceptions for reducing parking spaces if uses have peak

demands occurring at different times and 25% of required spaces that may remain as “green area” reserved for future parking expansion (S.VI.B.7).

Parking areas with more than 10 spaces are required to have at least one tree for every 10 spaces. However, this tree is required to be within a bermed island. We recommend instead to not require berms and allow stormwater runoff to drain to the island and infiltrate into the pervious area around the tree.

We recommend replacing language referencing stormwater, runoff, drainage, (i.e., stormwater drainage structures shall be adequately sized) to stormwater shall be managed to be in compliance with the standards indicated in the Stormwater Management bylaw (Ch 238).

In a Conservancy District removal or destruction of natural growth essential to preventing erosion and storm damage is prohibited. Consider including incentives to limit clearing and require retention of native vegetation and trees in other districts.

Chatham has an Open Space Residential Development with objectives to encourage the permanent preservation of open space while minimizing total disturbance of topography and vegetation. Leaching fields for septic systems are allowed in open space, however stormwater management systems are not. We recommend allowing stormwater management systems, especially LIDs. Additionally, one criterion for an OSRD special permit includes adequacy of drainage facility. We recommend that the drainage facility requirements meet the standards of the Stormwater Management Bylaw.

Wetlands Protection, Board of Health, and other Regulations

The Wetlands Protection Bylaw and Regulations recommends the use of undisturbed, naturalized vegetated buffer strips (VBS) between development activities and wetland resource areas. The buffering capacity of the VBS controls soil erosion and filters pollutants, nutrients, and sediment. In instances where no VBSs exist or are limited, it may be deemed necessary to provide or enhance a VBS as mitigation in order to preclude adverse impacts from past, present, or future activities on the adjacent upland resource area and the abutting wetland. A VBS is a low impact design for stormwater management. Management and treatment of stormwater could be improved by encouraging other LIDs (swales, bioretentions) in the Adjacent Upland Resource Areas.

In the interest of consistency, efficiency, and maximizing environmental benefit the same performance standards should apply to both upland projects and wetland projects. Consider allowing projects that require a wetlands protection permit to bypass a separate stormwater review so long as the substantive performance standards of the stormwater regulations are met.

As indicated in the Board of Health’s Nitrogen Loading Regulation, in 2004 the entire town was declared an “Area of Nitrogen Concern.” Due to the prevalence of surface water bodies, the town’s reliance on groundwater for drinking water, and the soils in Chatham, virtually every area of town is critical to protecting the quality of surface and groundwater. Considering this, many of the regulations set for specific overlays or districts would better protect water resources if they were applicable town wide.

Additional Recommendations

Stormwater Calculations – Regulations should reference the most updated data on storm intensities from the Northeast Climate Center at <http://www.nrcc.cornell.edu/> or the NOAA 2014 Atlas at https://hdsc.nes.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ma

We recommend that regulations require, or at least encourage, native, pollinator friendly species be used to vegetate or revegetate disturbed areas. For examples, reference these sites: https://grownativemass.org/sites/default/files/documents/Native_Plants_for_Cape%20Cod_Lands_cape.pdf or https://www.nrcs.usda.gov/Internet/FSE_Documents?nrcs144p2_015043.pdf

Areas of Potential Inconsistency

According to the Zoning Bylaws a site plan review is required for any activity that affects drainage however there is no reference to this requirement in the Stormwater Management Bylaw. It would be clearer if the Stormwater Bylaw noted this requirement and referenced Zoning bylaw (S.VI.A) for details on Site Plan Review.

Other Considerations

Create mechanisms for enforcement of maintenance agreements through fines for property owners who fail to maintain stormwater facilities.

Encourage the use of LIDs for stormwater management to the maximum extent feasible. Highlight the stormwater wetlands demonstration LID project at Oyster Pond Furlong, implemented on municipal owned property. Implement LID demonstration programs at municipal owned property.

In the WRPD roof runoff must be infiltrated on site. Consider taking this farther by changing local plumbing codes to allow the use of clean (e.g., rooftop) rainwater for landscape irrigation and interior non-potable uses such as toilet flushing.

Since Chatham has a stormwater bylaw it is recommended that other bylaws or regulations strike from them any language providing stormwater guidelines or requirements and instead refer the reader to the Stormwater Management Bylaw (and future regulations) to avoid confusion and inconsistencies. For example, "Erosion and sediment control shall be provided for all development and redevelopment as required by the Town of Chatham Stormwater Management Bylaw, Chapter 238."

Harwich Bylaw and Regulation Review

Overview

In an effort to understand Harwich's ability to regulate stormwater and promote development that minimizes runoff and maximizes recharge, and to determine compliance with the 2016 EPA Massachusetts Small MS4 General Permit, the Cape Cod Commission reviewed a variety of the Town's regulatory mechanisms. The following bylaws and regulations were reviewed:

- General Bylaws (April 2009)
- Zoning Bylaws (Ch 325, 2009)
- Wetlands Protection Bylaw (Ch 310) and Regulations (August 2018)
- Sub-Division of Land and Site Plan Special Permits Regulations (Ch 400, 2008)
- Comprehensive Stormwater and Illicit Discharge Regulations (October 2018)
- Board of Health Regulations & Policies (July 2014)

Key Areas of Analysis

- Compliance with MS4 Permit
- Protection of existing natural resources and open space
- Promotion of compact, efficient development patterns and designs that reduce impervious cover
- Standards that encourage wider adoption of low impact design (LID) and use of green infrastructure (GI)
- Consistency among town regulations

Comprehensive Stormwater and Illicit Discharge Regulations

The MS4 Permit requires regulated communities to develop or modify, as appropriate, its regulatory mechanism for post-construction stormwater management by the end of Year 2 (June 2020) of the permit term, however that deadline was moved to the end of Year 3, June 2021.

Harwich has a separate stormwater regulation, titled Comprehensive Stormwater and Illicit Discharge Regulation (pursuant to Ch 295 – Sewer Use). This Stormwater Regulation provides guidance for the regulation of design and construction and post-construction stormwater runoff to protect local water resources. Additionally, these regulations are intended to eliminate non-stormwater discharges to the Town's Municipal Separate Storm Sewer System (MS4).

A stormwater bylaw can reduce confusion from overlapping and potentially conflicting regulations and create a single set of standards to regulate stormwater management and discharges. Stormwater bylaws can also be used to promote environmentally sensitive development such as

low impact development (LID) techniques that both filter stormwater and promote local groundwater recharge. Stormwater bylaws define the administration and enforcement of the six minimum control measures:

- 1) Public Education and Outreach - MCM 1
- 2) Public Involvement and Participation – MCM 2
- 3) Illicit discharge detection and elimination – MCM 3
- 4) Construction Site Stormwater Runoff Control – MCM 4
- 5) Post-construction Stormwater Management in New and Redevelopment – MCM 5
- 6) Good House Keeping and Pollution Prevention for Permittee Owned Operations – MCM 6

The review of these bylaws and regulations by Commission staff focused primarily on MCM 3 through MCM 5.

The Comprehensive Stormwater and Illicit Discharge Regulation (pursuant to Ch 295) was established in 2018 and provides standards by which to regulate stormwater discharges. The Stormwater Regulation does a good job at minimizing loss of recharge through infiltration measures that require the annual recharge from post-development to approximate annual recharge from pre-development. Onsite infiltration is encouraged, and LID site planning and strategies must be used to the maximum extent feasible. Projects located within TMDL areas are encouraged to consider pollutant appropriate best management practices (BMPs) to address the pollutant(s) of concern. This regulation could do more by allowing LIDs to be sited on lots, common open space, or road ROWs with criteria for proper design for green infrastructure.

The Regulation additionally minimizes loss of recharge by limiting impervious area and encouraging impervious disconnection by prohibiting coal tar-based driveways for all paved areas that directly connect to storm drains.

Illicit discharges, connections, and obstructions are prohibited and enforced. There is no authority included in the regulations for investigations and eliminations of illicit discharges, but according to the Harwich's MS4 Annual Report the development of these processes is underway.

Projects with disturbance equal to and greater than 1 acre are regulated under The Stormwater Regulations, which requires measures to control construction waste. New and redevelopment projects must reduce stormwater pollutants per the MS4 requirements. These Regulations are enforceable with violations and penalties.

The Regulation does not recommend or encourage or provide guidelines for allowing utilities to be located directly under the road or sidewalks to enable placement of roadside swales. Nor does it address parking lots and the potential to utilize landscaped islands as bioretention areas or rooftop runoff BMPs. The regulation would be more effective if it indicated that roadside swales are “preferred” as opposed to “allowed” as an option and if it provided criteria for proper design. We recommend the town adopt technical specifications and design templates for green or nature-based infrastructure. We recommend encouraging clean rooftop runoff to be used for irrigation to landscaped areas or naturally vegetated areas capable of absorbing or infiltrating the runoff.

The regulation does not address permeable paving. We recommend that permeable paving or two track design be allowed and encouraged for residential driveways, parking stalls and especially for spill-over or less frequently used parking spaces, and emergency access ways (where feasible).

A construction erosion control and sedimentation plan, stormwater management operation and maintenance (O&M) plan and an inspection plan are required, and long-term plan developed and implemented, with written requirements. However, no preference for surficial bioretention, swales, or other LIDs is indicated. Also, this is less instructive and rigorous than the Zoning Bylaw (Ch 325), which requires recharge to be onsite and with naturally vegetated BMPs and discourages conventional closed underground systems that require inspections and cleaning.

Zoning Bylaw & Subdivision Regulations

The Zoning Bylaw does a good job managing stormwater runoff by requiring development in the Six Ponds District to minimize loss of recharge, onsite infiltration, and annual recharge from post-development to approximate pre-development. This bylaw would better manage stormwater if these requirements applied to the entire Town of Harwich.

The Zoning Bylaw encourages reduction in impervious surfaces by encouraging common drives whenever two or more lots are created by any division of land regulated by the Subdivision Control Law.

In parking areas trees are required (one tree/five spaces) as are berms or curbs around the trees. This keeps stormwater runoff from entering the area. We recommend that this language be updated to allow or encourage landscaping requirements in parking areas to include LIDs for stormwater management, and to not require curbs. Required landscaped islands ($\geq 10\%$ of parking area w ≥ 20 spaces), should be encouraged to be designed as stormwater treatment areas (swales, raingardens, etc.).

The Town has an Open Space Residential Development (OSRD) option which provides open space requirements, smaller lot sizes, and less frontage. It also includes optional reduction in roadway standards when more than 50% open space is part of the project design (325-51.E.(8)(a)). This includes a reduction in drainage requirements. We recommend that this be updated to encourage the utilization of nature-based and LID stormwater solutions within the open space and to not allow a reduction in drainage requirements.

OSRD types of development could encourage more sustainably designed subdivisions town-wide by preserving natural landscapes. The Town regulations would be more effective at limiting stormwater impacts if a permissible use for the open space within an OSRD include LID and nature-based stormwater treatments.

OSRD, which requires a special permit and definitive subdivision approval from the Planning Board, is not confined to a small portion of town and therefore there is no limit to its applicability. Making the OSRD a by-right option would encourage developers to choose conservation design as the preferred and easiest path for permitting.

Drinking Water Resource Protection District (DEP Zone II) (325-41C) requires runoff from impervious surfaces to be diverted to areas covered with vegetation. This condition could be strengthened and provide better protection for the water resources by requiring LID practices for stormwater treatment.

The Six Ponds Special District (Article XVI 325-90 – 103) is limited to a specific area in Harwich. It allows for flexible cluster development and grid subdivision (S 325-101) which includes variation in development styles and minimizing impacts of development while preserving open space in perpetuity for the protection of natural resources and providing for the efficient layout of roads and utilities. It also limits clearing and grading to 30% of the site and requires disturbed areas to be revegetated with native plants within seven days of final grading during the planting season. Disturbances greater than 30,000 square feet require a permit. Priority is given to projects that propose retaining existing trees, contiguous vegetation and specimen trees.

We recommend allowing and even incentivizing stormwater LIDs and nature-based solutions within the Six Ponds Special District as it would be consistent with the purpose to protect the water quality of water supplies as well as the Town's ponds, rivers, wetlands, and embayments.

Sharing of driveways is encouraged to reduce curb cuts. This is also a good way to reduce impervious cover.

Village Commercial Overlay District allows additional open space options in Harwich Port's village center. Stormwater BMP and LID technologies are encouraged.

The Subdivision of Land and Site Plan Special Permits Regulations (Ch 400) do not encourage LID designs to meet stormwater management standards detailed in the Stormwater Regulation. They do encourage the use of native plants but require a hydroseed mix that contains non-native grasses.

The turning circle radius of a cul-de-sac must be greater than 45 feet with a 30-ft diameter planting area possible. To improve stormwater management, we recommend encouraging or requiring center landscaping with bioretention for stormwater treatment.

Consider allowing curb breaks to enable stormwater to flow off road to vegetated LID features or open drainage with roadside vegetated swales.

Utilities are required to be underground, under the right of way, however there is no mention of allowance for roadside swales to facilitate stormwater treatment siting.

Wetlands Protection, Board of Health, and other Regulations

Wetland Protection Regulations limit clearing and require native plants to minimize erosion within 100 feet of a resource area. Vegetated buffer strips are allowed in buffer zones which encourages LID siting.

In the interest of consistency, efficiency, and maximizing environmental benefit the same performance standards should apply to both upland projects and wetland projects. Consider

allowing projects that require a wetlands permit to bypass a separate stormwater permit review so long as the substantive performance standards of the stormwater regulations are met.

Board of Health Regulations agree with the Stormwater Regulations by prohibiting floor drains from discharging to the ground, leaching structure or septic system. Additionally, they encourage unpaved berms and side-slopes of paved roads to be seeded and maintained as dense grassed areas to prevent stormwater from entering drainage systems.

Additional Recommendations

Stormwater Permit Administration – clarify language in Section 4:B concerning disturbance. It is not clear if this is referring to a disturbance equal to or greater than 1 acre or does it mean a disturbance of any size? The language in Section 5:A is more clear indicating “no person shall perform any activity that results in a land disturbance above the threshold contained in this subsection, below.”

