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A River of Energy Solutions

Water Sustainability & Site Design

Warren High- AMEC Environment and Infrastructure

Why Design for Water Sustainability

- Regulations
  - Section 438 Energy Independence and Security Act of 2007 (EISA)
  - E.O. 13514
  - Stormwater Permits (MS4)
  - TMDLs and Consent Decrees
- Design Goals
  - LEED Certification
- Cost
- Because it is the right thing to do!

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Federal Regulations and Guidance

- Section 438 Energy Independence and Security Act of 2007 (EISA)
- E.O. 13514 - Federal Leadership in Environmental, Energy, and Economic Performance. Section 14
- USEPA- Technical Guidance on Implementing…(EPA 841-B-09-001)

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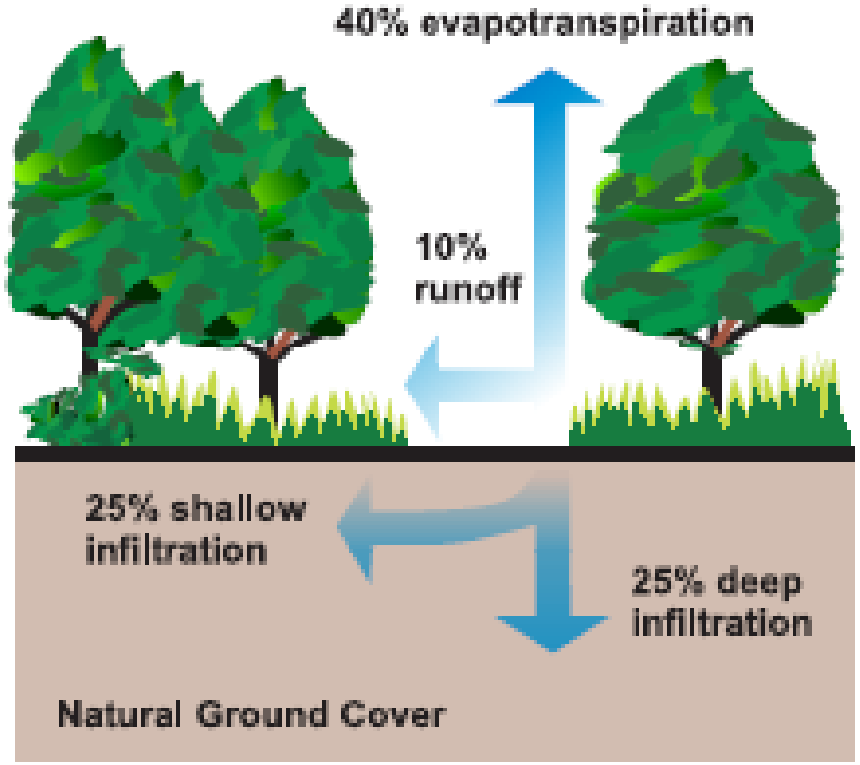
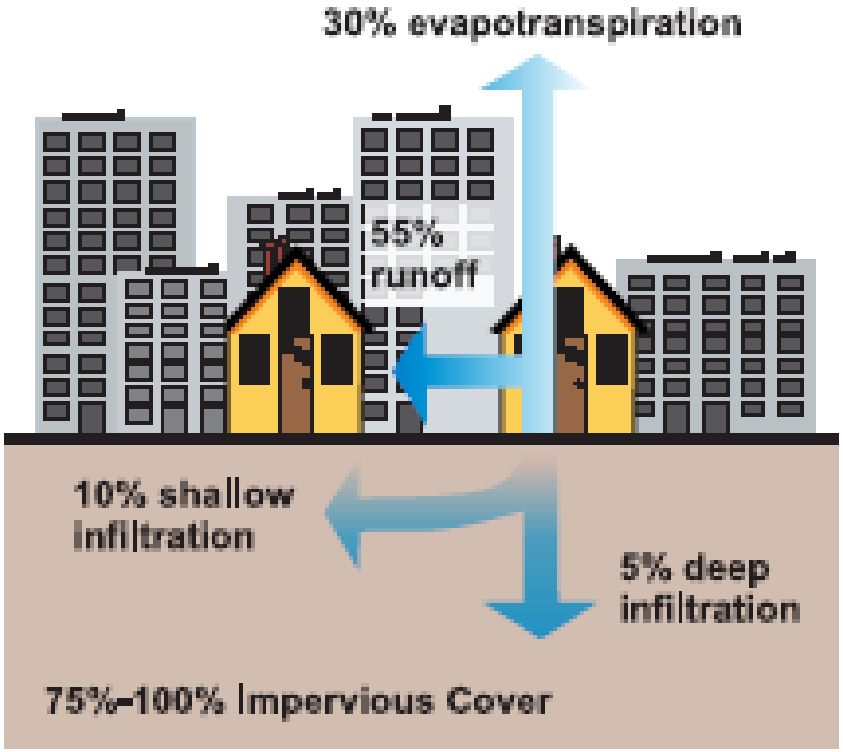
LEED Certification

