Better Stormwater Management Site Design

Presented at the "Managing Stormwater in Our Communities" Workshop

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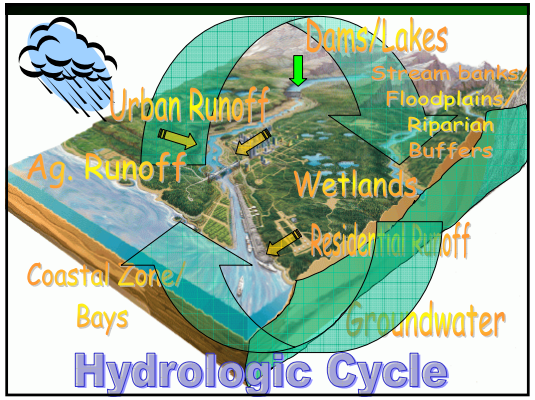
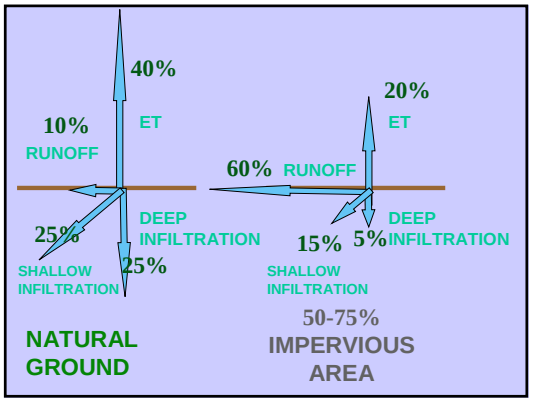
Why New Design Issues?

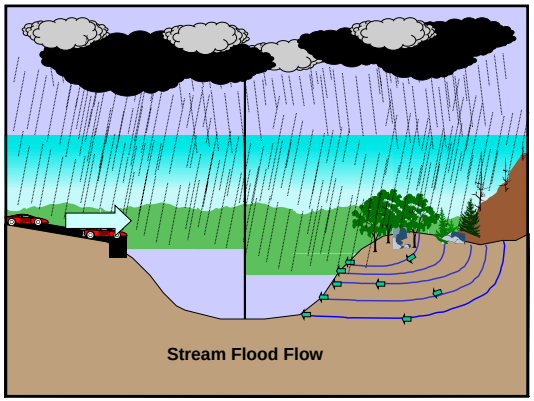
- Better understanding of the hydrologic science
- NPDES Phase II Program
- DEP's New Stormwater Management Policy
- Changes in Act 167 requirements
- DEP Stormwater Mgmt. Manual (Dec 2006)

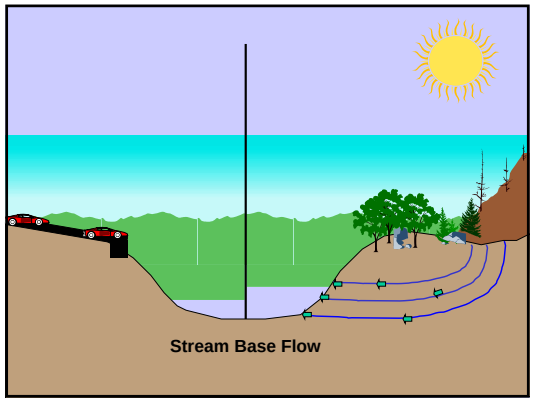
Implementation:

- Best Management Practices (BMP's)