Stormwater Calculations – Regulations should reference the most updated data on storm intensities from the Northeast Climate Center at <http://www.nrcc.cornell.edu/> or the NOAA 2014 Atlas at https://hdsc.nes.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ma

Landscaping and Recommended Trees – local regulations should require native, pollinator friendly species such as those listed here: https://grownativemass.org/sites/default/files/documents/Native_Plants_for_Cape%20Cod_Lands_cape.pdf or https://www.nrcs.usda.gov/Internet/FSE_Documents?nrcs144p2_015043.pdf

Take advantage of redevelopment and road repaving projects to improve stormwater management in existing areas.

Areas of Potential Inconsistency

Require retention or planting of native vegetation/naturalized areas – the Wetland Protection regulations and the Zoning Bylaw both require native plants, however the Stormwater Regulation doesn't mention it. Subdivision of Land and Site Plan Special Permit Regulations indicates that the use of native species is encouraged, but then requires a hydroseed mixture that contains non-natives.

The Zoning Bylaw requires recharge onsite with BMPs containing vegetation. The Comprehensive Stormwater and Illicit Discharge Regulation encourages but does not require surficial bioretention or recharge on site.

Provisions in the OSRD and Six Ponds Districts offer more guidance and recommendations for how and where to treat stormwater runoff than are provided in the Stormwater Regulation. We recommend that these regulations be consistent with requirements and guidance to be clear and avoid confusion. Another alternative would be to only provide requirements, guidance and standards in the Comprehensive Stormwater and Illicit Discharge Regulation and then refer to those standards in all the other bylaws and regulations.

Other Considerations

Create mechanisms for enforcement of maintenance agreements through fines for property owners who fail to maintain stormwater facilities.

Implement LID demonstration programs at municipal owned property.

Rooftop runoff is not allowed within 300 feet of a pond shoreline within the Six Ponds District. We encourage additional guidelines, for example, consider changing local plumbing codes to allow the use of clean (e.g., rooftop) rainwater for landscape irrigation and interior non-potable uses such as toilet flushing.

Orleans Bylaw and Regulation Review

Overview

In an effort to understand Orleans' ability to regulate stormwater and promote development that minimizes runoff and maximizes recharge, and to determine compliance with the 2016 EPA Massachusetts Small MS4 General Permit, the Cape Cod Commission reviewed a variety of the Town's regulatory mechanisms, including the following bylaws, regulations, and guidelines:

- Zoning Bylaws (Ch 164, April 2013) including proposed amendments to parking and site plan requirements
- Wetlands Protection Bylaw (date) and Regulations (Ch 196A, 1995, last revised 2013)
- Subdivision Rules and Regulations (Ch 192, 1993)
- Drainage and Erosion and Sediment Control (Ch 88, May 2008, last revised 2019)
- Illicit Discharges (Ch 148, May 2013)
- Design Guidelines (2019)
- Board of Health Regulations (Ch 185, 2008)
- Site Plan Review (S. 164-33 of the Zoning Bylaws)

Key Areas of Analysis

- Compliance with MS4 Permit
- Protection of existing natural resources and open space
- Promotion of compact, efficient development patterns and designs that reduce impervious cover
- Standards that encourage wider adoption of low impact design (LID) and use of green infrastructure (GI)
- Consistency among town regulations

Stormwater Management Bylaw and Illicit Discharge Regulations

The MS4 Permit requires regulated communities to develop or modify, as appropriate, its regulatory mechanism for post-construction stormwater management by the end of Year 2 (June 2020) of the permit term, however that deadline was moved to the end of Year 3, June 2021.

The town of Orleans has recently made some zoning changes to limit impervious surfaces. Additionally, several bylaws require stormwater to be recharged onsite by diverting to vegetated areas for infiltration to minimize loss of recharge. Reducing impervious surfaces and managing stormwater as close to the source as possible are effective methods of limiting stormwater impacts.

Stormwater bylaws can reduce confusion from overlapping and potentially conflicting regulations and create a single set of standards to regulate stormwater discharges. Stormwater bylaws can also be used to promote environmentally sensitive development such as low impact development (LID)

techniques that both filter stormwater and promote local groundwater recharge. Stormwater bylaws define the administration and enforcement of the six minimum control measures:

- 1) Public Education and Outreach - MCM 1
- 2) Public Involvement and Participation – MCM 2
- 3) Illicit discharge detection and elimination – MCM 3
- 4) Construction Site Stormwater Runoff Control – MCM 4
- 5) Post-construction Stormwater Management in New and Redevelopment – MCM 5
- 6) Good House Keeping and Pollution Prevention for Permittee Owned Operations – MCM 6

The review of these bylaws and regulations by Commission staff focused primarily on MCM 3 through MCM 5.

Orleans has a separate stormwater bylaw, titled Drainage and Erosion and Sediment Control (Ch 88), which was recently updated in 2019 to better handle stormwater runoff and impose more stringent regulations. The bylaw requirements apply to existing, new, and redevelopment projects with the goal of minimizing adverse impacts from erosion and stormwater runoff.

The drainage requirements reflect the requirements outlined in the Massachusetts 2016 MS4 permit. Stormwater management standards are required for construction projects greater than or equal to 1 acre of disturbance, require runoff to be recharged onsite by diverting to vegetated areas, and include using LID practices to the maximum extent feasible. Since the bylaw does not provide any guidance on how or where to site LIDs, providing siting recommendations as part of design guidelines or via some other method will help to promote further adoption of these approaches.

Permanent erosion controls with BMPs utilizing vegetated retention basins are required. This bylaw could further encourage use of LID by allowing practices to be sited on lots, common open spaces, or road right of ways and by providing design criteria for green infrastructure and encouraging minimizing impervious surfaces. Additionally, it is recommended that the bylaw mention and reference the requirement for a site plan review for any activity that would affect drainage (164-33 II.B.4).

Orleans also has an Illicit Discharges Bylaw (Ch 148) which prohibits discharges, illicit connections, and requires notification of spills. The bylaw provides authority to ensure compliance through inspection, monitoring, enforcement, and is an important element of compliance with the MS4 permit.

Zoning Bylaw & Subdivision Regulations

There have been recent amendments to the Zoning Bylaws that allow for a reduction in the required number of parking spaces – shared use of parking by activities having different peak demand times (up to 20% reduction – greater than 20% will require a special permit). This is important for reducing impervious cover.

For subdivisions within 300 ft of wetland or containing 2 or more lots of land within Groundwater Protection District 2 the Subdivision Rules and Regulations require an extensive analysis of surface

versus underground drainage system alternatives to ensure water level and water quality are protected. To further improve the effectiveness of protecting water we recommend adding the requirement to assess LID designs to the analysis.

Orleans has an Open Space Residential Development bylaw (164-40.1, 2005) with objectives to preserve open space in perpetuity. Road width may be reduced to sixteen feet where the Planning Board finds this will be in the best interest in the town to, for example, reduce impacts of runoff to wetlands. This option could be extended to reduce stormwater runoff impacts regardless of the location to better manage stormwater within OSRD and town wide. Additionally, there is a requirement that drainage improvements meet the standards of the Subdivision Rules and Regulations. We recommend that the drainage improvements be required to meet the standards of the Drainage and Erosion and Sediment Control Bylaw.

The OSRD encourages that the open space be contiguous and that walking trails within the designated open space be pervious. We recommend that these be requirements and additionally to explicitly allow LID stormwater treatment systems in the designated open space.

The Planning Board Design Guidelines offer excellent guidance and support to the Architectural Review and Site Plan Review (S 164-33, 164-33.1) by encouraging shared access and parking areas, green roof, LID practices, managing stormwater by capturing and infiltrating onsite, and encouraging stormwater LIDs in landscaped areas; encourage redevelopment sites to reduce impervious area coverage, enhance stormwater retention, water quality treatment, and recharge to the extent feasible.

Many of these guidelines would be appropriate as regulations and as such could do more to reduce impact on the environment and improve stormwater management at a wider scale. Additionally, other development incentives may be considered to further encourage designs based on these guidelines.

Wetlands Protection, Board of Health, and other Regulations

The Wetlands Protection Bylaw and Regulations require replacement plants be native to Cape Cod, limits clearings and requires immediate seeding within 100 feet of a resource area. Stormwater management using buffer strips, diversion ditches (swales) and grassed waterways are encouraged.

In the interest of consistency, efficiency, and maximizing environmental benefit the same performance standards should apply to both upland projects and wetland projects. Consider allowing projects that require a wetlands protection permit to bypass a separate stormwater permit review so long as the substantive performance standards of the stormwater regulations are met.

The Board of Health Regulations, consistent with the Illicit Discharge Bylaw, do not allow floor drains to discharge to the ground and require spills or losses to be reported. This is enforceable and fined per day per violation.

Additional Recommendations

Stormwater Calculations – Regulations should reference the most updated data on storm intensities from the Northeast Climate Center at <http://www.nrcc.cornell.edu/> or the NOAA 2014 Atlas at https://hdsc.nes.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ma

Landscaping and Recommended Trees – local regulations should require native, pollinator friendly species such as those listed here:
https://grownativemass.org/sites/default/files/documents/Native_Plants_for_Cape%20Cod_Landscape.pdf or https://www.nrcs.usda.gov/Internet/FSE_Documents?nrcs144p2_015043.pdf

Areas of Potential Inconsistency

According to the Zoning Bylaws a site plan review is required for any activity that affects drainage however there is no reference to this requirement in the Drainage and Erosion and Sediment Control bylaw. It would be clearer if the Drainage bylaw included this requirement and referenced Zoning bylaw (S 164-33) for details on Site Plan Review.

The Town bylaws and regulations lack consistency between them concerning how to handle stormwater runoff (drainage) and overall stormwater design. For example, the Zoning Bylaw and Subdivision Rules and Regulations do not require or encourage LID and in fact encourage conventional stormwater designs, whereas in the Drainage Bylaw the use of LIDs is required to the maximum extent feasible.

Some of the recommendations provided in the Orleans Design Guidance are inconsistent with bylaws and can add confusion. For example, setbacks in the Guidance are flexible and depend on the road type, whereas setbacks in the Zoning Bylaw depend on the zoning district.

Other Considerations

Create mechanisms for enforcement of maintenance agreements through fines for property owners who fail to maintain stormwater facilities.

Implement LID demonstration programs at municipal owned property.

The Design Guidelines encourage rooftop runoff to be directed to vegetated LIDs as well as eco-roofs (green roofs). Consider taking this farther by changing local plumbing codes to allow the use of clean (e.g., rooftop) rainwater for landscape irrigation and interior non-potable uses such as toilet flushing.

Since Orleans has a stormwater bylaw it is recommended that any other bylaw or regulation strike from it any language providing stormwater guidelines or requirements and instead refer the reader to the Drainage and Erosion and Sediment Control Bylaw and Regulations to avoid confusion and inconsistencies. For example, "Erosion and sediment control shall be provided for all development and redevelopment as required by the Town of Orleans Drainage and Erosion and Sedimentation Control Bylaw, Chapter 88."

Additionally, consider formalizing the Design Guidelines, or at least several of them, into Stormwater Regulations, pursuant to the Drainage and Erosion and Sediment Control Bylaw.

Appendices

Appendix A - Brewster SWM Bylaw Review

Appendix B - Chatham SWM Bylaw Review

Appendix C - Harwich SWM Bylaw Review

Appendix D - Orleans SWM Bylaw Review



Supporting LID in Your Community How to Compare Local Land Use Regulations with Best Practices

Key Areas of Analysis

The following analysis framework is designed to assist communities in Massachusetts in applying cost-effective Low Impact Development (LID) techniques. Specifically, this template enables you to evaluate local land use regulations in relation to models and examples from the Commonwealth of Massachusetts' Smart Growth/Smart Energy Toolkit and other sources in relation to the use of LID and Green Infrastructure (GI) techniques. The focus is primarily on residential development, but the concepts are also applicable to other forms of development and redevelopment.

Best practices minimize the alteration of natural green infrastructure such as forests; reduce creation of impervious surfaces; support retention of naturally vegetated buffers along wetlands and waterways; minimize grading and alterations to natural flow patterns; and support the use of LID techniques as the preferred, most easily permitted methods for managing stormwater.

Get more details on LID's many cost-savings and other benefits, and our customizable bylaw review chart, at: www.massaudubon.org/LIDCost.

Local coordination across municipal boards and permits is also important for supporting LID. Application of these practices can result in significant savings in infrastructure maintenance costs, as well as improved water quality and protection of water supplies, while supporting property values and overall quality of life. Sustainable development through the application of LID in all aspects of land and water management is a multi-faceted issue that can only successfully be addressed by working together among different departments and perspectives.

