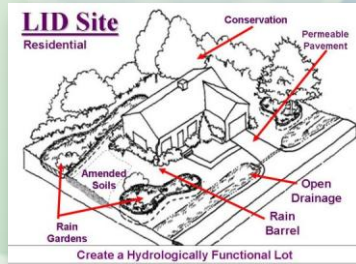


# EPA Region 1 MS4 Stormwater General Permits and LID Training Clinic



Track A: Planning & Budget  
Developing LID Bylaws,  
Conducting Local Code  
Audits, & Modifying Street  
and Parking Lot Standards

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## Why is this in the Draft Permit?

Urbanization results in  
increased surface runoff



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## Components of Impervious Cover in the Urban Landscape




## Impacts are well documented



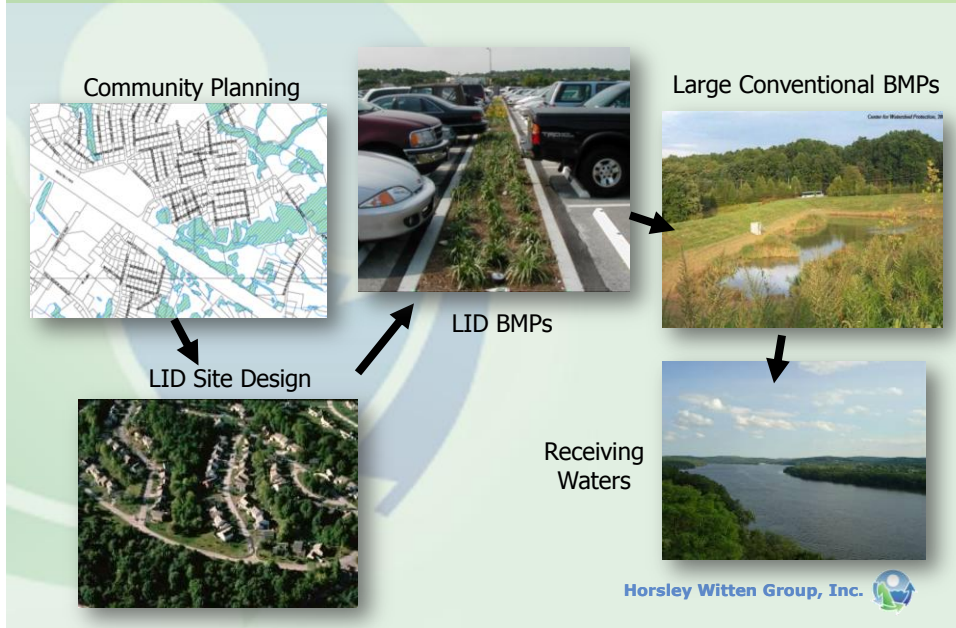
At ~10% impervious we begin to see\*:

- Water quality issues
- Impacts to biological communities
- Increased flooding
- Stream erosion
- Loss of recreational uses
- Shellfish bed closures
- Reduced baseflow and recharge

\* Sometimes less than 10%

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# Low Impact Development (LID)



# Low Impact Development (LID)

## Traditional controls

- Goal: Get the water out of here as fast as possible
- Collect and storage in big, "hole in ground" off-site
- Pipe discharge to a stream or wetland
- Limited water quality treatment and infiltration
- Stormwater is a waste product

## LID controls

- Goal: Reduce the amount of surface runoff by reducing impervious cover and preserving natural areas
- Rely on small, distributed on-site practices
- Infiltrate or reuse as much as possible; filter before discharge
- Source controls to minimize pollution
- Stormwater is a resource

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# Low Impact Development (LID)



# Low Impact Development (LID)

## Traditional Design

- Mass clearing and grading
  - Loss of trees
  - Compaction of native soils
- Residential
  - Wide streets and cul-de-sacs
  - Sidewalks to nowhere
  - Lots of turf
  - Curb and gutter
  - Ponds
- Non-residential
  - Big parking lots
  - Minimum parking ratios
  - Large stall dimensions

## LID

- Site fingerprinting
  - Preserve natural areas
  - Retain key pervious areas
- Residential
  - Narrow streets
  - Alternative turnarounds
  - Smart sidewalks
  - Shared driveways
  - Reduced setbacks
  - Open section roads
  - Downspout disconnection
- Non-residential
  - Pervious spillover parking
  - Maximum parking ratios
  - Shared parking
  - Reduced stall dimensions