- Prerequisite 1 – Construction Activity Pollution Prevention
- c1 – Site Selection (water body/wetland buffer)
- c1.1 – Water Efficient Landscape
- ss5.1 – Site Development: Protect or Restore Habitat
- ss5.2 – Site Development: Maximize Open Space
- ss6.1 – Stormwater Design:Quantity Control
- ss6.2 – Stormwater Design: Quality Control

Stormwater Problem





Source: EPA 841-B-09-001

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Consequences of Impacts

1. Increased volume of runoff.
2. Increased peak flow of runoff.
3. Increased duration of discharge.
4. Increased pollutant loadings.
5. Increased temperature of runoff.

Source: EPA 841-B-09-001

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Maximum Extent Technically Feasible

- All known, available and reasonable methods of stormwater retention
- Site constraints can cause “technical Infeasibility”
  - Examples: high groundwater, bedrock, utilities, site size, state and local requirements, and ……

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Site Constraints

- Water Bodies (Streams and lakes)
- Wetlands
- Springs
- Floodplain
- Groundwater/Aquifer
- Topography
- Vegetative Cover

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Site Opportunities

- Areas of disturbance
- Brownfields
- Redevelopment and Infill
- Incorporate natural features into design

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Factors to Consider

- Geography
- Geology
- Soils
- Topography
- Vegetation
- Landforms
- Land use

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Project Footprint

- Building size
- Access
- Parking
- Orientation
- Location on parcel

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Avoiding & Minimizing Impact

- Plan the project well before site selection (footprint creep)
- Define all aspects of the project
- Impacts must be properly weighted in Benefit/Cost ratio
- Site layout and design

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Mitigating for Impacts

- Include in site cost up front
- Permitting requirements
- Measures that meet required goals
- Cost and schedule impacts

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GI/LID approaches

- Green Roofs
- Rain Harvesting
- Downspout Disconnection
- Planter Boxes
- Rain Gardens
- Permeable Pavements
- Vegetated Swales
- Brownfield Redevelopment
- Infill and Redevelopment

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Neighborhood Approaches

- Green Parking
- Green Streets & Highways
- Pocket Wetlands
- Trees & Urban Forestry

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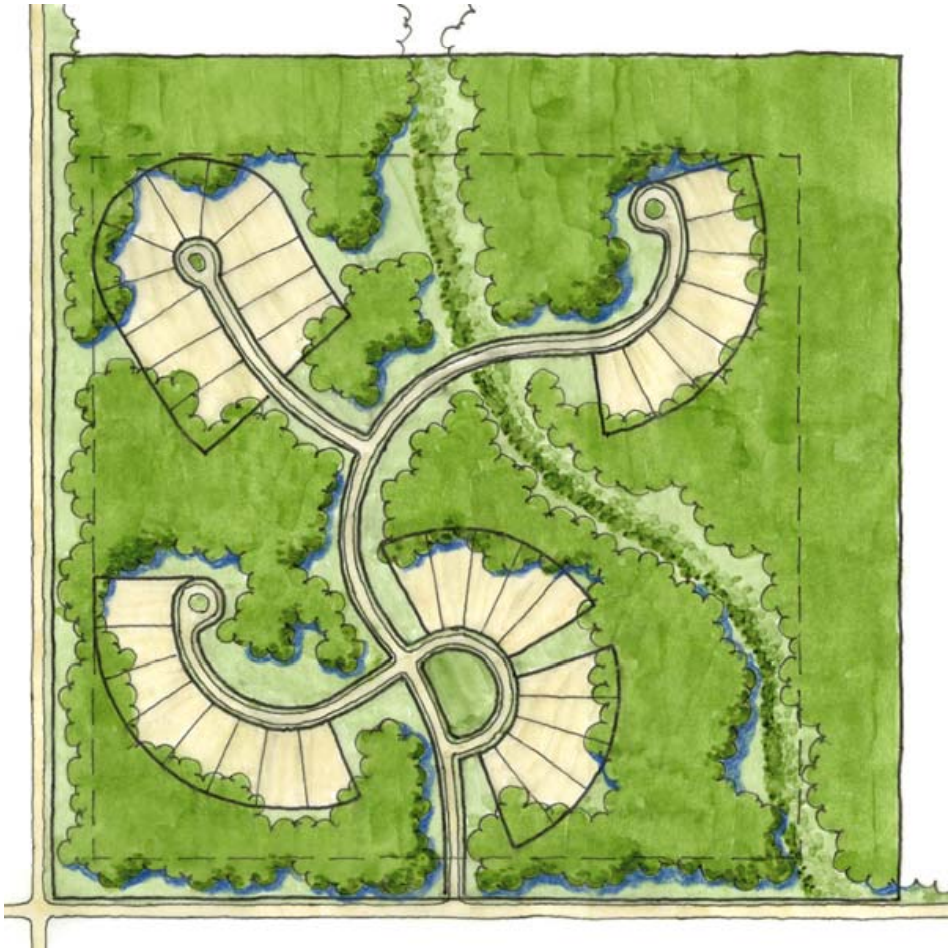
Cluster Development/Open Space