Key Areas of Analysis

1. **Overall site design:** Open Space Residential Design (OSRD) vs. conventional subdivisions
2. **Project design and layout standards in relation to LID:** road layout and width, curbing, drainage, sidewalks, parking, landscaping
3. **Maintenance and operations, mechanisms for enforcement:** Who is responsible for maintaining drainage/LID (municipal or homeowner); easements, homeowner association option; municipal inspection and administration systems (this is needed regardless of who is responsible)



Appendix A - Brewster SWM Bylaw Review

Appendix A - Brewster SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (179)	Subdivision Rules & Regulations (Ch 290, Auth = Planning board)	Wetlands Protection Bylaw & Regulations (Ch 172)	Site Plan Review & Staff Review (Ch 179-66 & Ch 83)	Illicit Connections and Discharges Bylaw (Ch 115)	Board of Health Regs (Ch BOH)	General Regulations
GOAL 1: PROTECT NATURAL RESOURCES AND OPEN SPACE										
Soils managed for revegetation	Not addressed	Limitations on removal from site, and/or requirements for stabilization and revegetation	Prohibit removal of topsoil from site. Require retailing and other prep of soils compacted during construction	(Not applicable)	No removal of topsoil from site. At least 4" of cover must be provided to cover all areas of subdivision. Stabilize area with seeding and planting (290-24 A). Soil specifications provided (290-15 A-C).	Not addressed	Not addressed	(Not applicable)	(Not applicable)	Not addressed
Limit clearing, lawn size, require retention or planting of native vegetation/naturalized areas	Not addressed or general qualitative statement not tied to other design standards	Encourage minimization of clearing/ grubbing	Require minimization of clearing/grubbing with specific standards	avoid extensive topo and veg changes (179-36 2&4); Trees and other veg retained (179-66);	Existing trees shall be preserved. Special consideration will be given to layout to ensure that existing trees be preserved during grading lots and roads (290-24 B);	not addressed	Limit clearing and require existing trees and veg be retained, protected and supplemented as much as possible, ≥25% of the front lawn must be vegetated; disturbed areas kept to minimum, temp vegetation and/or mulch (83-8 B.2, 83-9 2). Existing grade shall be changed minimally to meet intent of Ch 272 (83-9 (3))	(Not applicable)	(Not applicable)	Limit clearing and require existing trees and veg be retained, protected and supplemented as much as possible, ≥25% of the front lawn must be vegetated (83-8 B.2, 83-9 2); Removal of existing vegetated ground cover > 10,000 SF (83-3(4))
Require native vegetation and trees	Require or recommend invasives	Not addressed, or mixture of required plantings of native and nonnative	Require at least 75% native plantings	not addressed	Not addressed	planting compatible with natural vegetative cover (2.03(5)(c))	Not addressed	(Not applicable)	(Not applicable)	
GOAL 2: PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL										
Lot size	Required minimum lot sizes	OSRD/NRPZ preferred. Special permit with incentives to utilize	Flexible with OSRD/NRPZ by right, preferred option	Required min lot sized except with incentives (LID, openspace, agriculture) which provide density bonuses (179-72.3); ≥ 20% of multifamily lot must be reserved for green areas - which can include storm drainage (as well as landscaping)(179-34.C).	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Lot density				Multi-family structures shall not occupy >25% of parcel (179-34). Density bonuses if min of 3 LID components i.e., bioretention, rain gardens, swales, green roofs, etc.(179-72.3.C)	Not addressed / not applicable?	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Setbacks	Required minimum front, side, and rear setbacks	Minimize, allow flexibility	Clear standards that minimize and in some instances eliminate setbacks	Building min setbacks based on use and area (179 Table 2); parking setbacks have required min (street, sideline, rear)(179-23A(1));In NRPD set up ≤ 10 ft (179-74.2	(Not applicable)	(Not applicable)	Reduced set backs allowed (179-66 B2)	(Not applicable)	(Not applicable)	
Frontage	Required minimum frontage for each lot/unit	Minimize especially on curved streets and cul-de-sacs	No minimums in some instances, tied into other standards like OSRD design and shared driveways.	Specific min frontage based on use and size/area (Table). No numerical requirements in NRPD, or via a shared driveway (179-74.2).	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Common driveways	Often not allowed, or strict limitations	Allow for 2-3 residential units	Allow for up to 4 residential units, preferably constructed with permeable pavers or pavement	Allowed, no specifics (179-74.2)	(Not applicable)	(Not applicable)	On specific roads, to minimize curb cuts, access to businesses use common driveway; reduced setbacks allowed to accommodate joint driveways; (179-66B). Shared driveways - On streets providing adequate access, shared access to driveways where feasible (179-66B, 83-7 D)	(Not applicable)	(Not applicable)	

Appendix A - Brewster SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (179)	Subdivision Rules & Regulations (Ch 290, Auth = Planning board)	Wetlands Protection Bylaw & Regulations (Ch 172)	Site Plan Review & Staff Review (Ch 179-66 & Ch 83)	Illicit Connections and Discharges Bylaw (Ch 115)	Board of Health Regs (Ch BOH)	General Regulations
Limit impervious area – Rural Districts. In high density areas, require post-development infiltration to = or > predevelopment	Not usually addressed in zoning and subdivision regs for rural/suburban residential?	<15%	<10%	Multifamily lots must use ≥20% (cluster development ≥60%+) of the lot for green space (landscape or SVV BMPs) (179-34). New development discharge rates shall not exceed predevelopment; shall maximize recharge; and remove ≥80% TSS (179-57). Any use that renders impervious >15% or 2,500 sf of any lot, a system for groundwater recharge must be provided which complies with Ch 272 (179-56 D(2)(c)).	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
GOAL 3: SMART DESIGNS THAT REDUCE OVERALL IMPERVIOUSNESS										
Street location	Numeric and geometric standards based primarily on vehicular travel and safety, with basic pedestrian requirements e.g. sidewalks	Flexibility in applying standards, to reduce area of impact, grading, avoid key natural features	OSRD design preferred by-right. Require locating streets to minimize grading and road length, avoid important natural features	(Not applicable)	Numeric and geometric stands (290-11, table 2)	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Road width	Major and minor categories, 24-30'	Wide, medium, narrow categories. 22-24' max, plus 2' shoulders	Wide, medium, narrow, and alley categories. 20-24' widest for 2 travel lanes, 18-20' low traffic residential neighborhood, plus 2' shoulders. Allow alleys and other low traffic or secondary emergency access and all shoulders to use alternative, permeable materials.	(Not applicable)	22-24 plus shoulders width 7.5-10.5' (290-11, table 1)	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Road ROW width	50-75', fully cleared and graded	40-50', some flexibility in extent of clearing	20-50' depending on road type	(Not applicable)	40-60' - (290-11)	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Access Options	No common drives allowed, dead end allowed with limit on length and # of units	Allow dead end with limit on length and # of units. Allow common drives up to 2-3 units	Allow one way loop streets. Allow common drives up to 4 units, and alleys and rear-loading garages where suitable.	(Not applicable)	Not addressed	(Not applicable)	Internal circulation encouraged to encourage pedestrian, bike and car access (179-66 B 5); shared driveways allowed (no specifications)	(Not applicable)	(Not applicable)	
Dead Ends/Cul-de-sacs	120 ft or more minimum turnaround	Minimize end radii – 35 ft	Allow hammerhead turnaround	(Not applicable)	cul-de-sacs allowed on major and minor roads, 60 or 55 ft radius (respectively); radius at edge of minor road ≥ 30 ft (Table 2)	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Cul-de-sacs	Full pavement standard	Encourage center landscaping with bioretention	Require center landscaping with bioretention	(Not applicable)	full pavement standard	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Curbing	Curbing required full length both sides of road	Allow curb breaks or curb flush with pavement to enable water to flow to vegetated LID features	Open drainage with roadside swales and no curbs preferred	(Not applicable)	curbing required except on minor streets, granite or concrete, ≥1.5 ft wide, sloping toward the street (290-11 & 13.B.)	(Not applicable)	Encouraged to reduce curb cuts - no # specified (179-66)	(Not applicable)	(Not applicable)	
Roadside Swales	Allowed as an option	Preferred over closed drainage	Preferred, with criteria for proper design. Adoption of technical specifications and design templates for green infrastructure recommended	(Not applicable)	Not addressed	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	
Utilities	Off sets required contributing to wide road ROWs	Not specified, flexible	Allow under road, sidewalks or immediately adjacent to roads to enable placement of roadside swales.	(Not applicable)	Underground (290-11) otherwise not specific	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	

Appendix A - Brewster SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (179)	Subdivision Rules & Regulations (Ch 290, Auth = Planning board)	Wetlands Protection Bylaw & Regulations (Ch 172)	Site Plan Review & Staff Review (Ch 179-66 & Ch 83)	Illicit Connections and Discharges Bylaw (Ch 115)	Board of Health Regs (Ch BOH)	General Regulations
Sidewalks	Concrete or bituminous	Some flexibility in material and design	Prefer permeable pavement or permeable pavers	(Not applicable)	concrete or bituminous	(Not applicable)		(Not applicable)	(Not applicable)	
Sidewalk location	Required both sides of road	Allow on only 1 side of road especially in low density neighborhoods	Prefer siting with land contours and for best pedestrian utility (e.g. connect with common areas and shared open spaces) – not necessarily immediately parallel to road.	(Not applicable)	only 1 required except on minor road - then none required.	(Not applicable)		(Not applicable)	(Not applicable)	
Sidewalk drainage	Drains to road closed drainage system	Not addressed	Disconnect drainage from road system – e.g. adjacent green strips or within vegetated areas that can absorb sheet flow	(Not applicable)	drains to road catch basins/drains	(Not applicable)		(Not applicable)	(Not applicable)	
GOAL 4: ADOPT GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS										
Rooftop runoff	Prohibit directing clean roof runoff into closed municipal drainage systems.	Allow clean roof runoff to be directed to landscaped or naturally vegetated areas capable of absorbing without erosion, or infiltration	Require directing clean roof runoff to landscaped or naturally vegetated areas capable of absorbing, or infiltration	In the WQPD in Zones I, II or DCPC no runoff > 5ppm N (179-57)	Not addressed	(Not applicable)	Not addressed	(Not applicable)	(Not applicable)	
Overall stormwater design; piping and surficial retention vs. LID	Conventional stormwater system design standards	Encourage LIDs and BMPs	LID design standard. Allow surficial ponding of retained runoff for up to 72 hours and credit for green roofs towards stormwater requirements	In WQPD all runoff from impervious surfaces shall be recharged on the site and diverted towards vegetated areas for surface infiltration; no new direct discharge on or off site; post development discharge rates ≤ predevelopment rates; new development must max recharge to groundwater and remove ≥ 80% TSS (perf STDs for WQPD @179-57). BMPs to be maintained for appropriate periods of time (179-57F.5); Multi-family & planned residential developments must provide SW drainage systems of sufficient size and design to collect, carry off and dispose of runoff w/in the development (179-34 D.	construction of SW drainage shall conform with the definitive plan, and the details shall conform to the details of the Mass Highway Dept specs and stds. Drainage basins ev 300 ft on continuous grades, sized determind by the Rational Method, design storm 25 yrs, 10 yrs in industrial subdivisions, incl topo plan, for subdivisions > 10 lots impact of stormwater on adjacent and downstream water resources must be evaluated (290-10B(3)(a)[2])	(Not applicable)	All development shall be designed so that resulting SW patterns resemble, as nearly as possible, existing conditions of volume, velocity, quality, and lcoation of runoff; any increase over predevelopment runoff peak rate shall be authorized by the PRC (83-8.A.)	(Not applicable)	(Not applicable)	
Site Plan/Design Requirements	LID may not be addressed	Encourage use of LID features in site design - such as reduced impervious, maintaining natural hydrology, preserving open space, rainwater reuse.	Count bioretention and other vegetated LID features toward site landscaping/open space requirements. The site design process should include soil erosion and sedimentation control measures	All land uses, structures and related developments shall conform to the standards and requirements of Ch 272 (179-66 F.1); > 20% of multifamily lot must be reserved for green areas - which can include storm drainage (179-34.C). Dry wells shall only be used where other methods are infeasible (179-57.E)	Written instructions for preliminary and definitive plans for subdivision; no mention of LID (290-9&10), but other sections encourage reduction in impervious (?), preserving open space.	Not applicable	Staff Review process; All development and redevelopment shall be designed in compliance with the Ch 272 SWM bylaw (83-8). Existing grade shall be changed minimally to meet intent of Ch 272 (83-9 (3))	(Not applicable)	(Not applicable)	
Allow easy siting of LID features (bioretention, swales, etc.)	Often not addressed, may require waivers from subdivision standards	Encouraged along road ROW	Allowed on lots, common open space, or road ROW, easement recorded. For commercial development, allow an increase in floor area ratio or other developmental incentives for green roofs	Density bonuses if min of 3 LID components i.e., bioretention, rain gardens, swales, green roofs, etc.(179-72.3.C)	Not addressed	(Not applicable)	Not addressed	(Not applicable)	(Not applicable)	

Appendix A - Brewster SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (179)	Subdivision Rules & Regulations (Ch 290, Auth = Planning board)	Wetlands Protection Bylaw & Regulations (Ch 172)	Site Plan Review & Staff Review (Ch 179-66 & Ch 83)	Illicit Connections and Discharges Bylaw (Ch 115)	Board of Health Regs (Ch BOH)	General Regulations
Permeable paving	Often not addressed, may require waivers from subdivision standards	Allowed on private residential lots for parking, patios, etc.	Allowed for residential drives, parking stalls, spillover parking spaces, emergency access ways (with proper engineering support for emergency vehicles) Two track design allowed for driveways and secondary emergency access ways (where required).	Density bonuses if min of 3 LID components i.e., bioretention, rain gardens, swales, green roofs, etc. (179-72.3.C)	Not addressed	(Not applicable)	Not addressed	(Not applicable)	(Not applicable)	
Stormwater management O&M plan	Typically only addressed if municipality has a stormwater or LID bylaw, or for areas subject to wetlands permitting	Required	Required, surficial bioretention and swales preferred. Closed/underground systems requiring specialized inspection and clean out discouraged.	Any and all recharge areas in the WQPD Z I&I shall be permanently maintained in full working order by the owner (179-56.D(2)(c)); All development must be designed to result in SW patterns resembling preexisting conditions of vol., velocity, quality and location. No increase over predevelopment peak rate (179-66.F.1).	subdivider shall guarantee maintenance of drainage (and water distribution systems) for two years or until road is accepted by the Town, by posting a bond (290-34 B); subdivisions located w/in the Water Resource Districts shall include analysis of open and closed drainage system alternatives examining effects on water and future contaminant levels (290-10 B(3)(h)(1)).	(Not applicable)	Not addressed	(Not applicable)	(Not applicable)	
Construction Erosion and Sedimentation Plan required (S 2.3.5.c.iii)	Basic general requirements	Required, contents specified - The site design process should include soil erosion and sedimentation control measures	Goes beyond minimum NPDES requirements, requires minimization of site disturbance	Required with BMPs and contents specified (179-66.F.2)	Provide proposed erosion control efforts to support proposed development w/o danger of erosion, silting or other instability (290-10 B.3) h.iii)	Not addressed	Construction disturbing ≥ 60,000 sf (or as little as 20,000 sf if necessitated by slopes, shall have an erosion plan (83-8.B(2)); Erosion and sediment control shall be provided for all development and redevelopment, listed requirement and contents specified (83-8 B(1-3)) (179-66.F(3)) - min erosion through revegetating w/in 30 days, sediment basins, retain vegetation, etc.	(Not applicable)	(Not applicable)	Expose > 60,000 SF of soil requires an ESC plan; or 20K-60K where slopes are >10%; trees and veg maintained as much as possible (83-8 B)
GOAL 5: ENCOURAGE EFFICIENT PARKING										
Parking	Specific minimums set based on projected maximum use times	Encourage minimum # needed to serve routine use (e.g. 2/residential unit with any additional/visitors parking behind in driveway or on street.	Establish Maximum Parking spaces allowed. Do not require more than 2/residence. Allow tenants separate, optional lease agreements for parking.	Specific min based on use	(Not applicable)	(Not applicable)	Relax parking standards when it is beneficial to the Town as the development w/o a relaxed standard.	(Not applicable)	(Not applicable)	
Commercial Parking	Specific minimums set based on projected maximum use times adding all on-site uses together.	Some flexibility to reduce minimums based on street or other available nearby parking or transit.	Allowed shared parking for uses with different peak demand times. Provide model agreements/deed restrictions. Reduce parking requirements near transit. Limit parking stall size (9ftx18ft max), with up to 30% smaller for compact cars	Required parking spaces in accordance with appropriate zoning bylaw; parking stall size not flexible (179-23). Planned business or row commercial shall be served by one common parking area and exit/entrance; reduction in parking not to exceed 10% of normal requirements (179-38).	(Not applicable)	(Not applicable)	Shared parking allowed and may result in reduced # based on complementary use. Drainage designed to contain and treat SW on premise to comply w 179-57 (per STDs for WQPD) (179-66).	(Not applicable)	(Not applicable)	