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*Which of these is not LID?*



*Which of these is not LID?*





*Which of these is not LID?*





## Which is not considered LID?



## LID Practice Variants *Bioretention*



## LID Practice Variants: *Bioretention*



## LID Practice Variants: *Rain gardens*





## Bioretention or a Rain Garden?

- Bioretention involves:
  - Amended soils;
  - Complex sizing calculations (e.g. modeling);
  - Detailed engineering specifications;
  - Sophisticated conveyance devices (flow splitters, underdrains, overflow inlets, etc).
- Rain Garden:
  - Generally doesn't involve the above- usually a shallow depression in native soils, or modestly amended soils (but might contain some of the above features)



Beware of what something is called: One person's Bioretention is another person's Rain Garden

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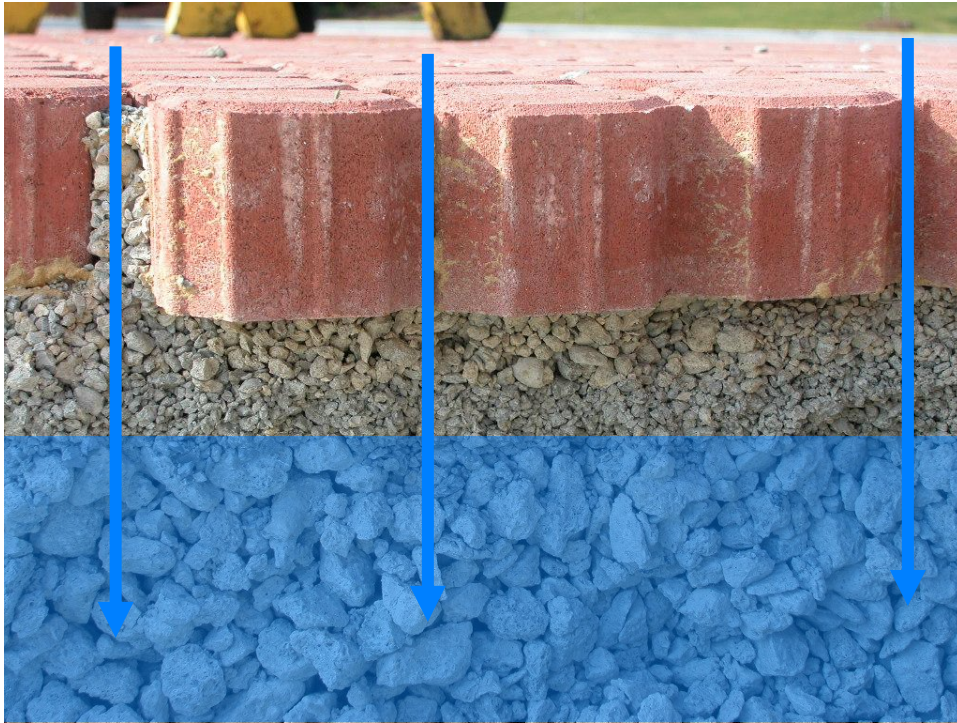
## LID Practice Variants: *Planters*