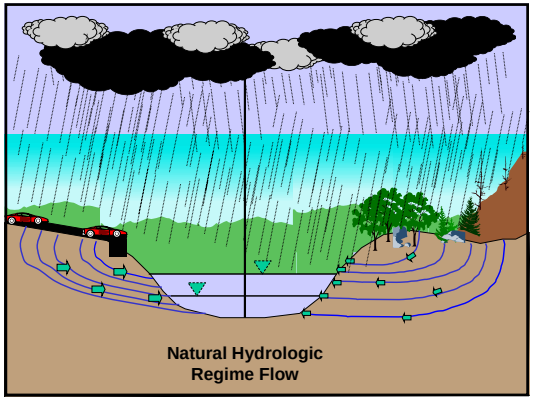


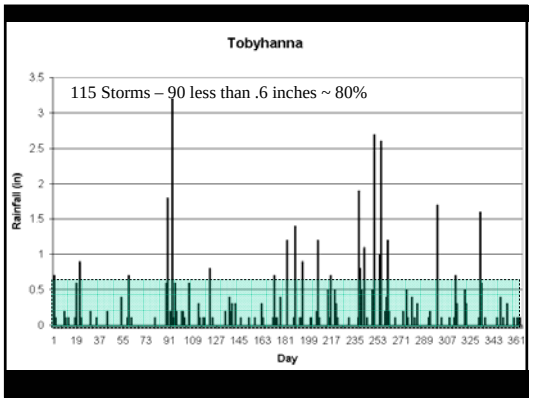






Diminished Groundwater Recharge And Stream Baseflow





Pennsylvania Stormwater Best Management Practices Manual

December 2006

Stormwater Best Management Practices Manual

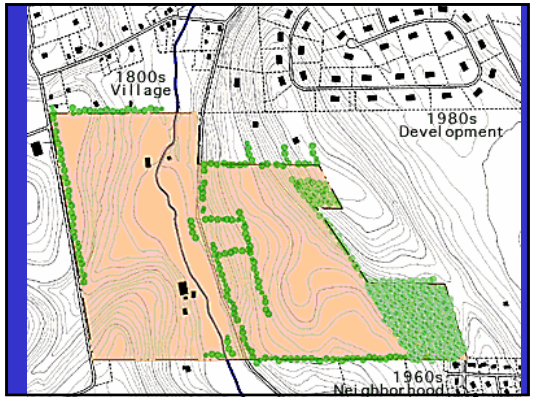
- Cover and Table of Contents
- Chapter 1 - Introduction and Purpose
  Chapter 2 - Making The Case For Stormwater Management
- Chapter 3 - Stormwater Management Principles and Recommended Guidelines
- Chapter 4 - Integrating Site Design and Stormwater Management
- Chapter 5 -Non-Structural BMPs
- Chapter 6 - Structural BMPs
- Chapter 7 - Special Management Areas
- Chapter 8 - Stormwater Calculations and Methodology
- Chapter 9 - Case Studies Innovative Stormwater Management Approaches and Practices
- Appendix A - Water Quality
- Appendix B - Pennsylvania Native Plant List
- Appendix C – Protocols for Structural BMPs
  - Protocol 1 – Infiltration Systems Guidelines
  - Protocol 2 – Soil Evaluation and Investigation for Infiltration BMPs
- Appendix D - Stormwater Calculations and Methodology – Case Study
- Glossary

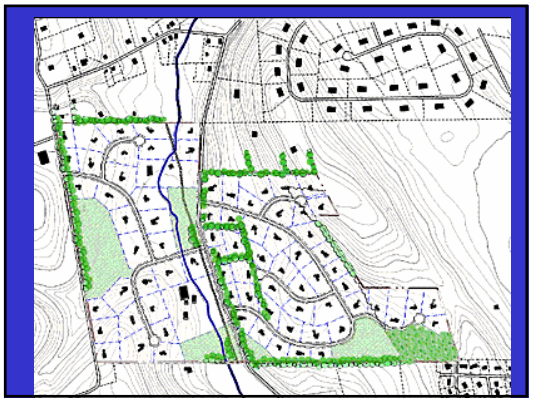
Best Management Practices (BMPs)