Appendix A - Brewster SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (179)	Subdivision Rules & Regulations (Ch 290, Auth = Planning board)	Wetlands Protection Bylaw & Regulations (Ch 172)	Site Plan Review & Staff Review (Ch 179-66 & Ch 83)	Illicit Connections and Discharges Bylaw (Ch 115)	Board of Health Regs (Ch BOH)	General Regulations
LID in Parking Areas	Often not addressed, may require waivers e.g. for planting islands to drain down rather than built up surrounded by curbs	Allow LID/bioretenation within parking areas.	Require landscaping within parking areas, as LID/bioretenation, at a minimum of 10% of the interior area landscaped and a minimum of 25 square feet for island planting areas	Not addressed	Not addressed/ not applicable?	(Not applicable)	Old well-established trees shall be protected and planned around (179-66).	(Not applicable)	(Not applicable)	
GOAL 6: Manage SW										
Discharge detection & elimination (S 2.3.4.a)	Not addressed	discharges and connects noted and or limits set on quantity and quality.	Illicit discharges and connections are prohibited, investigated and eliminated	No land uses, structures or developments shall discharge directly untreated stormwater (179-57.F); Any floor drain which discharges to the ground w/o DEP permit/approval (179-56.B.(12))	(Not applicable)	calculation of peak flow and estimated of water quality characteristics of discharge when it falls w/in an area subject to protection under the Wetlands Bylaw (1.05(4)(c)). Limits set on quantity and quality of discharge from a point source to protect the interests id'd in bylaw (1.05(6)(a)(b)).	(Not applicable)	Illicit connections and unauthorized discharges are prohibited and removed. Prevents pollutants from entering the Municipal storm sewer system. Provides authority to ensure compliance and inspections, monitoring and enforcement (115-1.B)	If inspection of septic systems (prompted by sale of property) yields evidence of sewage draining into waterways the BoH or Health Director is notified w/in 24 hours (Real Estate Transfer Reg S 5.4)	
Stormwater drainage patterns	Not addressed		Resemble pre-existing conditions of volume, velocity, quality and location, as nearly as possible	Multifamily developments must provide storm drainage sufficient to treat runoff determined by the rational method for a 10-yr storm (179-34.D); Post development rates equal or less than predevelopment; new development must max recharge to GW and require to remove ≥ 80% of TSS and use BMPs (179-57.F); SW patterns must resemble preexisting (179-66.F.1)	Not addressed	drainage is not to be altered from pre-existing patterns (172-1.04 b)	Design to contain and treat SW on site (179-66). Designed to resemble preexisting conditions of vol., velocity, quality and location, as nearly as possible (83-8.A.)	(Not applicable)	(Not applicable)	
As-built (S 2.3.6)	Not addressed	Recommended	Required, written instructions, electronic submission		Required (290-36)	Required - Policy for	Not addressed	Not addressed	(Not applicable)	
Intra-departmental communication/co-ordination	None	Informally or loosely occurring	Required	Staff Review	Staff Review	Communication and coordination with other boards required (172-6)	Plan Review Committee consists of representatives from numerous depts to improve interdepartment communications (83-1&2). Staff review required (for triggers see Ch 83-3)	(Not applicable)	(Not applicable)	
Construction site SW runoff control (S 2.3.5)	Not addressed	Required but w/o specifications	Required w/ written procedures for site inspections and enforcement of ESC - defining who is responsible and who has authority to enforce	(Not applicable)	Inspection required - includes construction inspection form (290-35)	(Not applicable)	Not addressed	provides authority for inspections	(Not applicable)	(Not applicable)
Site Plan Review (S 2.3.5)	Not addressed	Require but w/o written specifications	Required, written instructions/standards		Definitive plan and board review required, plan will be reviewed in accordance with Article IV (290-5&6)		Required with written standards (179-66)			
Require reduction of other wastes such as pollutants, demolition debris, litter, and sanitary wastes on construction sites	Not addressed	Required	Required with written procedures	Not addressed			Not addressed	(Not applicable)	Not addressed	
Post construction SW management for new development (S 2.3.6)	Not addressed	Allow LID	Retain vol of runoff ≥ 1 in X impervious SF and or remove 90% TSS post-construction & 50% TP generated from the post-construction	In the WQPD discharge rates must be ≤ predevelopment rates (179-57.F(2)); new development must maximize recharge to GW and must remove > 80% annual TSS (179-				(Not applicable)		

Appendix A - Brewster SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (179)	Subdivision Rules & Regulations (Ch 290, Auth = Planning board)	Wetlands Protection Bylaw & Regulations (Ch 172)	Site Plan Review & Staff Review (Ch 179-66 & Ch 83)	Illicit Connections and Discharges Bylaw (Ch 115)	Board of Health Regs (Ch BOH)	General Regulations
Post construction SW management for redevelopment (S 2.3.6)	Not addressed		Retain vol > 0.8 in X impervious SF and/or remove 80% TSS and 50% of TP load. Use LIDs to the maximum extent feasible.	In the WQPD discharge rates < predevelopment rates (179-57.F(2))				(Not applicable)		
Enforcement	No	Yes	Yes with fines			Inspection and enforcement authority. Violations punishable with a fine.		Enforced by DPW		

Appendix B - Chatham SWM Bylaw Review

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
GOAL 1: PROTECT NATURAL RESOURCES AND OPEN SPACE									
Soils managed for revegetation	Not addressed	Limitations on removal from site, and/or requirements for stabilization and revegetation	Prohibit removal of topsoil from site. Require rototilling and other prep of soils compacted during construction	No removal of soil, loam, sand, etc except for maintenance or protection of existing dwellings, in the Seashore Conservancy District (S.III.C.6.c.2) or in the Conservancy District (S.IV.A.4.b)	Topsoil removed shall be re-distributed providing $\geq 4 \frac{1}{2}$ " of cover and stabilized by seeding or planting. No topsoil can be removed w/o Board permission (S.IV.H.2)	Not addressed	Not addressed		No topsoil, subsoil, gravel, sand, or other earth may be removed from the town unless a permit is first obtained from the BoS or building permit (136-1.A)
Limit clearing, lawn size, require retention or planting of native vegetation/naturalized areas	Not addressed or general qualitative statement not tied to other design standards	Encourage minimization of clearing/ grubbing	Require minimization of clearing/grubbing with specific standards	Min lot disturbance of topo and veg encouraged in OSRD (S.VI.D.1); open space must $\geq 50\%$ (S.VI.D.3.g.5); In a Conservancy District no removal or destruction of natural growth essential to prevent erosion and storm damage (S.IV.A.4.h)	Due regard shown for all natural features incl large trees, water courses (S.IV.H.1.); Preserve existing trees to the fullest extent possible (S.IV.H.3). Entire area of a ROW shall be cleared except for tree of aesthetic value and $> 4"$ (S.V.C.1)	Adj upland resource areas = no disturbance area? Keep trees wherever possible in vegetated buffer strips (4.01(3)(b)4); projects must be designed to avoid adverse impact on wildlife habitat caused by disturbance, vegetation removal, creating wildlife corridor barrier (4.01(3)(c)), can't plant invasive species in VBS (IV(3)(b)2)	maximum retention of existing vegetation as part of the review criteria (S.VI.A.2.b.3.e.7)		Disturbance $> 5,000$ SF must be replanted annually with rye, vetch, wheat, legumes, or reforested (136-2)
Require native vegetation and trees	Require or recommend invasives	Not addressed, or mixture of required plantings of native and nonnative	Require at least 75% native plantings	Native or non-invasive not mentioned		exotic invasive plants prohibited in vegetated buffer strip (4.01(3)(b)2)	Not addressed		Not addressed
GOAL 2: PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL									
Lot size	Required minimum lot sizes	OSRD/NRPZ preferred. Special permit with incentives to utilize	Flexible with OSRD/NRPZ by right, preferred option	Min lot size 10,000 sf (S.III.3.a.1). Lot layout flexibility and size in an OSRD (S.VI.D1); OSRD min lot size 10,000 SF (S.VI.D3.g)	No lot area or frontage shall be less than the min required by Zonng w/in the District (S.IV.A.3)	Not applicable	Not applicable	Min lot size for houses on individual septic systems is 20,000 SF	

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
Setbacks	Required minimum front, side, and rear setbacks	Minimize, allow flexibility	Clear standards that minimize and in some instances eliminate setbacks	Min based on zoning district; May be reduced by 1/2 in an OSRD design (S.VI.D3.g.4)		Not applicable	Not applicable		
Frontage	Required minimum frontage for each lot/unit	Minimize especially on curved streets and cul-de-sacs	No minimums in some instances, tied into other standards like OSRD design and shared driveways.	In R20A and Flex ≥ 20 ft (S.VII.15.b); Tied into OSRD design (S.VI.D3.g.2)	not < min required by zoning for district (S.IV.A.3)	Not applicable	Not applicable		
Common driveways	Often not allowed, or strict limitations	Allow for 2-3 residential units	Allow for up to 4 residential units, preferably constructed with permeable pavers or pavement	Not addressed	Not addressed	Not applicable			Not addressed
Limit impervious area – Rural Districts In high density areas, require post-development infiltration to = or > predevelopment	Not usually addressed in zoning and subdivision regs for rural/suburban residential?	<15%	<10%	Any construction resulting in an increase of impervious surface is not allowed w/in a WRPD (S.IV.C.5.n); any increase in impervious on a residential lot in the WRPD resulting in > 15% or 2,500 SF must have artificial drainage (S.IV.C.5.q)	Not addressed	Not applicable	Not addressed		
GOAL 3: SMART DESIGNS THAT REDUCE OVERALL IMPERVIOUSNESS									
Street location	Numeric and geometric standards based primarily on vehicular travel and safety, with basic pedestrian requirements e.g. sidewalks	Flexibility in applying standards, to reduce area of impact, grading, avoid key natural features	OSRD design preferred by-right. Require locating streets to minimize grading and road length, avoid important natural features	Not addressed	Numeric and geometric standards (S.IV.B.3)				Not addressed

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
Road width	Major and minor categories, 24-30'	Wide, medium, narrow categories. 22-24' max, plus 2' shoulders	Wide, medium, narrow, and alley categories. 20-24' widest for 2 travel lanes, 18-20' low traffic residential neighborhood, plus 2' shoulders. Allow alleys and other low traffic or secondary emergency access and all shoulders to use alternative, permeable materials.	16-ft wide cottage to condo conversion (S.VII.B.9.b.)	Major and minor categories based on road type and subdivision, 18-30' (S.IV.B.4)				Min 33 ft width w min clearance of 28 ft and hardened surface of 20 ft (240-1D)
Road ROW width	50-75', fully cleared and graded	40-50', some flexibility in extent of clearing	20-50' depending on road type	Not addressed	30-60' depending on type of subdivision and type of road (S.IV.B.4)				Not addressed
Access Options	No common drives allowed, dead end allowed with limit on length and # of units	Allow dead end with limit on length and # of units. Allow common drives up to 2-3 units	Allow one way loop streets. Allow common drives up to 4 units, and alleys and rear-loading garages where suitable.	Not addressed	Driveways bituminous concrete, SW runoff must be contained on the site (except at apron) (S.V.B.18)				Not addressed
Dead Ends/Cul-de-sacs	120 ft or more minimum turnaround	Minimize end radii - 35 ft	Allow hammerhead turnaround	Not addressed	ROW radius >40 and roadway radius > 30'; T and L turn-arounds allowed;				Not addressed
Cul-de-sacs	Full pavement standard	Encourage center landscaping with bioretention	Require center landscaping with bioretention	Not addressed	Not addressed				Not addressed
Curbing	Curbing required full length both sides of road	Allow curb breaks or curb flush with pavement to enable water to flow to vegetated LID features	Open drainage with roadside swales and no curbs preferred	Not addressed	berms required along grades of $\geq 3\%$ and shall be a min of 18" wide 3" high (S.V.B.7)	Not applicable			Not addressed
Roadside Swales	Allowed as an option	Preferred over closed drainage	Preferred, with criteria for proper design. Adoption of technical specifications and design templates for green infrastructure recommended	Not addressed	Not addressed	Not applicable	Not addressed		Not addressed

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
Utilities	Off sets required contributing to wide road ROWs	Not specified, flexible	Allow under road, sidewalks or immediately adjacent to roads to enable placement of roadside swales.	Not addressed	Not addressed	Not applicable			Not addressed
Sidewalks	Concrete or bituminous	Some flexibility in material and design	Prefer permeable pavement or permeable pavers	Not addressed	May require at a max width of 5 ft (S.V.B.19)	Not applicable			Not addressed
Sidewalk location	Required both sides of road	Allow on only 1 side of road especially in low density neighborhoods	Prefer siting with land contours and for best pedestrian utility (e.g. connect with common areas and shared open spaces) – not necessarily immediately parallel to road.	Not addressed	Not addressed	Not applicable			Not addressed
Sidewalk drainage	Drains to road closed drainage system	Not addressed	Disconnect drainage from road system – e.g. adjacent green strips or within vegetated areas that can absorb sheet flow	Not addressed	Not addressed	Not applicable	Not addressed		Not addressed
GOAL 4: ADOPT GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS									
Rooftop runoff	Prohibit directing clean roof runoff into closed municipal drainage systems.	Allow clean roof runoff to be directed to landscaped or naturally vegetated areas capable of absorbing without erosion, or infiltration	Require directing clean roof runoff to landscaped or naturally vegetated areas capable of absorbing, or infiltration	In WRPD roof runoff must be infiltrated on site (S.IV.C.5.n)	Not addressed	Not applicable	Not addressed		