## LID Practice Variants: *Porous Pavement*







## LID Practice Variants: *Infiltration*





## LID Practice Variants: *Infiltration*



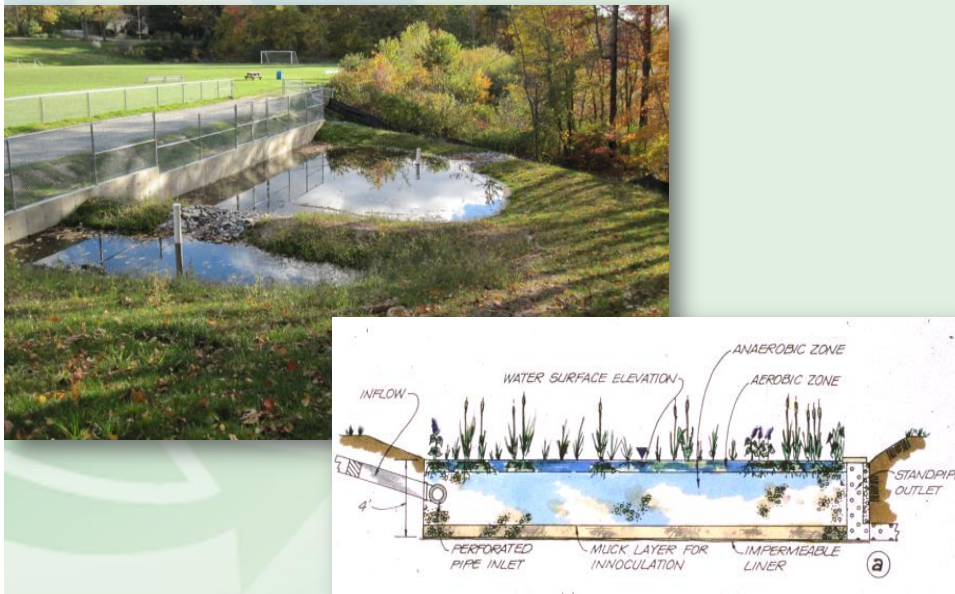
## LID Practice Variants: *Swales*



## LID Practice Variants: *Sand Filters*



## LID Practice Variants: *Gravel wetlands*





## LID Practice Variants: *Others*

- Downspout disconnection
- Pervious area restoration/soil amendments
- Urban reforestation
- Municipal pollution source control (street sweeping)



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## Feasibility Assessment of Local Regulations to Accommodate Green Infrastructure Practices

- Post-construction stormwater control measures
- New draft NDPES MS4 permit requirements
- Process for evaluating local procedures and regulations
  - Stormwater criteria for new construction and redevelopment
  - Street design and parking guidelines
  - Code barriers to green infrastructure implementation
    - Green roofs, infiltration practices, rainwater harvesting
  - Development approval process
- Additional Resources

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## Post-Construction Stormwater Management Control Measures

### Purpose

*The new draft permits state:*

*The objective of this control measure is for the hydrology resulting from new development to mirror the pre-development hydrology of the site or to improve the hydrology of a redeveloped site and reduce the discharge of stormwater.*

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## Post-Construction Stormwater Management Control Measures

### New Stormwater Approach

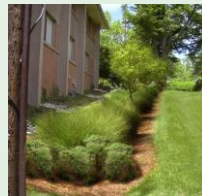
- Small scale stormwater management
- Non-structural techniques
- Better site planning
- Mimic natural hydrology
- Minimize the impact of development
- Conserve natural features
- Minimize impervious surfaces
- Slow down runoff
- Infiltrate and evapotranspirate
- Innovative technologies



Traditional Centralized Detention Pond



Small Scale, Integrated Green Infrastructure



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## Draft MS4 Permit Requirements Massachusetts North Coastal & MIMSC

Section 2.4.6 Stormwater  
Management in New  
Development and  
Redevelopment

- ☒ 2.4.6.1 Stormwater program for projects disturbing  $\geq 1$  acre OR  
(2.4.6.2)  $< 1$  acre if part of a larger common plan of  $\geq 1$  ac
- ☒ 2.4.6.3 Ordinance or regulatory mechanism
- ☐ **2.4.6.4 Amend regulations for compliance with Standards 3,4,5,6, and 7 of MASWMS regardless of proximity to wetlands (within 2 yrs)**
- ☐ **2.4.6.5 Procedures to prevent or minimize WQ impacts**
- ☒ 2.4.6.6 As-builts and long-term O&M provisions
- ☐ **2.4.6.7 Assessment of street design and parking lot guidelines (within 2 yrs)**
- ☐ **2.4.6.8 Assessment of local regs. to determine the feasibility of making green infrastructure practices allowable (3 yrs)**
- ☐ 2.4.6.9 Directly Connected Impervious Cover
  - ✓ indicates a previous requirement from the 2003 MS4 permit

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## Process for Evaluating Feasibility

1. Review existing codes and ordinances:
  - Zoning bylaws and subdivision regs
  - Stormwater regulations
  - Wetland By-laws/regs
  - Typical specifications/details
  - Building and plumbing codes
  - Fire and safety code
  - Development approval process
2. Identify barriers, gaps, and opportunities
3. Develop recommendations for code change
4. Gain consensus from a diversity of local stakeholders\*
5. Refine recommendations based on input\*
6. Propose schedule for changes
7. Enact code changes\*
8. Include progress reports in MS4 annual reports

\* Not required by permit

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## Process for Evaluating Feasibility Stormwater Requirements

