



LID, GI, AND IA REGULATORY ASSESSMENT

To: Mr. Sam Jensen, P.E., Assistant Town Engineer
From: Nick Cristofori, P.E., Comprehensive Environmental Inc.
Date: June 30, 2022
Subject: Review of Sandwich's Regulations for LID, GI, and Impervious Cover Creation

Under the Environmental Protection Agency's (EPA's) 2016 National Pollutant Discharge and Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit, regulated communities such as Sandwich are required to complete an assessment of existing town regulations as they pertain to Low Impact Development (LID), green infrastructures (GI), and the creation of impervious area (IA) under permit sections 2.3.6.b and 2.3.6.c. In summary, communities must complete the following:

- Develop a report assessing current street design and parking lot guidelines and other local requirements that affect the creation of impervious cover to determine if changes to design standards for streets and parking lots can be made to support low impact development options.
- Develop a report assessing existing local regulations to determine the feasibility of making, at a minimum, the following practices allowable when appropriate site conditions exist: green roofs; infiltration practices such as rain gardens, planter gardens, pervious pavements, and other designs to manage stormwater using landscaping and structured soils; and water harvesting devices such as rain barrels and cisterns.

This memorandum serves as a report assessing any barriers to implementing LID and green infrastructure, opportunities for reducing mandatory creation of impervious area, and recommended regulatory changes to be made.

As part of preparation of this memo, CEI reviewed the following regulations:

- Town Bylaws (June 15, 2020), including:
 - Chapter 5, Public Ways
 - Chapter 7, Conservation
- Site Plan Review Regulations (last amended April 4, 2019)
- Planning Board Subdivision Rules and Regulations (last amended February 20, 2018)
- Protective Zoning Bylaw (November 2020)
- Proposed Zoning Amendments (undated)

Recommendations

The following items are provided as recommendations and next steps:



LID, GI, AND IA REGULATORY ASSESSMENT

- Table 1 (attached) provides a detailed assessment and recommended regulatory changes that should be considered when updating relevant sections of the town's regulatory mechanisms.
- Regulatory review and permitting processes such as Site Plan Review, Subdivision, Wetlands, and/or any other similar processes should be updated to specifically reference the stormwater regulatory mechanisms adopted to meet MS4 regulations for projects that disturb one or more acres. This should include the construction and post-construction stormwater requirements, including requirements for treating stormwater from new development or redevelopment, so that project proponents are aware of the additional requirements under MS4 regulations.
- Changes should be made as part of the next major regulatory update undertaken by the town for each relevant section, or more suitable timeframe as determined by the Planning Board and/or other regulatory board/department.
- This memorandum should be provided to the Planning Board and local transportation board, if applicable, as recommended by the permit.

If you have any further questions or would like additional information, please feel free to contact me at 800.725.2550 x303 or ncristofori@ceiengineers.com. Thank you.

Nick Cristofori, P.E.
Principal, Project Manager

Attachments:

- Table 1: Recommendations for Updating Existing Regulations Pertaining to LID, Green Infrastructure and Impervious Cover Creation



LID, GI, AND IA REGULATORY ASSESSMENT

Table 1: Recommendations for Updating Existing Regulations Pertaining to LID, Green Infrastructure and Impervious Cover Creation

Topic	Reference	Existing Requirement	Recommendations
General design for environmental sensitivity	<u>Subdivision</u> 4.A General 4.I Protection of Natural Features	Provides for general protection of natural features.	Consider expanding these sections to include precautions to reduce pollution from stormwater runoff.
	<u>Zoning</u> 1100. Purpose		
Stormwater Management			
Surface runoff	<u>Subdivision</u> 5.S.2 Minimum Road Construction Requirements	Requires roadways be properly drained by use of drainage swales off each side of the roadway dispersing to undeveloped areas in a manner that will not cause ponding or erosion. Riprap channels, inlets, or other design methods may be required by Town Engineer.	Allows for use of natural open drainage features, which is desirable for promoting LID. No changes recommended.
	<u>Subdivision</u> 4.C.2 Storm Drainage System	Requires storm drainage system be designed to be of sufficient size to permit unimpeded flow of all natural runoff, to provide adequate drainage for all streets, to intercept runoff from the adjacent lots of the subdivision, and to eliminate ponding of storm runoff expect in designated areas.	
		Allows omittance of catch basins at the discretion of the Board at locations where suitable drainage is provided, e.g., swales.	
		Requires all runoff be designed to utilize natural drainage areas and these areas to be protected from development or compensatory drainage areas must be provided. In areas where the natural drainage area is insufficient in size, additional drainage areas are required.	