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
Overall stormwater design; piping and surficial retention vs. LID	Conventional stormwater system design standards		LID design standard. Allow surficial ponding of retained runoff for up to 72 hours and credit for green roofs towards stormwater requirements	SW LIDs not allowed in OSRD open space (S.VI.D.3.h.1); in WRPD no increase in impervious surface w/o infiltration on site. Roof runoff infiltrated onsite, runoff from ways or parking areas shall be collected, petroleum removed and infiltrated onsite. Proposed improvement w/in WRPD that >50% assessed value, or repaving, may also be required to treat SW from existing impervious (S.IV.C.5.n)	Quantity of SW shall be determined by the rational method and designed for 25 yr storm events; All SW disposed of by subsurface leaching (S.IV.E). No mention of LID, no surficial ponding. Conventional SW systems; size and slope of drains must meet "Rational Formula;" located in easements outside of ROW (S.V.A.8); Drainage structures sized using 25-yr design storm, plus a soil test hole (S.VI.A.2.b.2.n); In the WRPD SW	No SW runoff shall be directed to open streams or wetlands.	Require prevention, control, and reduced stormwater pollutants by using BMPs identified by DPW; compliance with NPDES permit is deemed compliance with local bylaw (238-10.A&B).		
Site Plan/Design Requirements	LID may not be addressed	Encourage use of LID features in site design	Count bioretention and other vegetated LID features toward site landscaping/open space requirements.	All new or expanded uses shall comply with the site plan review (SVII.A.4); SW LIDs not allowed in OSRD open space (S.VI.D.3.h.1); Drainage allowed in "green space / area" of business and industrial districts (S.III.D.3.j). Site plan written requirements (S.VI.2); alternative layouts including drainage may be submitted for discussion (S.VI.D.3.b)	Proposed systems of drainage including adjacent natural waterways (S.III.A.3.5.) No mention of LID. SW easement or drainage ROW for existing drainage ways may be required (S.IV.E)	Not addressed	Adequacy of storm water and drainage facilities required and maximum retention of existing vegetation as part of the review criteria (S.VI.A.2.b.3.e.5&7)	Not applicable	Road layout require plans showing drainage easement (240-1.A(1)) and a drawing showing leaching basins, catch basins, storm sewer (240-1.C.)

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
Allow easy siting of LID features (bioretention, swales, etc.)	Often not addressed, may require waivers from subdivision standards	Encouraged along road ROW	Allowed on lots, common open space, or road ROW, easement recorded. For commercial development, allow an increase in floor area ratio or other developmental incentives for green roofs	Drainage allowed in "green space / area" of business and industrial districts (S.III.D.3.i)	Not addressed for ROW or open space.	Not addressed	Not addressed	Not applicable	
Permeable paving	Often not addressed, may require waivers from subdivision standards	Allowed on private residential lots for parking, patios, etc.	Allowed for residential drives, parking stalls, spillover parking spaces, emergency access ways (with proper engineering support for emergency vehicles) Two track design allowed for driveways and secondary emergency access ways (where required).	Not addressed	Not addressed	Not applicable	Not addressed	Not applicable	
Stormwater management O&M plan	Typically only addressed if municipality has a stormwater or LID bylaw, or for areas subject to wetlands permitting	Required	Required, surficial bioretention and swales preferred. Closed/underground systems requiring specialized inspection and clean out discouraged.	In the WRPD SW runoff (roofs, pavement) must be infiltrated on site and all SW treatment facilities must be permanently maintained in full working order by the owner(s) (S.IV.C.5.n);	streets and appurtenances must be maintained as specified (inspection #4)(S.V.C.8) - where are these specifications?	Required for SW projects located w/in Cons Com jurisdiction (where is this in regs?)	Requirements to prevent, control, and reduce SW pollutants by the use of BMPs (238-10)	Not applicable	

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
Construction Erosion and Sedimentation Plan required	Basic general requirements	Required, contents specified	Goes beyond minimum NPDES requirements, requires minimization of site disturbance	In flood plain district - minimize erosion, sedimentation, pollution and damage to subject and adjacent properties (S.IV.B.4.g); Erosion control adequate to prevent damage, erosion, siltation of wetlands w/in a conservancy district, to a conservancy district and required w/in 300 ft of a Conservancy District (S.III.D.3.k)	Not addressed	Not addressed	Not addressed	Not applicable	
GOAL 5: ENCOURAGE EFFICIENT PARKING									
Parking	Specific minimums set based on projected maximum use times	Encourage minimum # needed to serve routine use (e.g. 2/residential unit with any additional/visitors parking behind in driveway or on street.	Establish Maximum Parking spaces allowed. Do not require more than 2/residence. Allow tenants separate, optional lease agreements for parking.	Min # based on use; Min size required to serve routine use, 9ft x 18 ft - exceptions for different peak demand times, age of occupants; 25% to remain as green area for potential future use (I.B.7.b); gravel allowed (S.VI.B.3.a); number of spaces based on gross floor area (S.VI.A.2.b.2.1.a)	Not addressed	Not applicable	Not addressed/Not applicable	Not applicable	

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
Commercial Parking	Specific minimums set based on projected maximum use times adding all on-site uses together.	Some flexibility to reduce minimums based on street or other available nearby parking or transit.	Allowed shared parking for uses with different peak demand times. Provide model agreements/deed restrictions. Reduce parking requirements near transit. Limit parking stall size (9ftx18ft max), with up to 30% smaller for compact cars	surface can be gravel (S.VI.B.3.a.); > 9ft x 18 ft (S.VI.B.3.b); lots containing > 10 spaces must have ≥ 1 shade tree/10 spaces, located w/in paved area w/ ≥ 35 SF of soil w/ a bermed island (S.VI.B.3.c.2); exception allowed for less parking if uses have different peak demand times; 25% can remain green area reserved for future parking (S.VI.B.7)	Not addressed	Not applicable	Not addressed	Not applicable	
LID in Parking Areas	Often not addressed, may require waivers e.g. for planting islands to drain down rather than built up surrounded by curbs	Allow LID/bioretenion within parking areas.	Require landscaping within parking areas, as LID/bioretenion, at a minimum of 10% of the interior area landscaped and a minimum of 25 square feet for	Not addressed	Not applicable	Not applicable	Not addressed	Not applicable	
GOAL 6: Manage SW (compliance w MS4)									
Discharge detection & elimination (2.3.4.a)	Not addressed	Discharges and connects noted and or limits set on quantity and quality.	Illicit discharges and connections are prohibited and enforced	Not applicable	Not applicable	Not applicable	illicit discharges and connectiosn prevented, prohibited, investigated, removed, and enforced (238-7); prevent, control, and reduce SW pollutants by the use of BMPs (238-10)	Not addressed	

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
stormwater /drainage patterns	Not addressed		Resemble pre-existing conditions of volume, velocity, quality and location, as nearly as possible	Drainage structures sized using 25-yr design storm, plus a soil test hole (S.VI.A.2.b.2.n); In the WRPD SV runoff (roofs, pavement) must be infiltrated on site and all SW treatment facilities must be permanently maintained in full working order by the owner			Not addressed		
As-built	Not addressed	Required	Required, written instructions, electronic submittal	Not applicable	required - survey or improvements as installed	Required for all SW projects located w/in Conservation Commission jurisdiction	Required for all SW projects	Not applicable	
Intra-departmental communication/co ordination	Not addressed	Informally or loosely occurring	Required	Flexible Development District - encourages intradepartment communication (S.IV.D.2); Site Plan Review requires copies be sent to other depts (S.VI.A.2.b.1.b)			Not addressed		
Construction Site SW runoff control (S 2.3.5)	Not addressed	Required but w/o specifications	Written procedures for site inspection and enforcement of ESC measures - defining who is responsible and who has authority	Not addressed	Inspections (4 total) referenced but no written details (S.V.C. 2-4, 8)	Not addressed	Requirements to prevent, control, and reduce SW pollutants by the use of BMPs (238-10)	Not applicable	Not addressed
Site Plan Review (S 2.3.5)	Not addressed	Required but w/o specifications	Required with written procedures	All projects must conform with a site plan approved by the Planning Board; written procedures (S.VI.A)	Not addressed	Not addressed	Not addressed		Required for road layout and construction (240-I.A)

Appendix B - Chatham SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw	Rules and Regulations Governing the Subdivision of Land	Wetlands Protection Regulations & Bylaw CH 272	Stormwater Management Bylaw CH 238	Board of Health Regs	General Regulations & Bylaws
Require reduction of other wastes such as demolition debris, litter, and sanitary wastes on construction sites (S 2.3.5.c.i)	Not addressed	Required	Required with written procedures	Not applicable	Not applicable	Not addressed	Not addressed	Not applicable	Not applicable
Post construction Stormwater Management for new development	Not addressed	Allow LID	Retain vol of runoff ≥ 1 in X impervious SF and or remove 90% TSS post-construction & 50% TP generated from the post-construction impervious surface area on the site. Use LIDs to the max extent feasible.	Not applicable	Not applicable	Not addressed	Not addressed	Not applicable	Not applicable
Post construction SW management for redevelopment	Not addressed	Allow LID	Retain vol > 0.8 in x impervious SF and/or remove 80% TSS and 50% of TP load. Use LIDs to the max extent feasible.	Not applicable	Not applicable	Not addressed	Not addressed	Not applicable	Not applicable
Enforcement	No	Yes	Yes with fines	Yes		Yes and with fines	Yes with fines (238-12.G)		

Appendix C - Harwich SWM Bylaw Review

Appendix C - Harwich SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw CH 325	Subdivision of Land & Site Plan Special Permits Regs CH 400	Wetland Protection Regulations & Bylaw CH 310	Comprehensive Stormwater and Illicit Discharge Regulations (pursuant to CH 295 - Sewer Use)	Board of Health Regs - easy to read	General Regulations & Bylaws
GOAL 1: PROTECT NATURAL RESOURCES AND OPEN SPACE									
Soils managed for revegetation	Not addressed	Limitations on removal from site, and/or requirements for stabilization and revegetation	Prohibit removal of topsoil from site. Require rototilling and other prep of soils compacted during construction	Minimum 4" of topsoil on disturbed areas proposed to be planted, seedbed prep, appropriate fertilizer, etc (325-98.B.(8))	Minimum 4" of topsoil on disturbed areas proposed to be planted, seedbed prep, appropriate fertilizer, etc (400-14.L.(1)). Replanting shall occur w/in 7 days of final grading and during the planting season appropriate for the selected species (325-98B(8)(a))	Not addressed	Not addressed	Not applicable	Not addressed
Limit clearing, lawn size, require retention or planting of native vegetation/naturalized areas	Not addressed or general qualitative statement not tied to other design standards	Encourage minimization of clearing/ grubbing	Require minimization of clearing/grubbing with specific standards	In Six Pond District: clearing/grading of > 30,000 SF requires a permit (325-98); clearing and grading limited to 30% of the site and revegetated with native plants (325-98.B.(2)); Priority given to retaining existing trees, contiguous vegetation and specimen trees (325-98.B.(4)). Removing top or subsoil from an area > 50,000 SF not allowed unless part of construction or area to be replanted or reforested (325-89.O).	Required hydroseed mixture contains non-natives (400-14.L.(2))	Require native plants (1.04.1.&4.); planting of appropriate native vegetation to minimize erosion (107.2.a.); w/in 100 ft of a resource area, cleared areas ≥ 50 sf require immediate revegetation w/ indigenous species and stabilization w bark mulch, coir matting through the 2nd growing season (1.07.2.c.1.)	Disturbance > 1 ac, or < 1 ac if part of a larger plan to disturb > 1 ac. Development or redevelopment that is part of a larger project that would disturb > 1 ac shall be regulated under this bylaw (5.5.B.2)	Not applicable	Not addressed
Require native vegetation and trees	Require or recommend invasives	Not addressed, or mixture of required plantings of native and nonnative	Require at least 75% native plantings	Require native species, proper seedbed prep, etc. (325-98.B.(8)). Revegetation shall occur on cleared sites w/in 7 calendar days of final grading and shall occur during the planting season appropriate to the selected plant species (325-98(B)(a)).	Use of native species in encouraged by Planning Board (400 Attachment 2:5 Note for Table 7); however hydroseeding mix has nonnatives in it: Tall Fescue, Perennial Rye Grass; Kentucky Bluegrass (400-14.L.(2))	Require native plants (1.04.1.&4.)	Not addressed	Not applicable	Not addressed
GOAL 2: PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL									
Lot size	Required minimum lot sizes	OSRD/NRPZ preferred. Special permit with incentives to utilize	Flexible with OSRD/NRPZ by right, preferred option	Minimum lot size for special permit (not by right) Open Space Residential Development = 12,000 SF (325-51.E.(4)(a)). Within Six Ponds District > 100,000 SF single family w/ accessory apart. (325-94.A.(1)). Varies w/ zoning (325-97)	(Not applicable)	(Not applicable)	(Not applicable)	Not applicable	

