LOW IMPACT DEVELOPMENT TOOLS FOR VERMONT TOWNS

Low Impact Development (LID) is an approach to managing stormwater runoff based on strategies that mimic natural hydrologic processes. LID provides an alternative to conventional stormwater management techniques. LID can be employed at individual homes, in subdivisions, and on commercial and industrial properties. It can be implemented at the start of new construction or to reduce runoff from an existing property.

By mimicking natural processes on developed lots, we can minimize runoff and maximize infiltration. Controlling runoff closer to its source (ex: rooftops, driveways, roadways, parking lots) and directing it to vegetated areas can reduce its overall volume, the distance it travels, and the amount of pollutants it collects. The net result is fewer contaminants entering our lakes, rivers and streams.

LID Site Plan – The Pinehills, Plymouth, MA

This document was designed as a resource for Vermont Municipalities that want to be pro-active about encouraging site design that maximizes infiltration of stormwater on site. Vermont stormwater regulations encourage these practices by providing bonus points for "non-structural processes" such as natural area conservation, disconnection of roof-top runoff, disconnection of non-rooftop runoff, stream buffers, grass channels, and "environmentally sensitive rural development." However, development that disturbs under 1 acre of land is exempt from Vermont Stormwater Rules, and smaller lots add up in densely populated villages and downtowns that are often located on important surface waters such as rivers and lakes.

The first section of this document, "Supporting Low Impact Development in the Municipal Plan" provides the statutory language that allows towns to plan for stormwater management, and some examples of the type of language that will support the development of regulatory tools that are needed to implement low impact development within a municipality.

The second section provides a Checklist for municipalities to use when looking through local bylaws and ordinances. The Checklist provides examples and signals areas where towns may want to check their bylaws to determine whether some low impact development techniques are allowed. For example, some towns require curbing everywhere, while allowing water to run off into a vegetated area would be preferable in an LID design.

While many towns may not want to require Low Impact Development techniques, we hope that this document will be useful to all towns in explaining what LID is and how it can benefit Vermont municipalities.

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SUPPORTING LOW IMPACT DEVELOPMENT (LID) IN THE MUNICIPAL PLAN

If a town is considering regulations that would require Low Impact Development techniques for new development, the regulations must be consistent with the municipal plan. This section outlines the enabling legislation that allows towns to create bylaws that include stormwater regulation, and offers a checklist of topics that should be included in the town plan to support Low Impact Development.

Enabling Legislation

Vermont state law allows municipalities to plan for clean water and to implement regulations that are consistent with town plans.

Town Plan

T.24 Section 4382 – This section of the law makes it possible for towns to develop municipal plans and lists the required elements. Required elements of a municipal plan related to stormwater and Low Impact Development include the following:

> *(2) A land use plan, consisting of a map and statement of present and prospective uses, indicating those areas proposed for forests,… public and semi-public spaces reserved for flood plain, wetland protection, or other conservation protection…*
>
> *(4) A utility and facility plan, consisting of a map and statement of present and prospective community facilities and public utilities showing exiting and proposed …public sites, buildings and facilities including… water supply, ….storm drainage and other similar facilities and activities, and recommendations to meet future needs for community facilities and services, with indications of priority of need, costs and methods of financing…*

The statute also says that the plan may be consistent with the goals established in Section 4302. Some of the goals related to management of stormwater include the following:

> *(4) To provide for safe, convenient, economic and energy efficient transportation systems that respect the integrity of the natural environment, including public transit options and paths for pedestrians and bicyclists.*
>
> *(6) To maintain and improve the quality of air, water, wildlife and land resources.*