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Bioretention Swale

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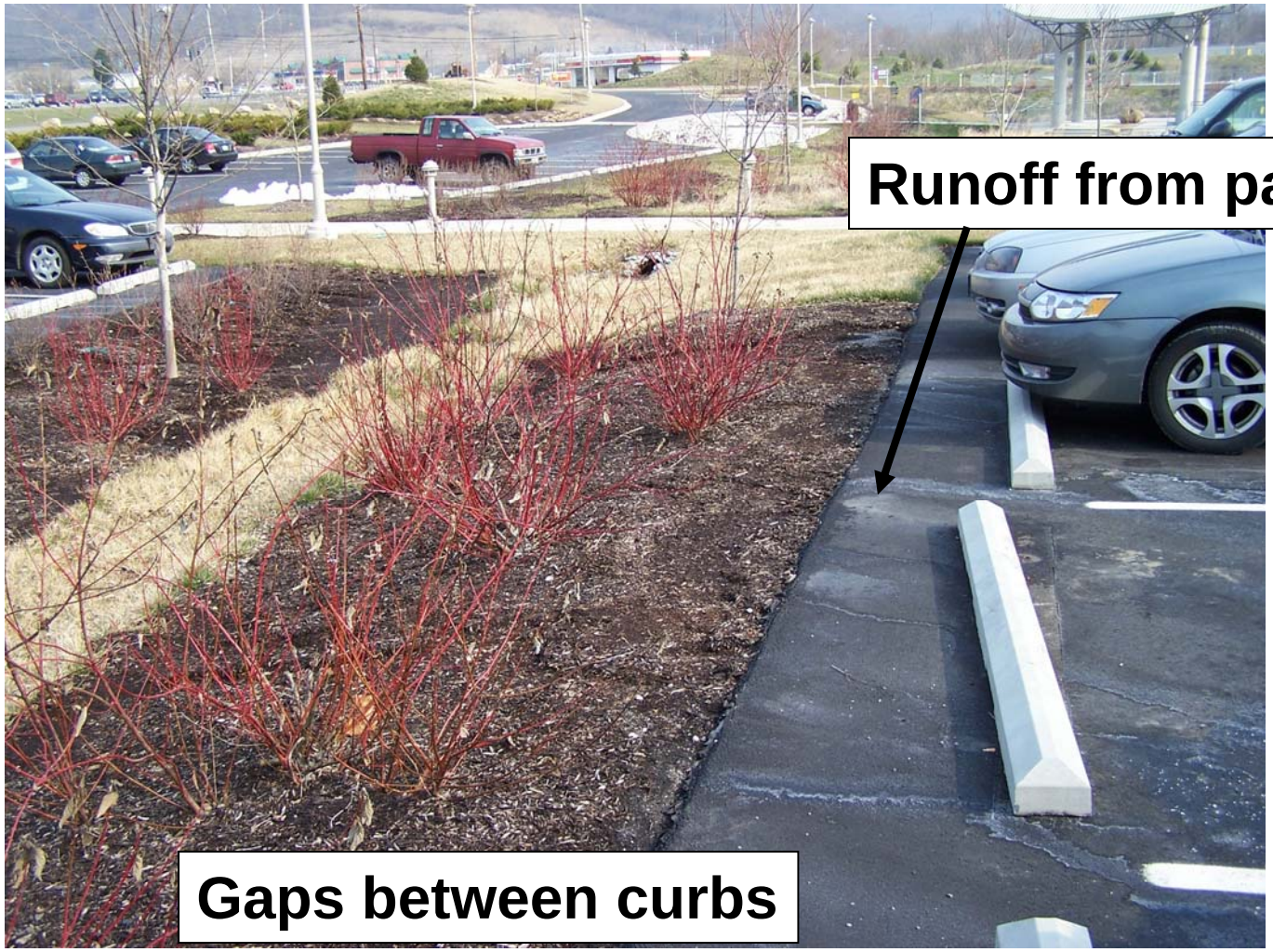