Appendix C - Harwich SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw CH 325	Subdivision of Land & Site Plan Special Permits Regs CH 400	Wetland Protection Regulations & Bylaw CH 310	Comprehensive Stormwater and Illicit Discharge Regulations (pursuant to CH 295 - Sewer Use)	Board of Health Regs - easy to read	General Regulations & Bylaws
Setbacks	Required minimum front, side, and rear setbacks	Minimize, allow flexibility	Clear standards that minimize and in some instances eliminate setbacks	May be reduced by half by the Planning Board (325-51E(4)(d)), (325-59C(6)). Within Village Commercial Overlay District (VCOD) allows flexibility (325-51L(5)(b). Depends on zone (325-97).	25 (front), 10 (sides and rear)	(Not applicable)	(Not applicable)	Not applicable	
Frontage	Required minimum frontage for each lot/unit	Minimize especially on curved streets and cul-de-sacs	No minimums in some instances, tied into other standards like OSRD design and shared driveways.	50 ft on proposed road. Existing frontage ≥ 100 ft. Within Village Commercial Overlay District (VCOD) allows flexibility (325-51L(5)(b). OSRD allows reduced std and dimension requirements (325-51.E(4))	100 ft	(Not applicable)	(Not applicable)	Not applicable	
Common driveways	Often not allowed, or strict limitations	Allow for 2-3 residential units	Allow for up to 4 residential units, preferably constructed with permeable pavers or pavement	In the Six Ponds District encouraged whenever two or more lots are created by any division of land regulated by the subdivision control law (325-100C.(1)); (325.101.C.)		(Not applicable)	Not mentioned	Not applicable	
Limit impervious area – Rural Districts In high density areas, require post-development infiltration to = or > predevelopment	Not usually addressed in zoning and subdivision regs for rural/suburban residential?	<15%	<10%	Runoff from impervious surfaces shall be recharged on site by BMPs (325-98.B.(7)(d)); OSRD incentive provision allows reduction in roadway standards (including drainage) in exchange for > 50% open space w/in the open space residential development (325-51.E.(8)(a))		(Not applicable)	loss of recharge minimized through infiltration measures. Annual recharge from post-development shall approximate annual recharge from pre-development, based on soil type (S 8.D.3.c.); coal tar based driveway and pavement sealers is prohibited for all paved areas directly connected to storm drains (S15.C.2)	Not applicable	
GOAL 3: SMART DESIGNS THAT REDUCE OVERALL IMPERVIOUSNESS									
Street location	Numeric and geometric standards based primarily on vehicular travel and safety, with basic pedestrian requirements e.g. sidewalks	Flexibility in applying standards, to reduce area of impact, grading, avoid key natural features	OSRD design preferred by-right. Require locating streets to minimize grading and road length, avoid important natural features	(Not applicable)	intersecting streets as close to 90 deg., and not less than 70 deg., but minimize tree loss (400-12.A.(3)).	(Not applicable)	(Not applicable)	Not applicable	

Appendix C - Harwich SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw CH 325	Subdivision of Land & Site Plan Special Permits Regs CH 400	Wetland Protection Regulations & Bylaw CH 310	Comprehensive Stormwater and Illicit Discharge Regulations (pursuant to CH 295 - Sewer Use)	Board of Health Regs - easy to read	General Regulations & Bylaws
Road width	Major and minor categories, 24-30'	Wide, medium, narrow categories. 22-24' max, plus 2' shoulders	Wide, medium, narrow, and alley categories. 20-24' widest for 2 travel lanes, 18-20' low traffic residential neighborhood, plus 2' shoulders. Allow alleys and other low traffic or secondary emergency access and all shoulders to use alternative, permeable materials.	(Not applicable)	Minimum roadway width 20-22 depending on road type (400 Table 1); Proposed roadways must be cleared, grubbed, and excavated to a min width of 35 ft.	(Not applicable)	(Not applicable)	Not applicable	No road < 40' width shall be accepted by the Town as a Town way. Newly constructed roads must be cleared to ≥ 20 ft (255-2 & 3)
Road ROW width	50-75', fully cleared and graded	40-50', some flexibility in extent of clearing	20-50' depending on road type	40-50 ft depending on road type, clearing required to be 35'	40-50 depending on road type (400 Attach 2, Table 1)	(Not applicable)	(Not applicable)	Not applicable	
Access Options	No common drives allowed, dead end allowed with limit on length and # of units	Allow dead end with limit on length and # of units. Allow common drives up to 2-3 units	Allow one way loop streets. Allow common drives up to 4 units, and alleys and rear-loading garages where suitable.	(Not applicable)		(Not applicable)	(Not applicable)	Not applicable	
Dead Ends/Cul-de-sacs	120 ft or more minimum turnaround	Minimize end radii - 35 ft	Allow hammerhead turnaround	(Not applicable)	Dead-end length 1,200 ft (400 Table 1); circular turnaround diameter of ≥ 90 ft; T-shaped turnarounds not permitted; turning circle radius > 45 ft (400-12.C.). A 30-ft diameter planting area may be considered.	(Not applicable)	(Not applicable)	Not applicable	
Cul-de-sacs	Full pavement standard	Encourage center landscaping with bioretention	Require center landscaping with bioretention	(Not applicable)	A 30-ft diameter planting area may be considered (400-12.C.)	(Not applicable)	(Not applicable)	Not applicable	
Curbing	Curbing required full length both sides of road	Allow curb breaks or curb flush with pavement to enable water to flow to vegetated LID features	Open drainage with roadside swales and no curbs preferred	(Not applicable)	18" machine berms required on both sides (400-12.B.(2)).	(Not applicable)	Not applicable	Not applicable	
Roadside Swales	Allowed as an option	Preferred over closed drainage	Preferred, with criteria for proper design. Adoption of technical specifications and design templates for green infrastructure recommended	All anticipated runoff from impervious surfaces will, when possible, be diverted to areas covered with vegetation (325-51)C(1)(c). Runoff from impervious surfaces shall be recharged on the site by SW infiltration basins, vegetated swales, or similar systems covered with natural vegetation (325-98B(7)(d)).		(Not applicable)	allowed as an option (S 7.3.c.i)	unpaved berm and side-slopes of paved roads shall be seeded and/or sodded and maintained as dense grassed area to prevent stormwater runoff from entering drainage systems (PtVI. Pt 1. 7.103)	

Appendix C - Harwich SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw CH 325	Subdivision of Land & Site Plan Special Permits Regs CH 400	Wetland Protection Regulations & Bylaw CH 310	Comprehensive Stormwater and Illicit Discharge Regulations (pursuant to CH 295 - Sewer Use)	Board of Health Regs - easy to read	General Regulations & Bylaws
Utilities	Off sets required contributing to wide road ROWs	Not specified, flexible	Allow under road, sidewalks or immediately adjacent to roads to enable placement of roadside swales.	(Not applicable)	Underground, under ROW - no mention of allowance for roadside swales (400-12(4)). Easements for utilities shall be ≥ 20ft wide (400-13.C.(1))	(Not applicable)	construction of utilities which will not alter drainage or result in discharge are exempt from SWM Regs	Not applicable	
Sidewalks	Concrete or bituminous	Some flexibility in material and design	Prefer permeable pavement or permeable pavers	(Not applicable)	not less than 4 ft wide, on one or both sides of the road (as required by the Planning Board) (400-14.M(1)). Material other than asphalt concrete must be approved by Planning Board (400-14.M.(3))	(Not applicable)	(Not applicable)	Not applicable	
Sidewalk location	Required both sides of road	Allow on only 1 side of road especially in low density neighborhoods	Prefer siting with land contours and for best pedestrian utility (e.g. connect with common areas and shared open spaces) – not necessarily immediately parallel to road.	(Not applicable)		(Not applicable)	(Not applicable)	Not applicable	
Sidewalk drainage	Drains to road closed drainage system	Not addressed	Disconnect drainage from road system – e.g. adjacent green strips or within vegetated areas that can absorb sheet flow	(Not applicable)		(Not applicable)	not mentioned	Not applicable	
GOAL 4: ADOPT GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS									
Rooftop runoff	Prohibit directing clean roof runoff into closed municipal drainage systems.	Allow clean roof runoff to be directed to landscaped or naturally vegetated areas capable of absorbing without erosion, or infiltration	Require directing clean roof runoff to landscaped or naturally vegetated areas capable of absorbing, or infiltration	Rooftop runoff not allowed w/in 300 ft of pond shoreline (325-99.B.(2)).		(Not applicable)	Not addressed	Not applicable	
Overall stormwater design; piping and surficial retention vs. LID	Conventional stormwater system design standards		LID design standard. Allow surficial ponding of retained runoff for up to 72 hours and credit for green roofs towards stormwater requirements	(Not applicable)	All SW shall be disposed of by subsurface leaching or drainage easements (400-13(4)). Runoff collected by catch basins will be piped to suitable leaching facilities located in easements outside of ROW.	Not addressed	Required to consider LID (S7.C.2.d.ii.); design to meet MA SWM STDs. Located w/in TMDL area BMPs encouraged. LID design must be used to max extent feasible (8.A-C).	Not applicable	

Appendix C - Harwich SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw CH 325	Subdivision of Land & Site Plan Special Permits Regs CH 400	Wetland Protection Regulations & Bylaw CH 310	Comprehensive Stormwater and Illicit Discharge Regulations (pursuant to CH 295 - Sewer Use)	Board of Health Regs - easy to read	General Regulations & Bylaws
Site Plan/Design Requirements	LID may not be addressed	Encourage use of LID features in site design	Count bioretention and other vegetated LID features toward site landscaping/open space requirements.	area and access driveways shall be graded and drained so as to dispose of on site all surface water accumulation (325-42.B.); Drainage area calculations to include areas outside of site based on topo and required to be submitted with plans (325-42.J)(5). LIDs not counted toward landscape requirements (325-43C.) Reduction in roadway STDs possible in exchange for > 50% open space (325-51.E.(8)(a))	(Not applicable)	Not addressed	LID site planning and strategies must be used to the max extent feasible (S8.C). Written site design requirements (S8.D)	Not applicable	
Allow easy siting of LID features (bioretention, swales, etc.)	Often not addressed, may require waivers from subdivision standards	Encouraged along road ROW	Allowed on lots, common open space, or road ROW, easement recorded. For commercial development, allow an increase in floor area ratio or other developmental incentives for green roofs	Encourage LID/BMPs (swales, constructed wetlands, etc) (325-98.B.(7)(d)); Not allowed in OSRD open space 325-51.E(5))		Vegetated buffer strips allowed in buffer zones (1.04.4).	LID must be used to the max extent feasible (S 8.B&C.). But no mention of siting ease, or ways to allow for easy siting. Stormwater Management easements shall be provided by the property owners as necessary for SV conveyance, infiltration, detention (S 11.E.4.g.i-iii).	Not applicable	
Permeable paving	Often not addressed, may require waivers from subdivision standards	Allowed on private residential lots for parking, patios, etc.	Allowed for residential drives, parking stalls, spillover parking spaces, emergency access ways (with proper engineering support for emergency vehicles) Two track design allowed for driveways and secondary emergency access ways (where required).	(Not applicable)		(Not applicable)	Not addressed	Not applicable	
Stormwater management O&M plan	Typically only addressed if municipality has a stormwater or LID bylaw, or for areas subject to wetlands permitting	Required	Required, surficial bioretention and swales preferred. Closed/underground systems requiring specialized inspection and clean out discouraged.	Require recharge on site with BMPs w natural vegetation. Dry wells used only where other methods are not feasible (325-98.B.(7)(d))			O&M plan required. Long term plan developed and implemented (8.D.3.f). O&M and Inspection plan required as part of the local SWM permit w/ written requirements (S11).	Not applicable	

Appendix C - Harwich SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw CH 325	Subdivision of Land & Site Plan Special Permits Regs CH 400	Wetland Protection Regulations & Bylaw CH 310	Comprehensive Stormwater and Illicit Discharge Regulations (pursuant to CH 295 - Sewer Use)	Board of Health Regs - easy to read	General Regulations & Bylaws
Construction Erosion and Sedimentation Plan required	Basic general requirements	Required, contents specified	Goes beyond minimum NPDES requirements, requires minimization of site disturbance	Site protected thru ESC as specified 325-98.B.(7)); Parking, stockpiling, other construction related equipment should be located in areas planned for permanent structures.	Required, contents specified per US Soil Cons Service (400-14.D.)	construction sites are required to have erosion control to prevent sedimentation runoff (1.07.2.c.4)	required, contents specified (§ 9). Describe measures to control construction waste & Must include efforts to min site disturbance (S10.A); disturbanc ≥ 1 ac (S.5.B.2); meet requirements of MS4 (S8.D.)	Not applicable	
GOAL 5: ENCOURAGE EFFICIENT PARKING									
Parking	Specific minimums set based on projected maximum use times	Encourage minimum # needed to serve routine use (e.g. 2/residential unit with any additional/visitors parking behind in driveway or on street.	Establish Maximum Parking spaces allowed. Do not require more than 2/residence. Allow tenants separate, optional lease agreements for parking.	Parking areas ≥ 5 spaces, drainage designs in accordance with the Rational Method based on 25-yr storm freq (325-42.J.(4)).		(Not applicable)	Not addressed	Not applicable	
Commercial Parking	Specific minimums set based on projected maximum use times adding all on-site uses together.	Some flexibility to reduce minimums based on street or other available nearby parking or transit.	Allowed shared parking for uses with different peak demand times. Provide model agreements/deed restrictions. Reduce parking requirements near transit. Limit parking stall size (9ftx18ft max), with up to 30% smaller for compact cars	paved parking areas > 5 spaces shall use absorbent pillows or similar device to absorb vehicle fluids in runoff (325-42.J.(6)); In the case of multiple uses on a single lot, required parking spaces = the combined total of parking spaces for each use (325-39.A.)	1 space/200sf of customer used floor space (retail), 1 space/3 units of capacity (restaurant), 1 space/2 employee	(Not applicable)	(Not applicable)	Not applicable	
LID in Parking Areas	Often not addressed, may require waivers e.g. for planting islands to drain down rather than built up surrounded by curbs	Allow LID/bioretenion within parking areas.	Require landscaping within parking areas, as LID/bioretenion, at a minimum of 10% of the interior area landscaped and a minimum of 25 square feet for island planting areas.	Not addressed. Planting islands required to be curbed (325-43.B); Parking areas must be graded and drained so as to dispose onsite any surface water accumulation (325-42.B)		(Not applicable)	parking areas not specifically addressed, but LID must be used to the max extent feasible (§ 8.C).	Not applicable	
GOAL 6: Manage SW (compliance w MS4)									
Discharge detection & elimination (2.3.4.a)	Not addressed	Discharges and connects noted and or limits set on quantity and quality.	Illicit discharges and connections are prohibited and enforced	(Not applicable)	(Not applicable)	(Not applicable)	Illicit discharges, connections and obstructions are prohibited and enforced (S15:A & E). Must collect pet feces; coal tar based pavement sealers are prohibited for all paved areas directly connected to the storm drain (S 15.C) Investigations and eliminations underway per MS4 timeline.	Floor drain regulation: No floor drains allowed to discharge to the ground, leaching structure, or septic system (Section IV&V)	