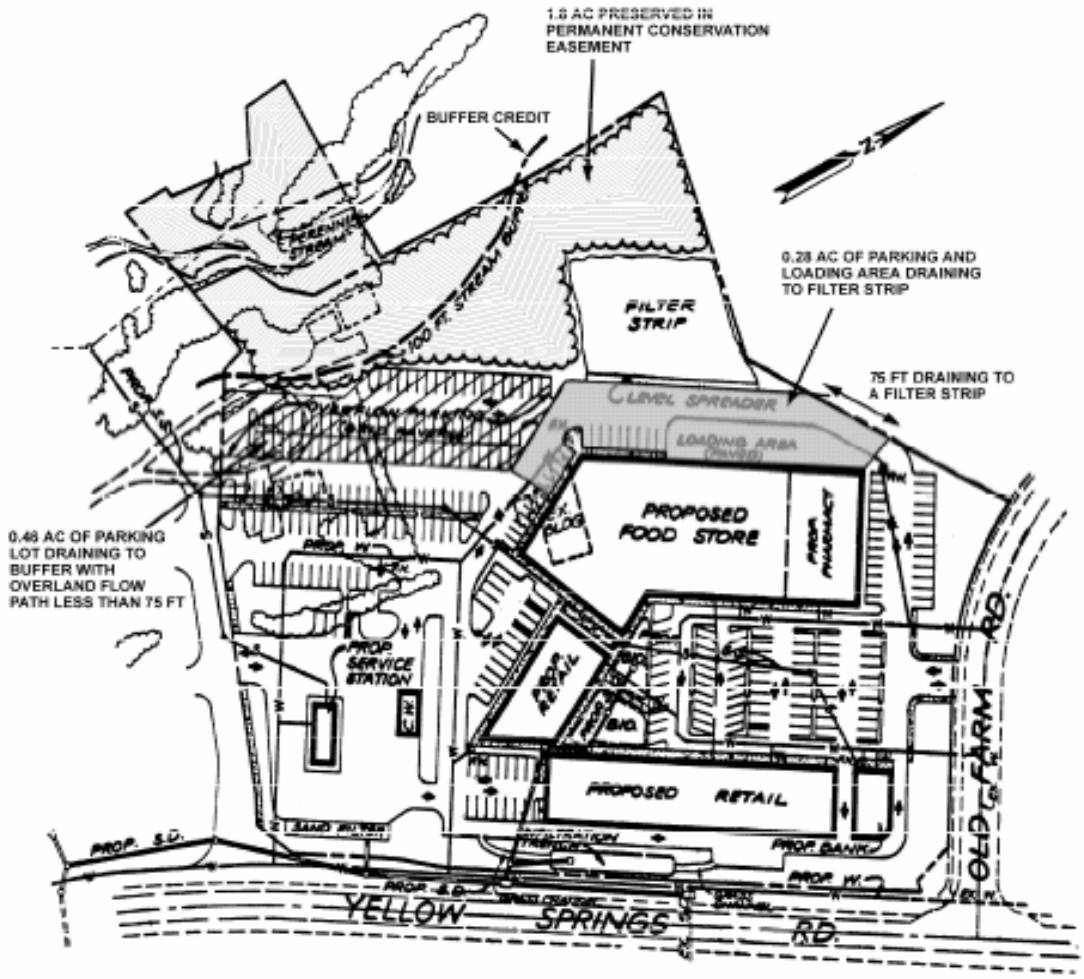
Zoning Bylaws

Changes to Chapter 117 strengthened the requirement that says zoning bylaws must be consistent with the land use plan for a municipality. Therefore, in order to regulate development so that it meets low impact development standards, the Town Plan must provide information and policies to support this type of regulation. In addition, T. 24 Section 4414 allows towns to regulate development for stormwater management and control as long as the regulations are consistent with state stormwater regulations

> *T.24 Section 4414 subsection (9) – Stormwater management and control. Any municipality may adopt bylaws to implement stormwater management and control consistent with the program developed by the secretary of the Agency of Natural Resources pursuant to 10 V.S.A. Section 1264.*

Vermont Stormwater Rules

Vermont's recently adopted stormwater regulations require that the majority of stormwater be treated on site for any development that involves over one acre of disturbed land. Vermont stormwater treatment standards allow "voluntary stormwater management credits" for a number of non-structural practices including natural area conservation, disconnection of roof-top runoff, disconnection of non- rooftop runoff, stream buffers, grass channels, and "environmentally sensitive rural development." Smaller developments are exempt from State and federal stormwater regulations. However, smaller sites including one- and two-family residences when combined in a sensitive watershed can have a significant impact on water quality.



Example of Modified Retail Site Design – Vermont Stormwater Rules (2002)

Town Plan Checklist

The following elements are suggested for inclusion in a municipal plan to support Low Impact Development policies within a town.

