



Assessing Street and Parking Design Standards to Reduce Excess Impervious Cover in New Hampshire and Massachusetts

Small MS4 Permit Technical Support Document, April 2011

Draft NPDES Permits require evaluation of local street and parking lot design standards

The draft NPDES Small MS4 permits for New Hampshire and North Coastal Massachusetts require permittees to evaluate and report on local street design and parking requirements that affect the **creation of impervious cover**. This assessment will be used to determine if design standards need to be revised to support the application of Low Impact Development (LID) techniques. Recommendations and a schedule for changing any relevant standards and policies need to be incorporated into the Stormwater Management Program (SWMP), with status updated in annual reports. This requirement is detailed in the draft permit Section 2.3.6.6 for New Hampshire and Section 2.4.6.7 for North Coastal Massachusetts, respectively.

Why evaluate current standards?

Roads and parking lots are a significant component of the urban landscape, and often constitute the majority of impervious area in a given watershed. In many communities, the current standards guiding road design and parking lot layout were established decades ago with little consideration of potential impacts to pedestrians or the local environment. Consequently, outdated zoning by-laws, subdivision regulations, and road standards may not only promote excessive impervious cover (Figure 1), but they may effectively prohibit the application of many LID practices (Figure 2). Even where variances and special permitting procedures allow for design alternatives, these additional steps can be time-consuming and unpredictable; and therefore, unattractive to developers.



Figure 1. Unnecessarily wide cul-de-sacs and residential roads generate additional stormwater runoff, create un-friendly pedestrian environments, and increase overall construction costs.



Figure 2. (A) Example of narrow residential road with a bio-swale, utilities, and single-sided sidewalk in Duxbury, MA. (B) Use of pervious pavers and bioretention practices in the landscape islands in spillover parking lot in Wilmington, MA.

What design factors lead to excess imperviousness?

At a minimum, the following street and parking standards should be evaluated to determine if they are contributing to the unnecessary generation of surplus impervious cover from new construction or redevelopment projects:

Local street design:

- **Residential roadway pavement widths**—pavement widths should be set based on the number of homes served, anticipated vehicle usage, and on-street parking requirements. Establish minimum and maximum standards to meet these needs while avoiding excessively wide streets.
- **Non-residential and mixed use roadway pavement widths**—pavement widths should be set based on traffic volumes, types of vehicles, parking, and pedestrian requirements, which often require

more complex analysis. Provide flexibility to accommodate this analysis, particularly in mixed use/and or Traditional Neighborhood Districts.

- **Road right-of-way (ROW) widths and usage**—large ROW’s can increase the overall area disturbed during development. Allow for flexibility in widths, where appropriate, and for the placement of utilities below the paved portion of the roadway to allow for the use of roadside swales or other stormwater practices.
- **Building frontage and setback requirements**—residential road length is often determined by the required frontage distance for individual lots.
- **Turnarounds for dead end streets**—road layouts that reduce the number of dead end streets are preferable. Provide options for turnaround designs (cul-de-sacs, loop-de-lanes, T-shaped, etc). To minimize impervious cover, maximum paved diameters for cul-de-sacs should be based on the required turning radius for emergency response vehicles and should also allow for landscaped islands (Figure 3).
- **Sidewalks**—consider pedestrian preferences when designing sidewalks, rather than the blanket application of a requirement for the placement of sidewalks on both sides of the roadway. Allow for sidewalks to be paved with pervious materials.
- **Driveways**—driveway dimensions can be minimized through reduced minimum widths and front yard setbacks. Standards should allow for pervious driveway materials, allow “two-track” designs (i.e., paved tire track with pervious median), and prohibit direct rooftop discharge on to impervious driveway surfaces. Shared driveways should be allowed and sample agreements should be provided by the municipality.

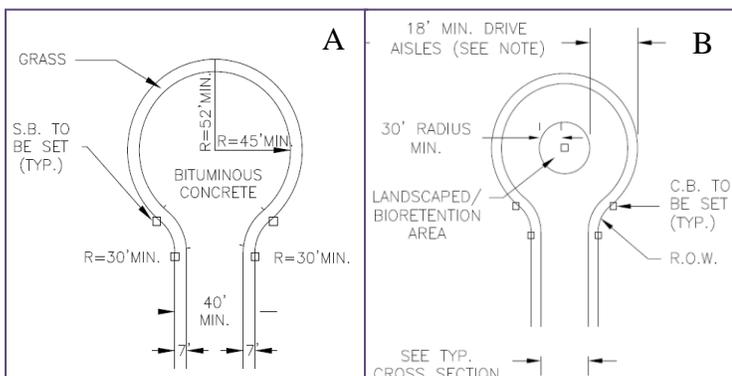


Figure 3. (A) Existing design details may require updating (B) to accompany revised street and parking requirements, such as in this revised cul-de-sac detail for Attleboro, MA that incorporates a reduced paved radius and a central bioretention/landscaped island.