LID, GI, AND IA REGULATORY ASSESSMENT

Topic	Reference	Existing Requirement	Recommendations
LID and Green Infrastructure Design	--	No provisions regarding the use of Low Impact Development or green infrastructure to be addressed during development.	<p>Consider expanding the LID language as follows:</p> <p>“LID site planning and design strategies must be implemented unless infeasible to reduce the discharge of stormwater from development sites. LID techniques with the goals of protecting water quality, maintaining predevelopment site hydrology, preserving existing vegetation, reducing the development footprint, minimizing or disconnecting impervious area, and use of enhanced stormwater BMPs shall be incorporated into landscaped areas. These techniques may include disconnection of rooftop and non-rooftop runoff, use of green roofs, vegetated bioretention systems, tree box filters, infiltration edges, dividers, or islands planters, and raingardens. Capture and reuse of stormwater is strongly encouraged. The applicant must document in writing why LID strategies are not appropriate when not used to manage stormwater.”</p>
Green Roofs	<u>Stormwater</u> Section 7. Stormwater Management Plan	No current provisions regarding green roofs.	Expand LID language as discussed under “LID and green infrastructure design” to include vegetated green roofs as an acceptable technique that may be used in the town.
Rain Water Harvesting	N/A	No current provisions regarding rain water harvesting.	Expand LID language as discussed under “LID and green infrastructure design” to encourage reuse of stormwater as part of site design.



LID, GI, AND IA REGULATORY ASSESSMENT

Topic	Reference	Existing Requirement	Recommendations
Open Space			
General requirements	<u>Zoning</u> 4400. Cluster Development: 4446. Open Space 7860. Common Open Space	Requires common open space be used solely for recreation, conservation, or agricultural purposes with a minimum of 80% of the open space left in the undisturbed, natural state.	Consider allowing construction of LID stormwater management practices (bioretention areas, filter strips, swales, rain gardens, constructed wetlands, etc.) on open land held in common.
Landscaping	<u>Zoning</u> 3500. Landscaping and Screening	Requires not less than 30% of lot area shall be retained in a vegetated condition unless by special permit. Lots that do not meet requirements shall be planted with a mixture of trees, shrubs, and groundcover species chosen to replicate natural state growth in nearby undisturbed areas. Variations require special permit.	Consider allowing LID stormwater management practices (bioretention areas, filter strips, swales, rain gardens, constructed wetlands, etc.) to count towards fulfillment of site landscaping/ open space requirements.
Cluster development	<u>Zoning</u> 4400. Cluster Development	Requires a special permit granted by the Planning Board for the construction of a Cluster Development.	Consider allowing cluster development as a “by right” form of development (no special permit required).
	<u>Zoning</u> 4400. Cluster Development, 4440. Requirements	Current provisions list the requirements for Cluster Development lots, such as the maximum number of dwelling units, flexible dimensions, and preserving open space.	Consider developing guidance for the provisions of cluster development: <ul style="list-style-type: none"> • Consider priorities for developing open space areas that are contiguous with existing off-site areas. • Require cluster development sites to be designed as LID with guidance regarding what is meant by LID: <ul style="list-style-type: none"> ○ site design strategy for minimizing pavement, retaining natural drainage paths and features, and treating runoff as close to its source as feasible;



LID, GI, AND IA REGULATORY ASSESSMENT

Topic	Reference	Existing Requirement	Recommendations
			<ul style="list-style-type: none"> ○ directing runoff from roofs and areas to “disconnect” runoff from the formal drainage system; ○ maximizing the use of infiltration practices to reduce runoff volume that must otherwise be conveyed and treated; ○ use of surface-based stormwater management systems that incorporate vegetation to enhance stormwater treatment.
Street Design			
Width	<u>Subdivision</u> Appendix: Typical Road Cross Section/ Design Standards	Width of roadway pavement: Collector streets = 24’ Minor streets and lanes = 20’ Commercial and industrial= 30’	Consider allowing a pavement width of 18-22 feet on low-traffic local streets in residential neighborhoods. Allow narrower pavement widths along sections of roadway where there are no houses, building, or intersections, and where on-street parking is not anticipated.
Materials	<u>Subdivision</u> 5.G.1 Roadway Surface	Requires all roadways be paved with Hot Mix Asphalt (HMA) paving.	Permit use of permeable paving for road shoulders/ parking lanes in residential neighborhoods, with use of conventional paving for travel lanes only.
	<u>Subdivision</u> 5.F Roadway Foundation Appendix: Typical Road Cross Section	Requires use of pavement/ bituminous concrete/ gravel.	
Berms/ Curbs	<u>Subdivision</u> 4.G Berms and Curbs 5.I Berms	Requires berms to be constructed of bituminous concrete on both sides of all streets except where omission is necessary to support drainage. The Board has discretion to	Consider allowing the use of “open drainage” along residential streets. If protection of the roadway edge is a concern, consider allowing alternative designs such as curbs with openings (or “leak-offs”) or flush curbs, that enable the