Background Discussion

- ☐ **Low Impact Development (LID) Concepts** – Town-wide and site by site
- ☐ **Physical Setting** –Surface waters and watersheds in the town and region, quality and threats to these resources
- ☐ **Steep slopes**
- ☐ **Protecting shorelines and wetlands**
- ☐ **Urban ecosystems** (see example from City of Burlington)

Inventories

- ☐ **Basins, watersheds, surface water resources.** List the watersheds that the town is located in or that are encompassed within the town boundaries.
- ☐ **Roads, bridges and culverts**
- ☐ **Impaired and threatened waters.** These are listed in the state's 303d listing from the Water Quality division of the Agency of Natural Resources. Development in the watersheds of impaired rivers and streams must meet specific federal requirements for control of stormwater runoff.
- ☐ **Topography, including steep slopes**
- ☐ **Soils** – those suitable for septic systems are also good for infiltration

Sample Town Plan Language

LID Concepts

Low impact development (LID) is a relatively new approach to managing stormwater in Vermont. Low impact development designs incorporate a site's topography and natural features in order to mimic the site's natural hydrology. Rather than funneling all the stormwater to a single retention pond or underground system, low impact development makes use of the existing landscape as well as incorporating features such as green roofs or pervious pavers that allow water to soak into the ground. Such systems, if properly designed and maintained, can be cost effective and can contribute to the aesthetic qualities of a site. Low impact development also allows for greater recharge of groundwater and ensures that stormwater does not carry pollutants directly into surface waters.

The practice of LID has taken hold in areas where surface waters are a critical part of local economies and where the climate is conducive to some of the landscape and building features that treat rainwater. Colder climates such as Vermont's face a number of challenges for some of the features commonly used in LID site designs. Freezing and winter maintenance such as sand and salt can damage pervious pavement and or clog pavers. However, by planning infrastructure and encouraging site designs to make the best use of the natural topography, avoid steep slopes, and plan for maximum infiltration through conservation, site planning, and landscape design, towns can have a significant positive impact on water quality.

LID at the Town Level – At the town-wide level, planning for low impact development can encompass common practices such as protection of steep slopes and high elevations from development; requiring naturally vegetated buffers next to rivers, lakes and streams; concentrating development in growth areas and conserving land in sensitive areas such as wetlands, wildlife habitat, and low-lying floodplains.

LID Site by Site – Low impact development can be encouraged at the site planning stage through some of the following practices:

- Specifying maximum building envelopes and yard sizes (keeping as many trees, shrubs and other native vegetation as possible)
- Creating rain gardens in low-lying areas to absorb runoff and beautify property
- Requiring landscaped bioretention areas or islands within parking areas
- Requiring the identification of areas that provide significant hydrologic functions, such as existing surface storage areas, forested areas, riparian corridors, and areas with high groundwater recharge capabilities
- Minimizing the amount of impervious surfaces by keeping road widths and lengths to a minimum, creating shared parking and driveway access, and allowing overflow parking on grassed or other pervious surfaces
- Collecting roof runoff in rain barrels (on residential properties) and/or dispersing it in landscaped areas
- Employing open space or cluster designs to minimize areas of disturbance and impervious surfaces
- Disconnecting impervious areas so that impervious cover drains to pervious cover, i.e. downspouts drain to the yard, not the driveway, decreasing both the runoff volume and time of concentration

Sample Town Plan Language

The following examples were taken from town plans in Vermont to illustrate the type of language that may be used to set the scene for low impact development in a municipality.

Physical Setting – Surface Waters and Watersheds (City of Burlington)

Burlington's physical setting contributes much to our uniqueness. Among the obvious features is the city's relationship to water. Of the 32 miles that make up our political boundary, 25 miles are defined by the Winooski River and Lake Champlain. No point in the city lies more than 1 3/4 miles from either of these two water bodies. When we consider the streams that flow through the city, it's clear that our daily activities have the potential for adversely impacting our own drinking water, healthy aquatic life, and high quality recreational experiences. Lake Champlain and the Winooski River are two of the region's most valued resources. They provide extensive aquatic habitat, scenic beauty, recreation opportunities, even food, and drinking water. Lake Champlain provides our drinking water as well as that of dozens of other communities within the region. The lake and river are simply elements of a much larger and very complex ecosystem - including the *Lake Champlain Basin*, spanning 8,234 square miles; the 10 million acre *Champlain Adirondack Biosphere Reserve* designated by the United Nations in 1989; and, the 26 million acre *Northern Forest* stretching from eastern Maine to the Tug Hill region of central New York. For these and other reasons, many of our local activities must be considered within a larger regional context.