Parking lot standards:

- **Parking ratios**—the number of required parking spaces is often based on parking demand studies that are not locally applicable, expressed only as a minimum standard for the worst case scenario, and often result in an oversupply of parking. In these cases, communities should be comfortable establishing maximum parking requirements at current minimum standards and new minimums set ~ 1/3 below these revised maximums (see Table 1).
- **Off-street and on-site parking**—in urban and village centers, consider dramatic changes to the typical parking demand requirements to provide flexibility in design. Consider revising off-site distance limits, as well as the amount of public parking allowed to help satisfy private parking requirements.
- **Credits for shared parking and mass transit**—allow for reductions in parking requirements for shared parking arrangements, parking garages, and in areas where mass transit is accessible. Provide model shared parking contracts.
- **Stall and driving aisle dimensions**—avoid requiring excessively wide stalls and driving aisles. Standard stall dimensions can be as small as 9 ft x 18 ft. Driving aisle widths should be based on orientation of parking stalls and whether traffic flow is single or two-way.
- **Pervious parking**—allow the use of structural permeable pavement options where appropriate; allow spillover parking (or parking above minimum requirement) to be pervious.
- **Landscape requirements**—landscape islands and borders are often required for traffic flow and screening purposes. The total landscaped area is often a calculated based on the number of parking spaces or amount of total impervious cover. Vegetated stormwater practices should be incorporated into these features; the amount of required landscaping should be sufficient to meet tree canopy/shade requirements and adequate for long-term tree survival.

A more detailed discussion of preferred parking lot design, planning options, and a model parking by-law can be found online at the **MA Smart Growth/Smart Energy Toolkit** www.mass.gov/envir/smart_growth_toolkit/.

Other important site design requirements

In addition, a number of other site design factors can have a significant impact on the amount of impervious cover created at a site and whether it is connected or disconnected to the storm drain system. Examples include:

- Allowing open space residential development (i.e., conservation design or low impact development) that provides for reduced setbacks and smaller lot sizes as “by-right” without additional permitting;
- Restricting the percentages of impervious and turf cover on individual lots;
- Allowing for open-section (i.e., curb-less) roads through flexibility in curbing requirements;
- Allowing for temporary ponding of stormwater on residential lots;
- Requiring the routing of rooftop runoff to pervious areas, dry wells, or other devices to promote infiltration and/or stormwater reuse;
- Requiring integration of landscaping and stormwater management requirements.

Table 1. Example of suggested parking requirements per 1,000 sq ft of Gross Floor Space (excerpt from the Smart Parking By-law, MA Smart Growth/Smart Energy Toolkit)

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

Challenges to updating design standards

Consider including representatives of local planning boards, water suppliers and other utilities, transportation, public works, emergency response, school superintendents; and the development community in the review process to help address some of the following concerns related to street design and parking standards:

- Safety concerns (i.e., fire, school bus) for setbacks, turnarounds, permeable pavers, and road widths;
- Utility installation and maintenance in public ROWs;
- Snow removal requirements for parking lots, landscape islands, and turnarounds; and
- Retail parking demands set by financial institutions for minimum parking requirements.

How do I report on our assessment of local regulations?

Within two years of the effective permit, permittees must have developed a report on the assessing current street design, parking lot guidelines, and other local requirements that affect the creation of impervious cover. *This report should clearly indicate which design standards promote excess impervious cover and any recommended changes.*

There are a number of checklists, self-audits, and model bylaws available to assist communities in evaluating street and parking standards including the *Codes and Ordinance Worksheet* from the Center for Watershed Protection (www.cwp.org) and the *LID Local Codes Checklist* from the Massachusetts Planning Commission (www.mapc.org/LID). **Table 2** provides a simplified checklist that can be used to help satisfy SWMP and annual reporting requirements. A narrative describing any recommended (or completed) changes must also be included.

Within three years, permittees must also have developed a report assessing regulatory barriers to implementing structural LID practices (e.g., green roofs, infiltration practices, and water harvesting devices). It may be advantageous to conduct and report on both assessments concurrently.