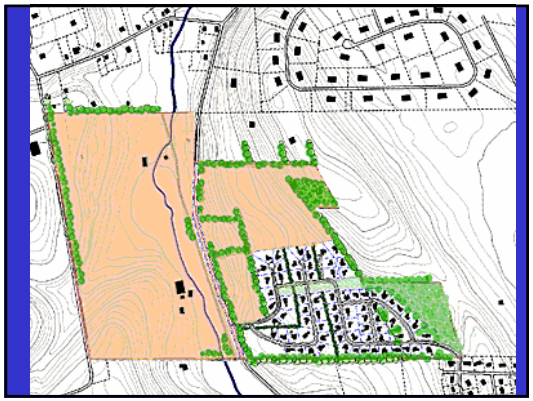
- Nonstructural
- Structural

NONSTRUCTURAL (OPEN SPACE) STORM WATER MANAGEMENT

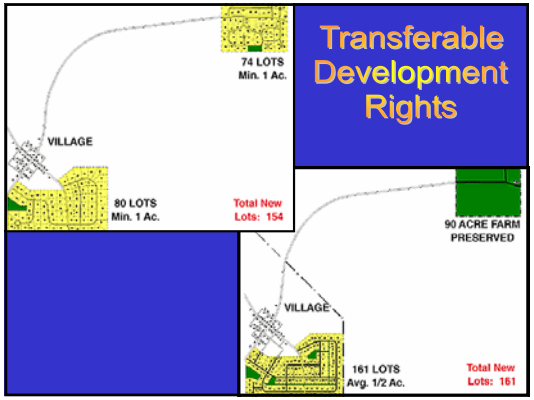
- Open Space Requirements
- Density Limitations
- Relax Road Requirements
- TDR PRDS Cluster housing
- Wetland Purchase / Leasing
- Conservation Easements
- Imp. Surface Reduction
- Buffers
- Land Exchange
- Water Conservation
- Retentive Grading
- Slope Restrictions







Transferable Development Rights - Development rights are assigned to property. The property can either be developed or the rights sold to another property owner where development should take place, thus placing the first property in permanent open space.

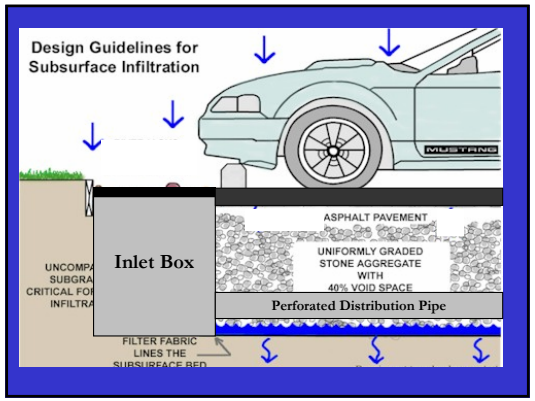


Relax Road Requirements - Reduce paved road width, turning radii, parking spaces.

Impervious Surface Reduction - Reduced impervious areas through paving blocks (pervious overload parking), porous pavement, reduced parking spaces, etc.

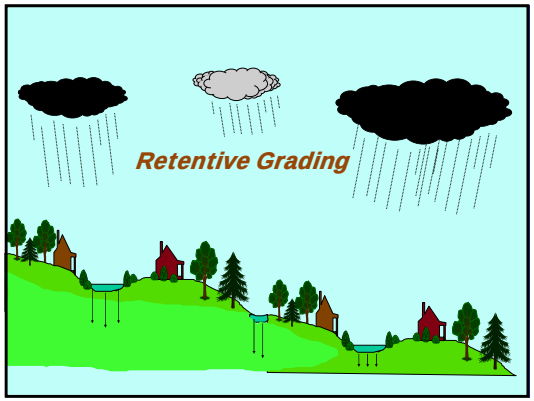
Impervious Cover Reduction

- *Site planning practices that reduce impervious cover thereby reducing WQ_v.*
- *Examples include:*
  - *Narrower road sections*
  - *Smaller turnarounds*
  - *Smaller parking demand ratios*
  - *Permeable spillover parking*
  - *Smaller front yard setbacks*
  - *Shared parking and driveways*
  - *Narrower sidewalks*
- *These requirements are typically enshrined in local subdivision, parking and street codes.*



Floodplain Restrictions - Limitation of development in the floodplain

Retentive Grading - Mild grading at advantages locations in a development site to detain/retain storm water.