Steep Slopes (City of Burlington)

There are many areas throughout the city with steep slopes. Construction, cutting and filling, and loss of vegetation on these sites can erode the slope's stability, degrade water quality, and diminish the city's natural landscape. After identifying affected areas, Burlington should consider implementing an ordinance limiting development on these slopes to preserve scenic quality, and prevent unnecessary damage to shorelines or bodies of water from streambank erosion.

Areas along the north side of Riverside Avenue slope steeply down to the Winooski River. This area is increasingly prone to slope instability and some areas have recently failed forcing the City to condemn some existing buildings. It also offers scenic views along the river as well as the potential for passive recreation. The City should consider rezoning this area as open space, or seek public acquisition to protect the Winooski River corridor thus adding to a scenic natural greenbelt around Burlington. Several other areas of steep slope exist, including along North Avenue, surrounding the Intervale and along the lakeshore, and should be further defined.

Stormwater Runoff (Town of Springfield)

Stormwater runoff is one of the greatest vehicles for nonpoint source pollution. Water from storm events flows quickly over impervious surfaces such as roads and parking lots and may carry pollutants and sediment directly into surface waters if not diverted. Higher elevation headwater streams are most sensitive to pollutants and should be buffered from development activities. Similarly, steep slopes are both prone to erosion and unable to slow water flow from impervious surfaces, and should therefore be avoided when planning for development. In less densely populated areas, site planning techniques may be adopted to reduce the amount of impervious surfaces and slow down the flow as it travels over developed areas.

Urban Ecosystems (City of Burlington)

The elements of the natural world do not recognize political boundaries, nor can they be compartmentalized, fenced off, and isolated from our day-to-day activities. Rainwater flows off rooftops, over lawns, and down streets along a path towards the lake. The air we breathe flows freely through the mountains, forests, and meadows, across highways, homes, and industry. Much of what we do, no matter where we may happen to be, has the potential for impacting the natural environment.

Traditionally, planning for the environment and natural resources has focused on specific issues affecting public health (water quality, toxic reduction, air pollution, etc.) and the protection of individual sites or species. What these approaches often fail to consider is the fact that everything is interconnected. There is little value in protecting the site of a endangered plant population if the water flowing through the habitat is polluted.

Typically, too much attention is focused on an individual plant or animal population, and not enough on the conditions that enable their existence or survival - their habitat. Burlington recognizes its environment and natural landscape as part of an "urban ecosystem." This ecosystem includes not only natural resources, habitats and systems, but also human adaptations and enhancements such as street trees, culverted streams, and stormwater runoff. In order for growth and prosperity to be sustainable over time, future development must minimize its impact on the environment through proper location and site design, energy efficiency, waste reduction, and renewable and durable construction materials. Rivers and streams that serve a wetland, areas of forest cover that connect sustainable forest communities, and travel corridors that link important wildlife habitats all must be considered for example.

Example Goals, Policies and Recommendations

Goals

1) Improve the quality of surface waters through better stormwater management practices.
2) Ensure that local regulations allow for low impact development designs.
3) Utilize low impact development (LID) concepts in road maintenance and design through the best management practices included in the Better Backroads manual.
4) Educate landowners to use LID strategies such as rain barrels and rain gardens to reduce impact of stormwater runoff on rivers and streams.
5) Protect the shorelines and waters of Lake _____, the _____ River, and other water sources from damage and degradation.

Policies

1) New roads should be designed so as to best utilize natural topography to slow stormwater runoff.
2) Impervious surfaces such as parking lots, driveways and sidewalks should be disconnected and designed to allow runoff to run into swales, rain gardens, or be otherwised dispersed across landscape features in order to reduce the total runoff from the site.
3) Maximum buffer distances and erosion control should be incorporated between new development and surface waters including rivers, lakes and streams to protect surface waters from phosphorus and other polluted runoff. Where conservation subdivision and PUD development is required, these features and a minimum buffer of ____ feet should be considered prime conservation areas.
4) Discourage or prohibit development on steep slopes and fragile soils by requiring developers to plan around such features through planned unit developments (PUDs) and site plan review.
5) Encourage narrower street widths and designs that eliminate curbing so that water can run off into grass swales or other natural infiltration areas.