### Massachusetts North Coastal and MIMSC

Adopt standards of MASWMS for all projects  $\geq 1$  acre, regardless of proximity to wetlands

Standard #3. Post-development = Pre-development recharge. *MASWMS recharge requirements range from 0.1"-0.6" depending on soil type*

#4. Remove 80% TSS

#5. Source control and pollution prevention at Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

#6. Special standards for discharges in water supply and other critical areas

#7. Redevelopment standard compliance

\* *The permit encourages permittees to go beyond MASWMS to encourage capture of 1-inch storm via infiltration, evap./trans., or harvesting*

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## Process for Evaluating Feasibility Road Design and Parking Standards

1. Evaluate existing codes & standards that affect the creation of impervious cover to determine if changes can be made to support LID options;
2. Consult with local engineers, planners, fire chief, public works staff, developers, health department, and other applicable municipal staff to identify potential code changes that would promote or require:
  - ☐ Reduced street widths for local access roads
  - ☐ Alternative cul-de-sac standards (hammerhead; pervious pavers; reduced radii; island bioretention)
  - ☐ Reduced frontages and lot setbacks
  - ☐ Maximum/median parking ratios based on local demands
  - ☐ Reduced stall dimensions
  - ☐ Pervious paving for spillover parking
  - ☐ Credits for shared parking/mass transit situations

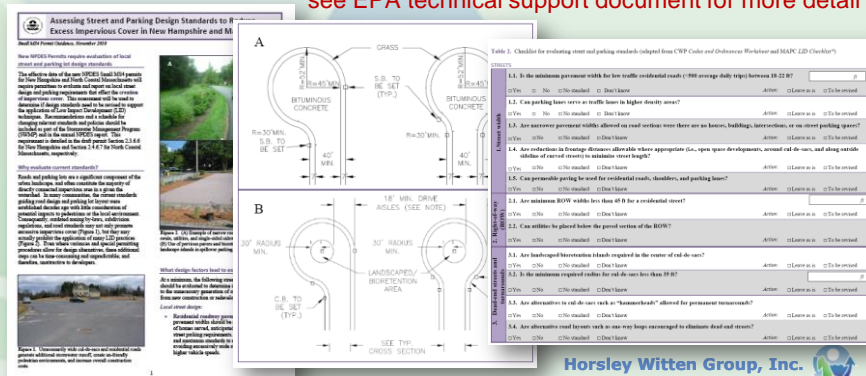
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# Process for Evaluating Feasibility Road Design and Parking Standards

3. Propose schedule for changes
4. Update codes, design standards, and details (*Not required under permit*)
5. Report on assessment and/or updates by YR 2 from effective date of permit

see EPA technical support document for more detail



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# Process for Evaluating Feasibility Code Barriers to Green Infrastructure

**Infiltration practices**



**Rainwater harvesting**



**Green and/or blue roofs**



## Process for Evaluating Feasibility Code Barriers to Green Infrastructure

### Alternative Roofs

- Green Roofs
- Blue Roofs
- Disconnection of Rooftop Runoff

### Rainwater Harvesting

- Cisterns
- Rain barrels
- Underground Storage Chambers


### Infiltration

- Infiltration Basins
- Infiltration Trenches
- Dry Wells
- Permeable Pavements

### Other Practices

- Submerged Gravel Wetlands
- Bioretention
- Rain Gardens
- Swales
- Enhanced Filters
- Soil Compost Amendments
- Stormwater Planters
- Expanded Tree Pits
- Stormwater Curb Extensions
- Foundation Planters
- Reforestation

Define Green Infrastructure and use consistent terminology throughout codes

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## Process for Evaluating Feasibility Code Barriers to Green Infrastructure

Practice	Barriers	Opportunities
Green/blue roofs	<ul style="list-style-type: none"> <li>• Building code material specifications that exclude standard green/blue roof construction materials/vegetation</li> <li>• Fire safety and access requirements that prohibit vegetative cover or temporary water storage</li> </ul>	<ul style="list-style-type: none"> <li>• Credit as green/open space in high density zones</li> <li>• Allow increased building heights or density incentives when using green/blue roofs</li> <li>• Tie into LEED certification</li> </ul>
Infiltration	<ul style="list-style-type: none"> <li>• Required curbing, sidewalk, and utility placement which limits stormwater options in road ROW</li> <li>• Parking requirements that generate excess impervious cover and limit available space for stormwater management</li> <li>• Landscape requirements that limit integration of stormwater management</li> </ul>	<ul style="list-style-type: none"> <li>• Specify practices allowable in surface parking landscaping requirements</li> <li>• Establish maximum parking ratios based on local demand</li> <li>• Include a list of pre-approved permeable pavement options which meet local fire access requirements</li> <li>• Provide permeable pavement and reinforced turf standards</li> <li>• Encourage use of permeable surfaces or reinforced turf in lieu of impervious</li> </ul>

