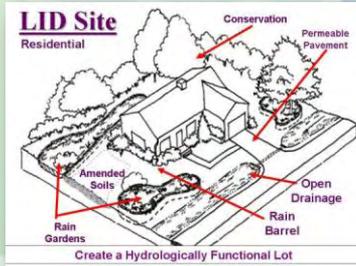


EPA Region 1 MS4 Stormwater General Permits and LID Training Clinic



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

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Low Impact Development (LID)



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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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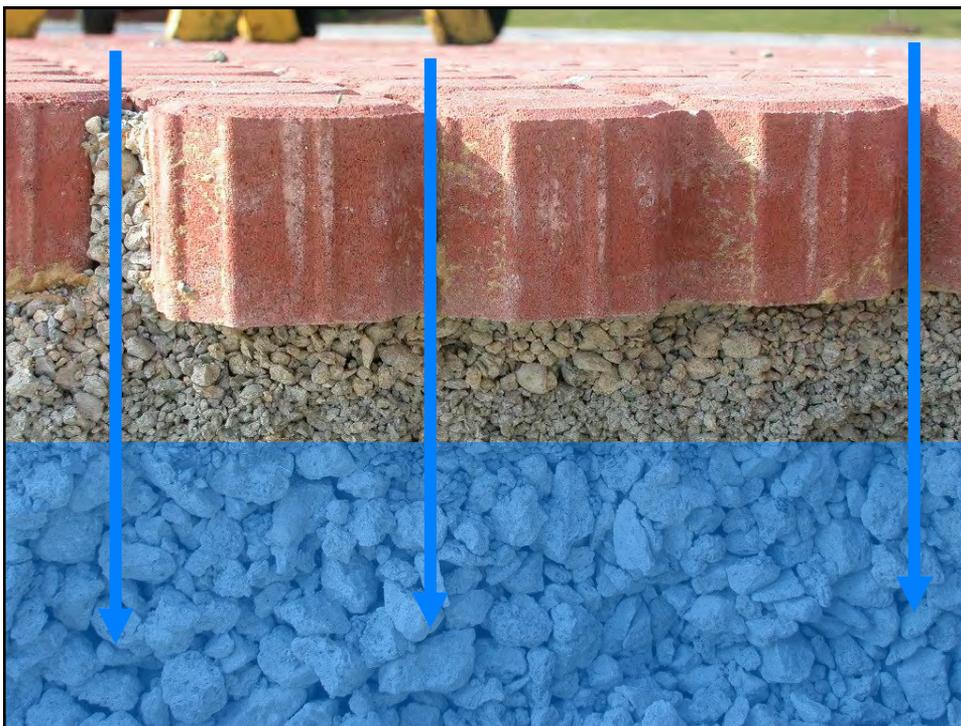
LID Practice Variants: *Planters*



LID Practice Variants: *Porous Pavement*



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General Permits and LID Training Clinic



LID Practice Variants: *Infiltration*



LID Practice Variants: *Infiltration*



LID Practice Variants: *Swales*



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

Post-Construction Stormwater Management Control Measures

Purpose

The new draft permit state:

The objective of this control measure is for the hydrology associated with new development to mirror the pre-development hydrology of the previously undeveloped 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

New Hampshire

Section 2.3.6 Stormwater
Management in New
Development and
Redevelopment

- 2.3.6.1 Stormwater program for projects disturbing >1 acre OR
(2.3.6.2) < 1 acre if part of a larger common plan of >1 acre
- 2.3.6.3 Ordinance or regulatory mechanism
- 2.3.6.4 Procedures to prevent or minimize WQ impacts**
- 2.3.6.5 As-builts and long-term O&M provisions
- 2.3.6.6 Assessment of street design and parking lot
guidelines (*within 2 yrs*)**
- 2.3.6.7 Assessment of local regulations to determine
feasibility of green infrastructure practices (*within 3 yrs*)**
- 2.3.6.8 Directly connected impervious cover

✓ indicates a previous requirement from the 2003 MS4 permit

Process for Evaluating Feasibility

1. Review existing codes and ordinances:
 - Zoning ordinances 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

New Hampshire Draft MS4 Permit

For new development and redevelopment projects >1 acre

- Include process to require practices that infiltrate, evapotranspire, or capture for reuse the 1st inch of rainfall (24-hr storm)
- “if practicable”

Local codes should clearly state that the capture of rainfall on-site is integral to any environmental development standards

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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

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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 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.

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Case Study - New London, NH

- Updated Land Subdivision Control Regulations - Fall 2007 - Incorporation of LID Design Elements;
- Section L - Stormwater and Erosion Control Design Standards;
- Section M - Landscape Design for Stormwater Treatment.
- Appendix A: Stormwater LID Practice Design Criteria



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Key Stormwater Features of New London Subdivision Regulations

- Permeable Pavements “encouraged” for low traffic areas (parking lots, driveways, etc.);
- On-site recharge retention requirement = ½” (can be waived with unsuitable soils, but bioretention is then preferred practice);
- “Pre-development condition baseline for flood controls established as “forested” land use, regardless of existing land use;
- Hydrologic “rules” established to avoid variable manipulation
- 1-year ED established as channel protection criterion;
- “Closed drainage” criteria revised to encourage open channels in lower density projects.

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Key Landscape Features of New London Subdivision Regulations

- SF Residential must retain 25% of site undisturbed (15% for multifamily) - must reforest prior disturbed sites;
- Stockpile native topsoil on-site for re-use - add organic matter where needed - soil amendments;
- Natural hard-wood mulches for stormwater practices;
- Lawn and turf areas to be limited, maintain natural areas - replant with native species;
- Compost (for soil amendments) shall be well-aged leaf (not grass).

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Key Site Design Features of New London Subdivision Regulations

- Parking lots with > 10 spaces must have bioretention landscaping islands;
- Cul-de-sacs should have vegetative islands depressed to accept stormwater runoff, as feasible;
- Tee turn-arounds are the preferred “dead end”;
- Street widths as narrow as 16 ft (\leq 5 house), 18 ft (\leq 30 houses);

http://www.nl-nh.com/index.asp?Type=B_LIST&SEC={0857FC09-FA51-4F89-931F-68EBDD3FB4E1}

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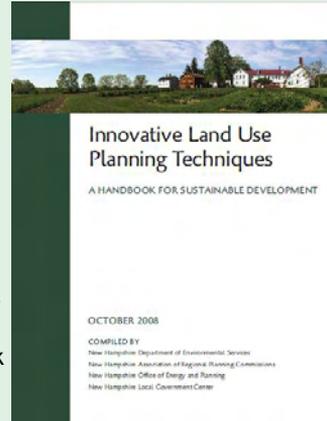
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Process for Evaluating Feasibility Code Barriers to Green Infrastructure		
Practice	Barriers	Opportunities
Green/blue roofs	<ul style="list-style-type: none"> Building code material specifications that exclude standard green/blue roof construction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

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

Additional Resources

- EPA's New England LID Website:
<http://www.epa.gov/region1/topics/water/lid.html>
- New Hampshire Innovative Land Use Planning Techniques
http://des.nh.gov/organization/divisions/water/wmb/repp/documents/ilupt_complete_handbook.pdf
- **Better Site Design:** A handbook for changing development rules in your community www.cwp.org
- **LID Local Codes Checklist** www.mapc.org/LID
- **Parking Spaces/Community Places:** Finding the balance with smart growth solutions
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
- 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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