6) Minimize front setback requirements in order to reduce the need for longer driveways and other impervious surfaces.

7) In higher density or urbanized areas, encourage development to maximize infiltration on site and divert rainwater from stormwater systems through rain barrels, rain gardens and green roofs (where feasible).

8) Allow higher density or cluster development in existing and designated settlement areas and low density development in the remaining areas.

9) Protect sensitive habitat and water resources with strict regulations governing land at elevations above 1500 feet, and especially above 2500 feet.

10) Reduce flood hazard and repetitive road and driveway washout, through strict regulations governing development on steep slopes (15% slope) and prohibiting development on slopes of 25% or more, and through investigation of the impact of stormwater run off on flood hazards.

11) Identify and manage pollution, flooding and fluvial erosion hazards along rivers and streams.

12) Identify and encourage sustainable forestry and agricultural practices.

13) Town land use regulations shall require adequate and specific storm water management practices and plans that maintain natural drainage patterns and/or follow state-recommended design standards & practices.

14) Consider increasing culvert size and bridge protections as town resources.

Recommendations

1) Develop educational programs and materials for homeowners regarding rain barrels and rain gardens for collection and treatment of stormwater.

2) Write a grant to subsidize cost of rain barrels to home owners.

3) Promote education about phosphorous and control of non-point phosphorous pollution.

4) Develop and implement road maintenance and construction guidelines that reduce erosion from roads and construction sites with a goal toward phosphorous reduction.

LID CHECKLIST[1] – ENABLING IMPLEMENTATION OF LOW IMPACT DEVELOPMENT TECHNIQUES

Low Impact Development strategies can reduce the "environmental footprint" of new housing and businesses. However, outdated local codes and standards may prohibit the use of LID techniques or may discourage developers by requiring special permits. Simple modifications to local codes can encourage builders and property owners to apply low impact techniques, while also ensuring high quality development, adequate access, and public safety. Some communities may also wish to enact a stormwater/LID bylaw, but a comprehensive review of local codes should happen before writing a bylaw; the emphasis of both efforts should be on creating a predictable, streamlined process that encourages developers to try LID techniques.

This checklist is a tool that citizens, officials, and developers can use to review their local codes for consistency with LID principles. It is important to remember that conditions are different in each community. Some of the recommendations here may not be appropriate for your city or town. A careful review may also identify other opportunities not listed here; be sure to consider local area plans, redevelopment authorities, groundwater protection districts, planned unit developments, and other local policies or entities.

Finally, the best way to ensure the success of a regulatory review is to make it a collaborative effort. Be sure to involve representatives from all relevant boards and departments, public works officials, emergency response officials, watershed advocates, and developers, so that their concerns are heard and addressed early in the process.[2]

Part 1: Vegetation and Landscaping

A. Preservation of Natural Areas

Municipal regulations should include requirements to preserve existing vegetated areas, minimize turf grass lawn areas, and use native vegetation

- ☐ Are applicants required to provide a layout of the existing vegetated areas, and a description of the conditions in those areas?
- ☐ Does the municipality have maximum as well as minimum yard sizing ordinances?
- ☐ Are residents restricted from enlarging existing turf lawn areas?
- ☐ Do the ordinances provide incentives for the use of vegetation as filters for stormwater runoff?
- ☐ Do the ordinances require a specific percentage of permanently preserved open space as part of the evaluation of cluster development?

B. Tree and Forest Protection Ordinances

Municipalities should consider enhancing tree ordinances to a forest ordinance that would also maintain the benefits of forested areas (not just individual trees and their removal and replacement)

- ☐ Does the municipality have a tree protection ordinance?
- ☐ Can the municipality include a forest protection ordinance?
- ☐ If forested areas are present at development sites, is there a required percentage of the stand to be preserved?