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During

After

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Reforestation/Infiltration

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Rain Garden

Cincinnati Zoo

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Stormwater Planter

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Green Roof

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Porous Pavement

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Porous Pavers

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Porous Paving Grid

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Standard Detention Pond

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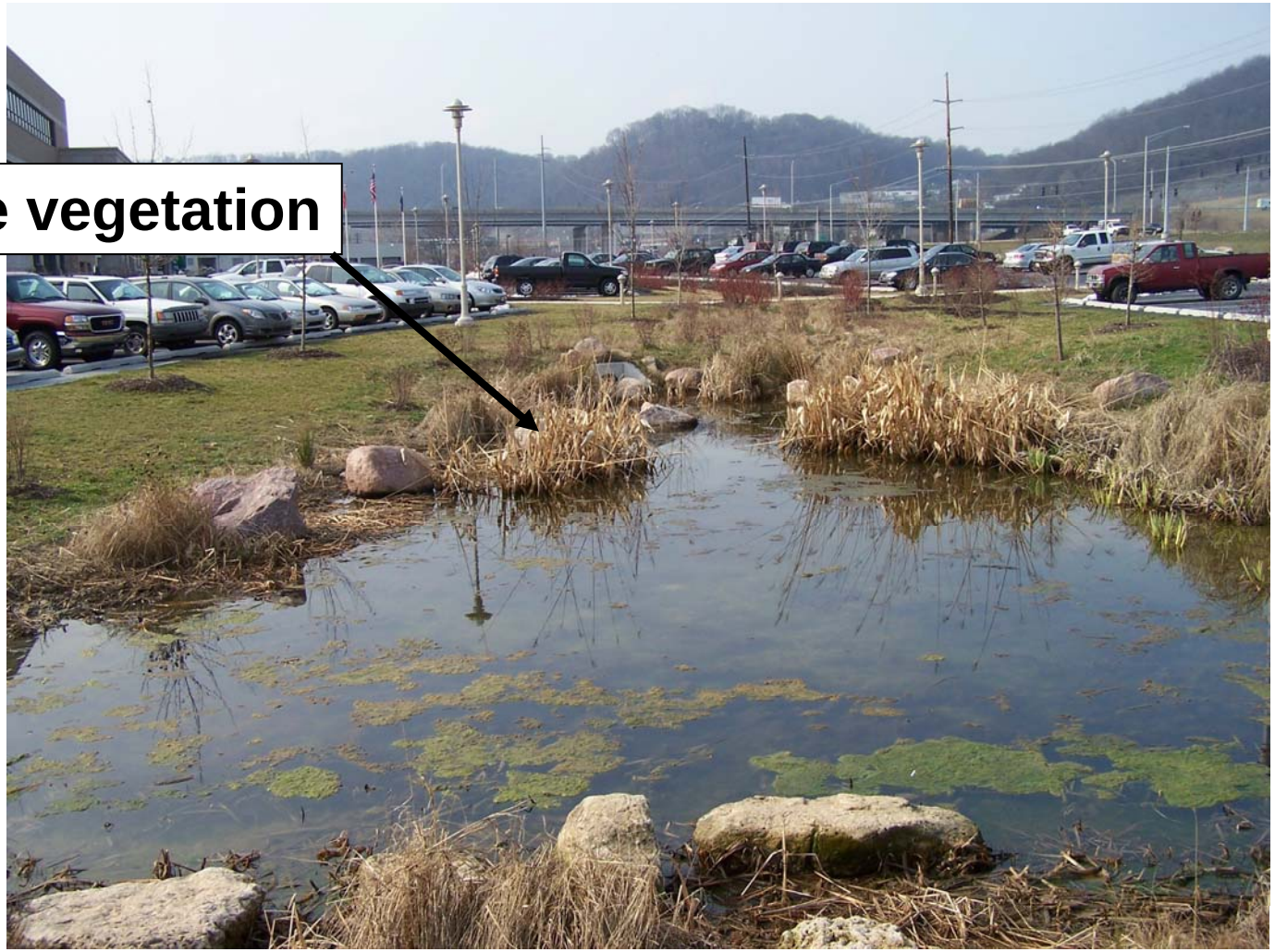
Wet Retention Pond



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Disconnect Downspouts

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Rain Barrels

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Cistern

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Cisterns

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Cistern/Infiltration

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Conclusion

- Planning your project for compliance
- Design for compliance
- Methods that are Maximum Extent Technically Feasible
- Implementation
- Monitor for success
- Publish the results

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Design for Water Sustainability

- Regulations
- Design Goals
- Cost
- Right thing to do!

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