LID, GI, AND IA REGULATORY ASSESSMENT

Topic	Reference	Existing Requirement	Recommendations
		require vertical curbs on one or both sides of any street in place of berms.	use of bioretention, treatment swales, and open drainage instead of piped drainage systems.
Cul-de-sacs	<u>Subdivision</u> 4.B. Streets, 4.B.3 Dead End Streets	Requires dead end streets to have a cul-de-sac at the closed end with an outside roadway diameter of at least 100 feet.	Consider allowing alternative layouts for turnarounds, such as “hammerhead” turnarounds, to minimize impervious surfaces.
	<u>Subdivision</u> 5.S.6 Minimum Road Construction Requirements	Requires that all dead ends are constructed with a cul-de-sac having a minimum centerline radius of 40 feet.	
	<u>Subdivision</u> 4.B. Streets, 4.B.3 Dead End Streets	Requires vegetated central island 60 feet in diameter.	Consider allowing alternative pavement types such as pervious pavement for turnarounds. Consider allowing the use of vegetated stormwater management practices within the island.
	<u>Subdivision</u> 5.S.6 Minimum Road Construction Requirements	Requires the inside islands of cul-de-sacs to remain natural as much as practical.	
Landscaping	<u>Subdivision</u> 5.J Grass Areas Appendix: Typical Road Cross Section	Requires a grassy area on each side of all roadways. Planning Board may require planting of blueberry sod in place of grass.	Consider allowing LID stormwater management practices (bioretention areas, filter strips, swales, rain gardens, constructed wetlands, etc.) in required roadside grass areas.
	<u>Zoning</u> 7600. Scenic Roads Corridor: 7610. New Structures	Requires a minimum 100-foot buffer of natural vegetation maintained along the frontage of all lots fronting on scenic roadways.	Consider allowing LID stormwater management practices (bioretention areas, filter strips, swales, rain gardens, etc.) to count towards fulfillment of vegetated buffer requirements.
Location of Utilities	=	No current provisions regarding placement of utilities.	Consider explicitly permitting the placement of all utilities under the paved section of the ROW or immediately adjacent to the road edge so that the land adjacent to the roadway can be used for drainage swales.



LID, GI, AND IA REGULATORY ASSESSMENT

Topic	Reference	Existing Requirement	Recommendations
Sidewalks			
General requirements	<u>Subdivision</u> 4.F Sidewalks	Requires sidewalks be located on one or both sides of a collector street and on one side of a minor street and at any other appropriate locations.	Consider adding more flexibility in providing sidewalks only when there is a need for them and with sidewalk layout (e.g., alternative pedestrian circulation layout that uses common areas, rather than street right of ways).
Width	<u>Subdivision</u> 4.F Sidewalks	Requires sidewalks not be less than 4 feet in width.	Consider establishing the sidewalk width of 4 feet as a requirement, rather than a minimum.
Materials	<u>Subdivision</u> 4.F Sidewalks 5.H Sidewalks	Requires sidewalks be constructed of either bituminous concrete or Portland cement concrete.	Permit/encourage the use of permeable paving/ other pervious material for sidewalks.
Drainage design	<u>Subdivision</u> 4.F Sidewalks 5.H Sidewalks	No current provisions regarding sidewalk drainage.	Consider requiring runoff from sidewalks to be “disconnected” from street drainage where feasible (e.g., place a green strip) or allowing for sidewalks to direct runoff to landscaped areas such as tree box filters or rain gardens.
Parking Lots			
Number of spaces	<u>Zoning</u> 3100. Parking Requirements: 3110 Adequate off-street parking & 3120. Table of Requirements	Table specifies the minimum required number of spaces for individual uses without a special permit.	Consider specifying a maximum number of spaces.
		Requires minimum number of spaces met unless the Board grants a special permit upon showing that the construction of fewer spaces will adequately serve anticipated parking needs through peak demand analysis and use of on-street parking.	Implies flexibility in the number of required spaces, which is desired for promoting low impact development. Consider specifically mentioning reduced parking for homes and businesses near major transit stops.
		Off-street parking requirements: Supermarket, grocery store, convenience store = 1 space per 200 square feet of gross floor area	MAPC recommends: Do not require more than 3 off street parking spaces per 1000 square feet of gross floor area in professional office buildings.