C. Landscaping Island and Screening Ordinances

Landscaping islands can provide ideal opportunities for the filtration and disconnection of runoff, or the placement of small LID-Best Management Practices (BMPs). Low maintenance vegetation can be required in

[1] Adapted from Massachusetts Low Impact Development Toolkit (available at www.mapc.org) and New Jersey Stormwater Best Management Practices Manual (available at http://www.njstormwater.org/tier_A/pdf/NJ_SWBMP_A.pdf)

[2] Excerpted from Massachusetts Low Impact Development Toolkit, available at www.mapc.org

islands and areas used for screening to provide stormwater quality, groundwater recharge, or stormwater quality benefits.

- ☐ Do the ordinances require landscaping islands in parking lots, or between the roadway and the sidewalk? Can the ordinance be adjusted to require vegetation that is more beneficial for stormwater quality, groundwater recharge, or stormwater quantity, but that does not interfere with driver vision at the intersections?
- ☐ Is the use of bioretention islands and other stormwater practices within landscaped areas or setbacks allowed?
- ☐ Do the ordinances require screening from adjoining properties? Can the screening criteria require the use of vegetation to the maximum extent practicable before the use of walls or berms?

D. Riparian Areas

Municipalities may have existing buffer and/or floodplain ordinances that require the protection of vegetation adjacent to streams. The municipality should consider conservation restrictions and allowable maintenance to ensure the preservation of these areas.

- ☐ Is there a stream buffer of floodplain ordinance in the community?
- ☐ Is the ordinance consistent with existing state regulatory requirements?
- ☐ Does the ordinance require a conservation easement, or other permanent restrictions on buffer areas?
- ☐ Does the ordinance identify or limit when stormwater outfall structures can cross the buffer?
- ☐ Does the ordinance give detailed information on the type of maintenance and/or activities that is allowed in the buffer?

Part 2: Minimizing Land Disturbance

The minimization of disturbance can be used at different phases of a development projects. The goal is to limit clearing, grading, and other disturbance associated with development to protect existing features that provide stormwater benefits. Zoning ordinances typically limit the amount of impervious surfaces on building lots, but do not limit the amount of area that can be disturbed during construction. This strategy helps preserve the site's existing hydrologic character, as well as limiting the occurrence of soil compaction.

A. Limits of Disturbance

Designing with the terrain, or site fingerprinting, requires an assessment of the characteristics of the site and the selection of areas for development that would minimize the impact. This can be incorporated into the requirements for existing site conditions and the environmental impact statement. Limits of disturbance should be incorporated into construction plans reviewed and approved by the municipality. Setbacks should be evaluated to determine whether they can be reduced.

- ☐ As part of the depiction of existing conditions, are environmentally critical and environmentally constrained areas identified? (Environmentally critical areas are areas or features with significant environmental value, such as steep slopes, stream corridors, natural heritage priority sites, and habitats of threatened and endangered species. Environmentally constrained areas are those with development restrictions, such as wetlands, floodplains, and sites of endangered species.)
- ☐ Can any of the existing setbacks be reduced?
- ☐ Are there maximum turf grass or impervious cover limits in any of the setbacks?
- ☐ Do the ordinances inhibit or prohibit the clearcutting of the project site as part of the construction?
- ☐ Is the traffic of heavy construction vehicles limited to specific areas, such as areas of proposed roadway? Are these areas required to be identified on the plans and marked in the field?

Suggested Maximum Setbacks for LID:

front yard – 20 feet;

rear yard – 25 feet; and

side yard – 8 feet.

- ☐ Do the ordinances require the identification of specific areas that provide significant hydrologic functions, such as existing surface storage areas, forested areas, riparian corridors, and areas with high groundwater recharge capabilities?
- ☐ Does the municipality require an as-built inspection before issuing a certificate of occupancy? If so, does the inspection include identification of compacted areas, if they exist within the site?
- ☐ Does the municipality require the restoration to compacted areas in accordance with the Soil Erosion and Sediment Control Standards?

B. Open Space and Cluster Development

Open space areas are restricted land that may be set aside for conservation, recreation, or agricultural use, and are often associated with cluster development requirements. Since open space can have a variety of uses, the municipality should evaluate its open space ordinances to determine whether amendments are necessary to provide improved stormwater benefits.

- ☐ Are open space or cluster development designs allowed in the municipality?
- ☐ Are flexible site design incentives available for developers that utilize open space or cluster design options?
- ☐ Are there limitations on the allowable disturbance of existing vegetated areas in open space?
- ☐ Are the requirements to re-establish vegetation in disturbed areas dedicated for open space?
- ☐ Is there a maximum allowable impervious cover in open space areas?