Other References

CWP. 1998. Better Site Design: A handbook for changing development rules in your community www.cwp.org

EPA. 2006. Parking Spaces/Community Places: Finding the balance with smart growth solutions. www.epa.gov/smartgrowth/pdf/EPAParkingSpaces06.pdf

American Planning Association, Massachusetts and Home Builders Association of Massachusetts. October 2010. Sustainable Neighborhood Road Design: A guidebook for Massachusetts cities and towns. www.apa-ma.org/resources/publications/nrb-guidebook

New Hampshire Department of Environmental Services. 2008. Innovative Land Use Planning Techniques: A handbook for sustainable development. http://des.nh.gov/organization/divisions/water/wmb/repp/documents/ilupt_complete_handbook.pdf

Rhode Island Department of Environmental Management. Rhode Island Community LID Site Planning and Design Guidance Document. 2011.

Maryland Governor’s Office of Smart Growth. Driving Urban Environments: Smart growth parking best practices.

Table 2. Checklist for evaluating street and parking standards (adapted from CWP *Codes and Ordinances Worksheet* and MAPC *LID Checklist**)

STREETS

1. Street width	<p>1.1. Is the minimum pavement width for low traffic residential roads (<500 average daily trips) between 18-22 ft?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	<input type="text"/> ft
	<p>1.2. Can parking lanes serve as traffic lanes in higher density areas?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	
	<p>1.3. Are narrower pavement widths allowed on road sections where there are no houses, buildings, intersections, or on-street parking spaces?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	
	<p>1.4. Are reductions in frontage distances allowable where appropriate (i.e., open space developments, around cul-de-sacs, and along outside sideline of curved streets) to minimize street length?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	
	<p>1.5. Can permeable paving be used for residential roads, shoulders, and parking lanes?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	
2. Right-of-way (ROW)	<p>2.1. Are minimum ROW widths less than 45 ft for a residential street?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	<input type="text"/> ft
	<p>2.2. Can utilities be placed below the paved section of the ROW?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	
3. Dead-end streets and turnarounds	<p>3.1. Are landscaped/bioretenion islands required in the center of cul-de-sacs?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	
	<p>3.2. Is the minimum required radius for cul-de-sacs less than 35 ft?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	<input type="text"/> ft
	<p>3.3. Are alternatives to cul-de-sacs such as "hammerheads" allowed for permanent turnarounds?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	
	<p>3.4. Are alternative road layouts such as one-way loops encouraged to eliminate dead end streets?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know</p> <p style="text-align: right;"><i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised</p>	

4. Sidewalks	4.1. Are sidewalks always required on both sides of residential streets?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
	4.2. Is permeable paving allowed for sidewalks?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
	4.3. Are alternative pedestrian pathway layouts allowed, rather than placement in road ROW?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
5. Driveways	5.1. Are reductions in setback distances allowable where appropriate to minimize driveway lengths?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
	5.2. Is the minimum driveway width 9 feet or less (single lane) or 18 feet (two lane)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know	<input type="text" value=""/> ft <input type="text" value=""/> ft <i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
	5.3. Are shared driveways allowable?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
	5.4. Are alternative materials and designs (i.e., porous pavers, two-track design) allowed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised

PARKING

6. Parking ratios	6.1. Are parking ratios expressed as both minimum and maximums?	<input type="checkbox"/> Yes <input type="checkbox"/> No, minimum only <input type="checkbox"/> No maximum only <input type="checkbox"/> No, Expressed as medians	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised	
	6.2. Are the minimum required # of parking spaces less than:		<i># of spaces</i>	
	3 spaces per 1000 sq ft for professional office building?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No Standard	<input type="text" value=""/>	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
	4.5 spaces per sq ft for shopping centers?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No Standard	<input type="text" value=""/>	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
	2 spaces per single family home?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No Standard	<input type="text" value=""/>	<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised
6.3. Are parking requirements reduced for shared parking arrangements, structured parking, areas near mass transit, and special districts?	<input type="checkbox"/> Yes, all <input type="checkbox"/> Not all <input type="checkbox"/> Not for any <input type="checkbox"/> Don't know		<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised	
6.4. Are model shared parking agreements provided?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Shared parking not allowed <input type="checkbox"/> Don't know		<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised	
6.5. Are there special design standards for urban village centers?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> No standard <input type="checkbox"/> Don't know		<i>Action:</i> <input type="checkbox"/> Leave as is <input type="checkbox"/> To be revised	