LID, GI, AND IA REGULATORY ASSESSMENT

Topic	Reference	Existing Requirement	Recommendations
		Industrial retail accessory use, offices, and stores = 1 space per 200 square feet of gross floor area	Do not require more than 4.5 off street parking spaces per 1000 square feet of gross floor area of shopping centers.
Size of spaces	<u>Zoning</u> Article VIII: Definitions	Requires spaces to be not less than 9 feet wide or 18 feet long.	Consider allowing stall width of 9 feet or less and stall length of 18 feet or less. Consider providing dimensional requirements for compact cars (e.g., 8' by 16') and recommending commercial parking lots have at least 30% of spaces reserved for compact cars.
Materials	<u>Zoning</u> 3100. Parking Requirements	No current provisions for pervious parking lot materials.	Permit use of permeable paving for parking stalls and spillover parking areas. Add language such as, "Pervious materials such as porous pavers, paving stones, reinforced grass, and pervious pavement may be allowed for parking stalls or overflow parking areas."
Landscaping	<u>Zoning</u> 3500. Landscaping and Screening: 3520. Parking lots for 6 or more cars	Requires parking lots for 6 or more cars contain or be bordered within 5 feet by at least one tree per 6 cars.	Consider expanding landscaping requirements for parking areas to include vegetated islands with bioretention functions and/or tree box filters.
Driveways			
Common driveways	<u>Zoning</u> 4100. Accessory Uses: 4140. Common Driveways	Allows use of common driveways to serve up to 3 single-family dwellings on 2 separate lots by Special Permit.	Consider allowing the use of common driveways to serve up to 4 houses, including cluster development lots that do not meet standard dimensional requirements.
Materials	<u>Zoning</u> 4100. Accessory Uses	Requires driveways conform to the road construction requirements from the Subdivision Regulations (5.S.).	Consider allowing pervious materials (porous pavers, paving stones, pervious concrete) and/or the use of "two-track" driveways, for residential driveways.



LID, GI, AND IA REGULATORY ASSESSMENT

Topic	Reference	Existing Requirement	Recommendations
Width	<u>Zoning</u> 4100. Accessory Uses	No current provisions regarding the width of residential driveways.	Consider requiring driveway width of no more than 9 feet for 1-way and 18 feet for 2-way, as recommended by MAPC.
	<u>Zoning</u> 3100. Parking Requirements, 3140. Centerlines of driveways	Requires parking lot driveways comprise no more than two travel lanes, each not more than 12 feet in width.	
Lot Layout			
Setbacks and frontages	<u>Zoning</u> 2600. Intensity of Use Schedule 4151. Special Permit Criteria 4443. Flexible Dimensions for Cluster Lots 4444. Village Cluster Regulations 4450. Affordable Housing Conditional Density Development: 4453. Standards 7200. Dimensional Requirements 7830. Dimensional Requirements 8130. Dimensional Requirements and Allowed Uses	Standard dimensional requirements for varying zoning districts. On special permit from the Board of Appeals, the front yard setback may be reduced to as little as zero, notwithstanding any other provisions of the bylaw, in the Business Limited, Marine, Village Business, Shore, and Business districts.	Permit reduction in frontage (and corresponding road length/paved area) where appropriate, such as in cluster developments, at the outside sideline of curved streets, and around cul-de-sacs.
Impervious area limits	<u>Zoning</u> 2600. Intensity of Use Schedule 4151. Special Permit Criteria 4443. Flexible Dimensions for Cluster Lots 4444. Village Cluster Regulations	Current provisions provide maximum lot coverage by Zoning district.	Consider establishing limits on impervious lot coverage (e.g., 15%) in rural, low-density areas. This would not be appropriate for town centers, transit-oriented districts, or moderate density neighborhoods, where compact development should be encouraged.



LID, GI, AND IA REGULATORY ASSESSMENT

Topic	Reference	Existing Requirement	Recommendations
	4450. Affordable Housing Conditional Density Development: 4453. Standards 7200. Dimensional Requirements 7830. Dimensional Requirements 8130. Dimensional Requirements and Allowed Uses		
Site Work			
Soil restoration	<u>Zoning</u> 4200. Earth Moving Regulations: 4250. Stockpiling	Requires topsoil stripped and stockpiled in preparation for construction or for earth removal shall be restored to its original distribution within 36 months of stripping unless a valid permit is in force.	Consider requiring contractors to reestablish permeability of soils that have been compacted by construction vehicles. For example, rototilling the lawn areas prior to seeding to re-establish void space (therefore permeability and infiltration) of the soils.