Appendix C - Harwich SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw CH 325	Subdivision of Land & Site Plan Special Permits Regs CH 400	Wetland Protection Regulations & Bylaw CH 310	Comprehensive Stormwater and Illicit Discharge Regulations (pursuant to CH 295 - Sewer Use)	Board of Health Regs - easy to read	General Regulations & Bylaws
Stormwater /drainage patterns	Not addressed		Resemble pre-existing conditions of volume, velocity, quality and location, as nearly as possible	Not addressed	Not addressed	Not addressed	Loss of annual recharge shall be eliminated or minimized through the use of infiltration measures incl. LID, BMPs. At a min annual recharge from post-development shall approx pre-dev, based on soil type (S.8.D.3.c.)	(Not applicable)	
As-built (S 2.3.6)	Not addressed	Required	Required, written instructions, electronic submittal	(Not applicable)	Required - some written instructions, site can't be occupied until as-built approved (400-18.G(1))	Not addressed	required, contents listed at Section 13). Electronic submittal not mentioned.	(Not applicable)	
Intra-departmental communication/co ordination	none	informally or loosely occurring	Required				Other Boards shall be notified - including Planning Board, Eng Dept., Cons Com., and DPW (S 6.F)	Not addressed	
Construction Site SW runoff control (S 2.3.5)	Not addressed	Required but w/o specifications	Written procedures for site inspection and enforcement of ESC measures - defining who is responsible and who has authority to enforce	In the Six Ponds District construction ESC required 325-98.B(7))		construction sites are required to have an ESC plan to prevent runoff (1.07.2.c.4).	Agree to site inspection upon filing of SW permit application. Written procedures for site inspection (12:B&C); meet requirements of MS4 (S8.D.); measures to control construction waste (S10.A)	(Not applicable)	
Site Plan Review (S 2.3.5)	Not addressed	Require but w/o written specifications	Require, including written procedures for site plan review				Local Stormwater permit approval required prior to issuance of Site Plan approval (S4:B). Stormwater Management Plan Submission has written requirements (S7)		
Require reduction of other wastes such as pollutants, demolition debris, litter, and sanitary wastes on construction sites (S 2.3.5.c.i)	Not addressed	Required	Required and written procedures	Facilities for dumping construction debris or other solid waste are prohibited w/in the Six Pond Special District (325-102B.(2)). Parking, stockpiling, other construction related equipment should be located in areas planned for permanent structures.			SW Plan includes measures to reduce adverse impacts from construction and long-term and it must meet MS4 requirements on post-construction management (S7:A&D); And measure to control construction waste including chemicals, litter, sanitary waste, etc. (S10:A)		

Appendix C - Harwich SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw CH 325	Subdivision of Land & Site Plan Special Permits Regs CH 400	Wetland Protection Regulations & Bylaw CH 310	Comprehensive Stormwater and Illicit Discharge Regulations (pursuant to CH 295 - Sewer Use)	Board of Health Regs - easy to read	General Regulations & Bylaws
Post construction Stormwater Management for new development (S 2.3.6)	Not addressed	Allow LID	Retain vol of runoff ≥ 1 in X impervious SF and or remove 90% TSS post-construction & 50% TP generated from the post-construction impervious surface area on the site. Use LIDs to the maximum extent feasible.				Retain vol of runoff ≥ 1 in X impervious SF and or Remove 90% TSS post construction and 50% of TP (S8.D.1.b.i.&ii.)		
Post construction SW management for redevelopment (S 2.3.6)	Not addressed		Retain vol > 0.8 in X impervious SF and/or remove 80% TSS and 50% of TP load. Use LIDs to the maximum extent feasible.				Retain vol ≥ 0.8 in X impervious SF and/or remove 80% TSS and 50% of TP load (S.8.D.2).		
Enforcement	No	Yes	Yes with fines			\$300/day/offense	Yes - \$5,000/day civil penalties. Noncriminal \$300/violation		

Appendix D - Orleans SWM Bylaw Review

Appendix D - Orleans SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (CH 164)	Subdivision Rules and Regs (CH 192)	Wetland Bylaw (CH 160) & Regulations (CH 196A) (CH 196A revised 2013)	Site Plan Review Section 164-33) & Architecture Review (164-33.1)	Drainage and erosion and sediment control (CH 88) updated in 2019	Illicit Discharge (CH 148)	Design Guidelines (2019)	Board of Health Regs (Ch 185)	General Regulations & Bylaws
GOAL 1: PROTECT NATURAL RESOURCES AND OPEN SPACE												
Soils managed for revegetation	Not addressed	Limitations on removal from site, and/or requirements for stabilization and revegetation	Prohibit removal of topsoil from site. Require recontouring and other prep of soils compacted during construction	Any removal of topsoil, subsoil, loam, sand, stone or other earth will require grading and replanting with soil-improving plants, with permanent cover crop or reforestation within 6 mths (164-24.B.)		Lawns w/in 100-ft of a resource area require min 4-6 in of loam - improve conditions for lawn and min nutrient leaching (196A-7.F.(2)(a))		Not addressed		(Not applicable)	(Not applicable)	Not addressed
Limit clearing, lawn size, require retention or planting of native vegetation/naturalized areas	Not addressed or general qualitative statement not tied to other design standards	Encourage minimization of clearing/ grubbing	Require minimization of clearing/grubbing with specific standards	Within GWPDP 2 ≥ 30% of lot area retained in natural state and ≥ 60% must remain pervious (164-17.D.2.a.1&2); Removal or fill of earth > 2,000 cy shall require ZBoA special permit (164-24.C); For communication structures, buildings and appurtenances the maximum amount of vegetation shall be preserved (164-39.C(8))	roads and lots designed with goals of reducing disturbance of veg and # of trees removed (192-9); Preserve natural features (trees, watercourses, wetlands) (192-9.B). Preserve existing trees > 6 DBH is possible (192-14.I)	require replacement planting of native vegetation, shrubs, trees (196A-7E.5.(h)); Any activity that denudes ≥50 SF w/in 100 ft of a resource area requires immediate seeding (196A-7.I(4)(a)); Clear cutting prohibited w/o NOI (196A-7E(5)(f))	Reasonable effort to conserve and protect natural features; Existing trees of 6-in DBH shall be incorporated into landscape design (164-33.IV.B&F)	Construction at sites > 1 ac or < 1 ac but part of a larger construction project shall meet the SWM standards/requirements (88-5)	Not applicable	Encourage alternatives to lawn area including native grasses and forbs to reduce maintenance and fertilizer applications; planting street trees but native not recommended (Design Guidelines)	Not applicable	Not addressed
Require native vegetation and trees	Require or recommend invasives	Not addressed, or mixture of required plantings of native and nonnative	Require at least 75% native plantings	Native plants preferred (S.164-33.I.E.14)		Require native veg w/in 50-ft buffer; Recommends native outside of 50-ft buffer (196A-7G.(2)); Planting of invasives is prohibited w/in 100-ft buffer (196A-7.G(2))		Not addressed		Encourage primarily native plants (Design Guidelines)	(Not applicable)	Not addressed
GOAL 2: PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL												
Lot size	Required minimum lot sizes	OSRD/NRPZ preferred. Special permit with incentives to utilize	Flexible with OSRD/NRPZ by-right preferred- option Ask Patty?	Required min lot sizes & densities (S.164-31.B.1); In Shoreline District <10% of lot can be covered w buildings (164-18.B.(1)(c)). Flexible w OSRD on parcels > 120,000 SF of buildable upland by permit (164-40.1)	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)			(Not applicable)	

Appendix D - Orleans SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (CH 164)	Subdivision Rules and Regs (CH 192)	Wetland Bylaw (CH 160) & Regulations (CH 196A) revised 2013	Site Plan Review Section 164-33) & Architecture Review (164-33.1)	Drainage and erosion and sediment control (CH 88) updated in 2019	Illicit Discharge (CH 148)	Design Guidelines (2019)	Board of Health Regs (Ch 185)	General Regulations & Bylaws
Setbacks	Required minimum front, side, and rear setbacks	Minimize, allow flexibility	Clear standards that minimize and in some instances eliminate setbacks	Depends on zoning (164-21.A); Residential Affordable Housing (RAH) min 20, 20, 20 (164-19.2.B); OSRD min 25-ft front, side and rear, except from preexisting streets front setback = 50 ft (164-40.1.D.3)		(Not applicable)	(Not applicable)	(Not applicable)		Flexible depending on road type - (ranges from 0-40ft from road frontage) (Design Guidelines)	(Not applicable)	
Frontage	Required minimum frontage for each lot/unit	Minimize especially on curved streets and cul-de-sacs	No minimums in some instances, tied into other standards like OSRD design and shared driveways.	Min required - in RAH 20 ft; 25 ft min tied to OSRD (164-40.1.D.3)		(Not applicable)	(Not applicable)	(Not applicable)			(Not applicable)	
Common driveways	Often not allowed, or strict limitations	Allow for 2-3 residential units	Allow for up to 4 residential units, preferably constructed with permeable pavers or pavement			(Not applicable)		(Not applicable)			(Not applicable)	
Limit impervious area – Rural Districts In high density areas, require post-development infiltration to = or > predevelopment	Not usually addressed in zoning and subdivision regs for rural/suburban residential?	<15%	<10%	In GWPD 2 < 15% of lot may be impervious unless recharge of precipitation, regardless >60% must remain pervious; 30% must remain in natural state. All runoff shall be recharged w/in the lot (164-17.D.2.a.2&3); road width reduction to 16 ft when in best interest of town to reduce runoff impacts (164-40.0.D.4)	for subdivisions with up to 4 dwellings, paved surface not required - must provide adequate drainage (192-14.1)	(Not applicable)		Runoff must be recharged on site by diverting to vegetated areas for infiltration, unless public benefit to allow flow offsite; commercial must design flow from 25-yr storm; (88-3.a&b)		Encourage limiting impervious and requiring infiltration to improve predevelopment conditions (Design Guidelines)	(Not applicable)	
GOAL 3: SMART DESIGNS THAT REDUCE OVERALL IMPERVIOUSNESS												
Street location	Numeric and geometric standards based primarily on vehicular travel and safety, with basic pedestrian requirements e.g. sidewalks	Flexibility in applying standards, to reduce area of impact, grading, avoid key natural features	OSRD design preferred by-right. Require locating streets to minimize grading and road length, avoid important natural features	(Not applicable)	Geometry based on vehicular safety; intersect as nearly as possible at right angles (192-10.A)	(Not applicable)	(Not applicable)	(Not applicable)			(Not applicable)	
Road width	Major and minor categories, 24-30'	Wide, medium, narrow categories. 22-24' max, plus 2' shoulders	Wide, medium, narrow, and alley categories. 20-24' widest for 2 travel lanes, 18-20' low traffic residential neighborhood, plus 2' shoulders. Allow alleys and other low traffic or secondary emergency access and all shoulders to use alternative, permeable materials.	road width reduction to 16 ft when in best interest of town to reduce runoff impacts (164-40.0.D.4)	Based on # of dwellings existing & proposed: 14 - 20 ft (192-10.F(2))	(Not applicable)	(Not applicable)	(Not applicable)			(Not applicable)	

Appendix D - Orleans SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (CH 164)	Subdivision Rules and Regs (CH 192)	Wetland Bylaw (CH 160) & Regulations (CH 196A) revised 2013	Site Plan Review Section 164-33) & Architecture Review (164-33.1)	Drainage and erosion and sediment control (CH 88) updated in 2019	Illicit Discharge (CH 148)	Design Guidelines (2019)	Board of Health Regs (Ch 185)	General Regulations & Bylaws
Road ROW width	50-75', fully cleared and graded	40-50', some flexibility in extent of clearing	20-50' depending on road type		ROW width and surface type based on number of dwellings - 33-40' (192-10.F.(2))	(Not applicable)	(Not applicable)	Not mentioned			(Not applicable)	
Access Options	No common drives allowed, dead end allowed with limit on length and # of units	Allow dead end with limit on length and # of units. Allow common drives up to 2-3 units	Allow one way loop streets. Allow common drives up to 4 units, and alleys and rear-loading garages where suitable.	Common driveways may be required on panhandle lots (164-22.A(5))		(Not applicable)	(Not applicable)	(Not applicable)		Shared access, parking areas to limit environmental impacts (Design Guidelines)	(Not applicable)	
Dead Ends/Cul-de-sacs	120 ft or more minimum turnaround	Minimize end radii - 35 ft	Allow hammerhead turnaround	minimize frontage to 30ft of arc frontage on dead-end (164-19.2.B)	80 ft diameter turnaround; length ≤ 600ft; (192-10.C)	(Not applicable)	(Not applicable)	(Not applicable)			(Not applicable)	
Cul-de-sacs	Full pavement standard	Encourage center landscaping with bioretention	Require center landscaping with bioretention	Not addressed	May require plantings w/in cul-de-sacs or turnarounds (192-14.I)	(Not applicable)	(Not applicable)	(Not applicable)			(Not applicable)	
Curbing	Curbing required full length both sides of road	Allow curb breaks or curb flush with pavement to enable water to flow to vegetated LID features	Open drainage with roadside swales and no curbs preferred	Not addressed	Berms require on both sides of all paved roads where the grade is ≥ 3% (192-14.G)	(Not applicable)		(Not applicable)			(Not applicable)	
Roadside Swales	Allowed as an option	Preferred over closed drainage	Preferred, with criteria for proper design. Adoption of technical specifications and design templates for green infrastructure recommended	Not addressed	Not addressed	(Not applicable)				Encourages roadside swales, bioretention, biofiltration strips, gravel wetlands, flow through planters, tree boxes where appropriate; stormwater disconnection from storm drains, sewer, and waterbodies, (Design Guidelines)		
Utilities	Off sets required contributing to wide road ROWs	Not specified, flexible	Allow under road, sidewalks or immediately adjacent to roads to enable placement of roadside swales.	Not addressed	For any Definitive Plan which could contain ≥ 2 dwellings, utilities shall be placed underground (192-12)	(Not applicable)					(Not applicable)	No utilities shall be placed underground w/in 5 ft horizontally from the water mains (196-7)
Sidewalks	Concrete or bituminous	Some flexibility in material and design	Prefer permeable pavement or permeable pavers	In VC sidewalks required unless determined useless or not feasible due to topo; and must be constructed of all-weather material (impervious) and preserve trees if possible (164-19.1.D.)	Not addressed	(Not applicable)		(Not applicable)			(Not applicable)	
Sidewalk location	Required both sides of road	Allow on only 1 side of road especially in low density neighborhoods	Prefer siting with land contours and for best pedestrian utility (e.g. connect with common areas and shared open spaces) – not necessarily parallel to road.	Not addressed	Not addressed	(Not applicable)		(Not applicable)			(Not applicable)	