Practice	Barriers	Opportunities
<b>Rainwater Harvesting</b>	<ul style="list-style-type: none"> <li>• Plumbing codes that prohibits reuse of rainwater</li> <li>• Concerns with blocking of fire access</li> <li>• Accessory structure limitations that hinder addition of cisterns</li> </ul>	<ul style="list-style-type: none"> <li>• State that some rain barrels/cisterns can fit under decks, underground, or in conjunction with steps, terraces, and porches as long as blocking of fire access is avoided.</li> <li>• Revise plumbing codes for rainwater use for irrigation and/or non-potable uses.</li> <li>• Allow below ground cisterns in ROW and as exemptions to accessory structure requirements.</li> <li>• Allow rainwater harvesting storage within inner courts or storage structures within buildings.</li> </ul>
<b>Other Vegetated Practices</b>	<ul style="list-style-type: none"> <li>• Street and parking standards, and lot setbacks that reduce available space for stormwater practices</li> <li>• Mowing and weed control requirements</li> <li>• Drainage codes and/or nuisance regulations that prohibit temporary ponding of water</li> </ul>	<ul style="list-style-type: none"> <li>• Require stormwater practices in street ROW landscape strips when possible and provide enough ROW width for expanded tree pits and other practices.</li> <li>• Minimum sizes of planting islands and other landscaping areas should be large enough to allow for these practices .</li> <li>• Increase % green area requirements and allow vegetated practices to count towards requirements.</li> <li>• Increase shade/tree canopy requirements.</li> <li>• Require that bioretention tree pits be large enough to support tree health.</li> <li>• Specify disconnection &amp; drainage of impervious area into landscaped area</li> </ul>

## Process for Evaluating Feasibility Development Approval Process

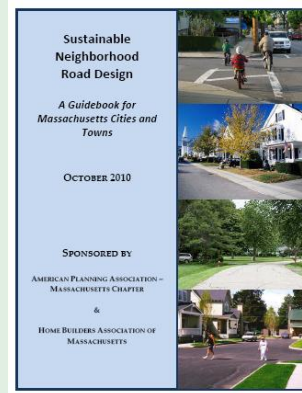
Review approval process to determine if the following are issues:

- Stormwater management is not required to be addressed at a site concept stage (where other site elements are defined).
- Site plans and details submitted to different agencies for review do not always show the proposed locations of stormwater BMPs or drainage infrastructure.
- Resource inventories do not specify areas on a development site that may be appropriate locations for stormwater management.
- Limited guidance exists for plan review staff to shape the selection and design of appropriate green infrastructure practices.
- Additional permitting requirements and variances necessary for approval of green infrastructure designs.
- Standard checklists and narratives related to LID do not exist, or are not properly used by applicants.



## Additional Resources

- **Better Site Design:** A handbook for changing development rules in your community  
[www.cwp.org](http://www.cwp.org)
- **LID Local Codes Checklist** [www.mapc.org/LID](http://www.mapc.org/LID)
- **Parking Spaces/Community Places:** Finding the balance with smart growth solutions  
[www.epa.gov/smartgrowth/pdf/EPAParkingSpaces06.pdf](http://www.epa.gov/smartgrowth/pdf/EPAParkingSpaces06.pdf)
- **Sustainable Neighborhood Road Design:** A guidebook for Massachusetts Cities and Towns  
[www.apa-ma.org/resources/publications/nrb-guidebook](http://www.apa-ma.org/resources/publications/nrb-guidebook)
- **Massachusetts Smart Growth/Smart Energy Toolkit**  
[www.mass.gov/envir/smart\\_growth\\_toolkit/](http://www.mass.gov/envir/smart_growth_toolkit/)
- **2011 Rhode Island LID Site Planning and Design Guidance Document**  
<http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/t4guide/lidplan.pdf>



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