Part 3: Impervious Area Management

The amount of impervious area, and its relationship to adjacent vegetated areas, can significantly change the amount of runoff that needs to be addressed by BMPs. Most of a site's impervious surfaces are typically located in the streets, sidewalks, driveway, and parking areas. These areas are further hampered by requirements for continuous curbing that prevent discharge from impervious surfaces into adjacent vegetated areas.

A. Streets and Driveways

Street widths of 18 to 22 feet are recommended for low impact development designs in low density residential developments. Minimum driveway widths of 9 and 18 feet for one lane and two lanes, respectively, are also recommended. The minimum widths of all streets and driveways should be evaluated to demonstrate that the proposed width is the narrowest possible consistent with safety and traffic concerns and requirements.

Municipalities should evaluate which traffic calming features, such as circles, rotaries, medians, and islands, can be vegetated or landscaped. Cul-de-sacs can also be evaluated to reduce the radius area, or to provide a landscape island in the center.

- ☐ Are the street widths the minimum necessary for traffic density, emergency vehicle movement, and roadside parking?
- ☐ Are street features, such as circles, rotaries, or landscaped islands allowed to or required to receive runoff?
- ☐ Are curb cuts or flush curbs with curb stops an allowable alternative to raised curbs?
- ☐ Can the minimum cul-de-sac radius be reduced or is a landscaped island required in the center of the cul-de-sac?
- ☐ Are alternative turn-arounds such as "hammerheads" allowed on short streets in low density residential developments?
- ☐ Can the minimum driveway width be reduced?
- ☐ Are shared driveways permitted in residential developments?
- ☐ Can you reduce total length by considering alternative street layouts?

B. Parking Areas and Sidewalks

A mix of uses at a development site can allow for shared parking areas, reducing the total parking area. Municipalities require minimum parking areas, but seldom limit the total number of parking spaces.

- ☐ Can the parking ratios be reduced?
- ☐ Are the parking requirements set as maximum or median rather than minimum requirements?
- ☐ Is the use of shared parking arrangements allowed to reduce the parking area?
- ☐ Are model shared parking agreements provided?
- ☐ Does the presence of mass transit allow for reduced parking ratios?

Recommended Minimum Parking Space Ratios for Low Impact Development

(Use Parking Ratio per 1000 sq. ft. of Gross Floor Area)

Professional office building:	Less than 3.0
Shopping centers:	Less than 4.5

- ☐ Is a minimum stall width of 9 feet allowed?
- ☐ Is a minimum stall length of 18 feet allowed?
- ☐ Can the stall lengths be reduced to allow vehicle overhang into a vegetated area?
- ☐ Do ordinances allow for permeable material to be used in overflow parking areas?
- ☐ Do ordinances allow for multi-level parking?
- ☐ Are there incentives to provide parking that reduces impervious cover, rather than providing only surface parking lots? Sidewalks can be made of pervious material or disconnected from the drainage system to allow runoff to re-infiltrate into the adjacent pervious areas.
- ☐ Do ordinances allow for sidewalks constructed with pervious material?
- ☐ Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

C. Unconnected Impervious Areas

Disconnection of impervious areas can occur in both low density development and high density commercial development, provided sufficient vegetated area is available to accept dispersed stormwater flows. Areas for disconnection include parking lot or cul-de-sac islands, lawn areas, and other vegetated areas.

- ☐ Are developers required to disconnect impervious surfaces to promote pollutant removal and groundwater recharge?
- ☐ Do ordinances allow the reduction of the runoff volume when runoff from impervious areas is re-infiltrated into vegetated areas?
- ☐ Do ordinances allow flush curb and/or curb cuts to allow for runoff to discharge into adjacent vegetated areas as sheet flow?

Part 4: Vegetated Open Channels

The use of vegetated channels, rather than the standard concrete curb and gutter configuration, can decrease flow velocity, and allow for stormwater filtration and re-infiltration. One design option is for vegetated channels that convey smaller storm events, such as the water quality design storm, and provide an overflow into a storm sewer system for larger storm events.

- ☐ Do ordinances allow or require vegetated open channel conveyance instead of the standard curb and gutter designs?
- ☐ Are there established design criteria for vegetated channels?