Appendix D - Orleans SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (CH 164)	Subdivision Rules and Regs (CH 192)	Wetland Bylaw (CH 160) & Regulations (CH 196A) revised 2013	Site Plan Review Section 164-33) & Architecture Review (164-33.1)	Drainage and erosion and sediment control (CH 88) updated in 2019	Illicit Discharge (CH 148)	Design Guidelines (2019)	Board of Health Regs (Ch 185)	General Regulations & Bylaws
Sidewalk drainage	Drains to road closed drainage system	Not addressed	Disconnect drainage from road system – e.g. adjacent green strips or within vegetated areas that can absorb sheet flow	Not addressed	Not addressed	(Not applicable)		(Not applicable)			(Not applicable)	
GOAL 4: ADOPT GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS												
Rooftop runoff	Prohibit directing clean roof runoff into closed municipal drainage systems.	Allow clean roof runoff to be directed to landscaped or naturally vegetated areas capable of absorbing without erosion, or infiltration	Require directing clean roof runoff to landscaped or naturally vegetated areas capable of absorbing, or infiltration	Not addressed		(Not applicable)		Roof drains not allowed to be directed to public road layout (88-3.C)		Encouraged to direct roof runoff to vegetated LIDs; Ecoroofs (green roofs)	(Not applicable)	
Overall stormwater design; piping and surficial retention vs. LID	Conventional stormwater system design standards	Encourage LID design and green roofs	LID design standard. Allow surficial ponding of retained runoff for up to 72 hours and credit for green roofs towards stormwater requirements	In Shoreline Districts drainage from parking and service areas shall be collected and recharged or impurities (not incl N) removed before recharge to surface waters (164-18.C.(1))	Conventional SW (192-10.B.) Catchbasins required at low points, near corners, at intersections and every ≤ 200 ft w/ 5% grade, or every ≤ 400 ft on continuous grades of < 5% (192-15). No mention of LID. Near wetlands or in GPD 2 analyze surface vs underground drainage system alternatives re water budget and contaminant loading (192-6.C(2)(d))	Buffer strips, catch basins, diversion ditches, grassed waterways (swales) are encouraged methods of erosion control (196A-7.1.(1)).		Runoff must be recharged site by diverting to vegetated areas for infiltration, unless public benefit to allow flow offsite; commercial must design flow from 25-yr storm; (88-3.a&b)		Encourage green roofs, but no credit towards SW requirements	(Not applicable)	
Site Design Requirements	LID may not be addressed	Encourage use of LID features in site design	Count bioretention and other vegetated LID features toward site landscaping/open space requirements.	LID not addressed in Architectural Review (164-33.1.E)	LID not addressed	Not addressed				Utilize LID for SW; integrate SW design with landscaping; break up parking areas with landscaping and SW management;	(Not applicable)	
Allow easy siting of LID features (bioretention, swales, etc.)	Often not addressed, may require waivers from subdivision standards	Encouraged along road ROW	Allowed on lots, common open space, or road ROW, easement recorded. For commercial development, allow an increase in floor area ratio or other developmental incentives for green roofs	Not addressed	Not addressed	Buffer strips serve to improve recharge, reduce pollution and erosion (196A-7.D(2)). A buffer strip must be maintained to provide a border b/w the resource area and human impact areas of the property (196A-7F(5)(a))				Encouraged where appropriate	(Not applicable)	

Appendix D - Orleans SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (CH 164)	Subdivision Rules and Regs (CH 192)	Wetland Bylaw (CH 160) & Regulations (CH 196A) revised 2013	Site Plan Review Section 164-33) & Architecture Review (164-33.1)	Drainage and erosion and sediment control (CH 88) updated in 2019	Illicit Discharge (CH 148)	Design Guidelines (2019)	Board of Health Regs (Ch 185)	General Regulations & Bylaws
Permeable paving	Often not addressed, may require waivers from subdivision standards	Allowed on private residential lots for parking, patios, etc.	Allowed for residential drives, parking stalls, spillover parking spaces, emergency access ways (with proper engineering support for emergency vehicles) Two track design allowed for driveways and secondary emergency access ways (where required).	Not addressed		(Not applicable)		Not addressed		Encourage permeable pavement where appropriate, including lightly use or seasonal parking, walkways (Design Guidelines)	(Not applicable)	
Stormwater management O&M plan	Typically only addressed if municipality has a stormwater or LID bylaw, or for areas subject to wetlands permitting	Required	Required, surficial bioretention and swales preferred. Closed/underground systems requiring specialized inspection and clean out discouraged.			Not required.				(Not applicable)	(Not applicable)	
Construction Erosion and Sedimentation Plan required	Basic general requirements	Required, contents specified	Goes beyond minimum NPDES requirements, requires minimization of site disturbance			Required, using ESC BMPs; Erosion control methods must be shown on the plans; (196A-7.1(2))		Required, using ESC BMPs; contents specified (88-4)		(Not applicable)	(Not applicable)	
GOAL 5: ENCOURAGE EFFICIENT PARKING												
Parking	Specific minimums set based on projected maximum use times	Encourage minimum # needed to serve routine use (e.g. 2/residential unit with any additional/visitors parking behind in driveway or on street.	Establish Maximum Parking spaces allowed. Do not require more than 2/residence. Allow tenants separate, optional lease agreements for parking.	Min # encouraged (164-44 Table); ≤ 2/residence	(Not applicable)	(Not applicable)		Not addressed			(Not applicable)	
Commercial Parking	Specific minimums set based on projected maximum use times adding all on-site uses together.	Some flexibility to reduce minimums based on street or other available nearby parking or transit.	Allowed shared parking for uses with different peak demand times. Provide model agreements/deed restrictions. Reduce parking requirements near transit. Limit parking stall size (9ftx18ft max), with up to 30% smaller for compact cars	Shared parking allowed for activities having different peak demand times - allowing a ≤ 20% reduction of required spaces (S.164-34.B.(3)); parking space reduction > 20% requires special permit from board of appeals (164-34.B(3)).		(Not applicable)		Not addressed			(Not applicable)	

Appendix D - Orleans SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (CH 164)	Subdivision Rules and Regs (CH 192)	Wetland Bylaw (CH 160) & Regulations (CH 196A) revised 2013	Site Plan Review Section 164-33) & Architecture Review (164-33.1)	Drainage and erosion and sediment control (CH 88) updated in 2019	Illicit Discharge (CH 148)	Design Guidelines (2019)	Board of Health Regs (Ch 185)	General Regulations & Bylaws
LID in Parking Areas	Often not addressed, may require waivers e.g. for planting islands to drain down rather than built up surrounded by curbs	Allow LID/bioretenion within parking areas.	Require landscaping within parking areas, as LID/bioretenion, at a minimum of 10% of the interior area landscaped and a minimum of 25 square feet for island planting areas.	Trees (native not required or encouraged) required (1 tree/8 spaces) but not to serve as SW bioretenion (164-34.C.(5)). Runoff (first 1", 25yr storm) shall be directed to recharge the GW beneath the lot. LID not addressed (164-34.C.(7)).		(Not applicable)		Not addressed		Encourage integrating landscaped bioswales, bioretenion into parking area designs; Encourage landscaping and SW management in parking area and pedestrian pathways; landscaped areas as stormwater management (Design Guidelines)	(Not applicable)	
GOAL 6: Manage SW (& compliance w MS4)												
Discharge detection & elimination (S 2.3.4.a)	Not addressed	Discharges and connects noted and or limits set on quantity and quality.	Illicit discharges and connections are prohibited and enforced	(Not applicable)	(Not applicable)	(Not applicable)	(Not applicable)	Not addressed	Illicit discharges and connections are prohibited and enforceable; requires notification of spills and allows for inspections (148-7&10)	(Not applicable)	No floor drains shall be allowed to discharge, w or w/o pretreatment to the ground, leaching structure, or spetic system in any industrial or commercial facility if such floor drain in specific areas (see reg - 185-119); spill or loss of product must be reported (185-6.A)	
Stormwater drainage patterns	Not addressed		Resemble pre-existing conditions of volume, velocity, of runoff - must quality and location, as nearly as possible	SW runoff shall be directed so as to recharge GW beneath the lot and to not increase the flow of runoff - must show proposed drainage facilities sufficient to contain 25-yr storm and to remove contaminants (164-34.C.(7))		For subdivisions w/in 300 ft of wetland or containing 2 or more lots of land w/in GW Protection District 2: analysis of surface vs. underground drainage system alternatives, examine effects upon the basin water budget and concentration and speed of transport of contaminants (192-6.C(2)(d&e))	Not addressed	Not addressed	Not addressed	Not applicable	(Not applicable)	
As-built	Not addressed	Required	Required, written instructions, electronic submittal			Not required. May request an official revised site plant to reflect as-built conditions (196A-6.C)		Required w/in 2 yrs - written instructions (88-3.d.5.)			(Not applicable)	
Intra-departmental communication/co ordination	none	informally or loosely occurring	Required				Part of the site plan review - copies of site plan distributed and reviewed by other town agencies and depts (164-33.3&4)	Not mentioned			Not mentioned	

Appendix D - Orleans SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (CH 164)	Subdivision Rules and Regs (CH 192)	Wetland Bylaw (CH 160) & Regulations (CH 196A) revised 2013	Site Plan Review Section 164-33) & Architecture Review (164-33.1)	Drainage and erosion and sediment control (CH 88) updated in 2019	Illicit Discharge (CH 148)	Design Guidelines (2019)	Board of Health Regs (Ch 185)	General Regulations & Bylaws
Construction site SW runoff control (§ 2.3.5)	Not addressed	Required but w/o specifications	Written procedures for site inspection and enforcement of ESC measures - defining who is responsible and who has authority to enforce			Planting appropriate grasses, shrubs, and trees, buffer strips, diversion ditches (swales), grassed waterways are encouraged for erosion control (196A-7.1(1))		Erosion and sediment control designed and executed to prevent erosion or tracking onto/into public way or stormwater system during and after construction, require BMPs (88-4); Permanent erosion control incl revegetation, retention basins (88-4); Town has right to inspect construction sites and enforce compliance w approved SWM plans and construction permits (88-5. c). No written procedues.				
Site Plan Review (§ 2.3.5)	Not required	Required but vague, no written procedures for submission	Require and have written procedures	Required for any activity that affects drainage (164-33.II.B.4); written requirements (164-33.III.D.2). Committee made up several dept and committees (164-33.V)				Generally required for any projects affecting drainage per Zoning Bylaw (164-33), however not specifically stated here in the drainage bylaw.				
Require reduction of other wastes such as demolition debris, litter, and sanitary wastes on construction sites (§ 2.3.5.c.i)	Not required/addressed	Required but w/o specifications	Required w/ written procedures for site inspections and enforcement	Not addressed	For subdivisions w/in 300 ft of wetland or containing 2 or more lots of land w/in GW Protection District 2: analysis of surface vs. underground drainage system alternatives, examine effects upon the basin water budget and upon the concentration and speed of transport of contaminants (d); analysis of impact upon ground and surface water quality and level including estimated P and N loading on GW and surface water	Not addressed	Not addressed	Construction at sites ≥ 1 ac or < 1 ac but part of a larger construction project shall meet the SWM standards/requirements: use BMPs designed per MassSVW Handbook Vol 2, and shall use LID to max ext feasible; follow guidance in SW Handbook, as amended (88-5)	(Not applicable)		(Not applicable)	
O&M requirements								Long term O&M in accordance with MassSVW STD 9 (88-3.d.vi)				

Appendix D - Orleans SWM Bylaw Review

Factors	Conventional	Better	Best	Zoning Bylaw (CH 164)	Subdivision Rules and Regs (CH 192)	Wetland Bylaw (CH 160) & Regulations (CH 196A) revised 2013	Site Plan Review Section 164-33) & Architecture Review (164-33.1)	Drainage and erosion and sediment control (CH 88) updated in 2019	Illicit Discharge (CH 148)	Design Guidelines (2019)	Board of Health Regs (Ch 185)	General Regulations & Bylaws
Post construction Stormwater Management for new development (S.2.3.6)	Not addressed	Allow LID	Retain vol of runoff > 1 in X impervious SF and or remove 90% TSS post-construction & 50% TP generated from the post-construction impervious surface area on the site. Use LIDs to the maximum extent feasible.	Stormwater drainage shall be contained on the development site - designed to handle calculated flows from a 25-yr storm and remove contaminants (164-34.C.7)	Not addressed	New and redevelopment requires vegetated buffer strip landward of resource area min of 25ft	Stormwater drainage shall be contained on the development site & designed to handle calculated flows from 25-yr storm (164-33.IV.E)	All SWM systems designed to retain vol of runoff > 1 inch x post-construction impervious surface area & remove 90% of TSS & 60% of TP generated from post-constr impervious - calculated consistent w/ EPA's BMP performance Extrapolation Tool (88-3.d.vii); bylaw applies to existing, new and redevelopment (88-2)				
Post construction stormwater management for redevelopment (S 2.3.6)	Not addressed		Retain vol of runoff ≥ 0.8 in & remove 80% TSS and 50% TP	Not addressed	Not addressed	Not addressed	Not addressed	Improve existing conditions - retain runoff vol ≥ 0.8 in x post-constr impervious surface and/or remove 80% of ave annual post-constr TSS and 50% TP (88-3.d.4); bylaw applies to existing, new and redevelopment (88-2)				
Enforcement	No	Yes	Yes with fines			Conservation Administrator authorized to review, conduct site visits, and enforce (196A-4 & 160-10); Violators punishable with fines (160-10.E)		Inspect sites and enforce compliance. BoS enforce or designate enforcers (88-2); violators fined ≤ \$200/offense and may have permit evoked. Each day offense continues = separate offense	Illicit discharges and connections are prohibited and enforceable by DPW and or NR Dept (148-7&10)		Fine > \$200 ≤ \$1,000 per day/violation	