STRUCTURAL

Best Management Practices (BMP's)

Infiltration / Recharge

Groundwater Recharge

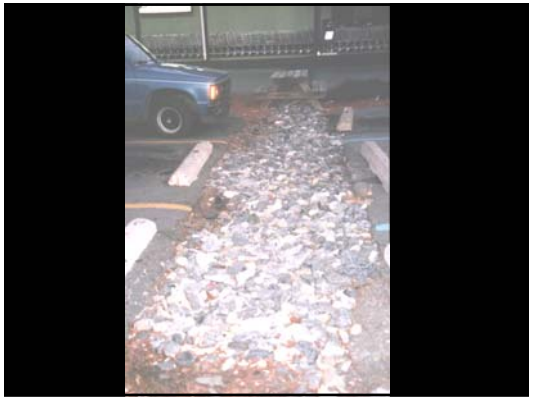
Many varieties of infiltration BMPs including :

- Infiltration Trenches
- Dry Wells
- Storage-infiltration reservoirs
- Bioretention Facilities

Infiltration BMPs Minimum Criteria (Suggested):

- Minimum 24" between bottom of facility and seasonal high water table and/or bedrock (limiting zones). Only roof runoff promoted".
- Sufficient infiltration rate determined by field testing.
- Located a minimum of 10 feet from building foundations.
- Directed towards most permeable HSG available.
- Complete infiltration within 4 days.
- Detail site soil evaluation.

Infiltration Trench



Infiltration Basin

Pocket Infiltration

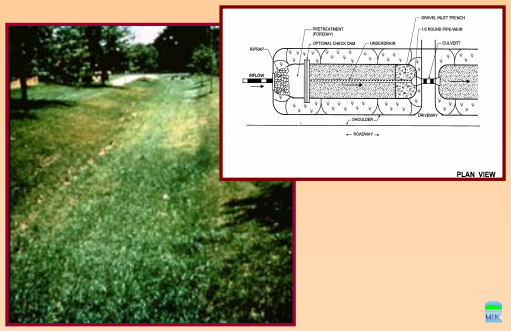
Bioretention

Bioretention

Best Management Practices (BMP's)

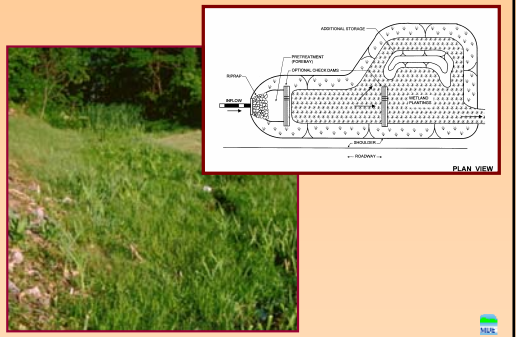
Water Quality Management

Dry Swale



Grass Channels

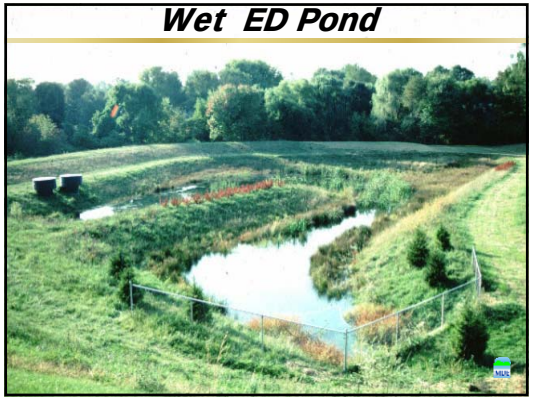
Wet Swale



Micropool ED Pond

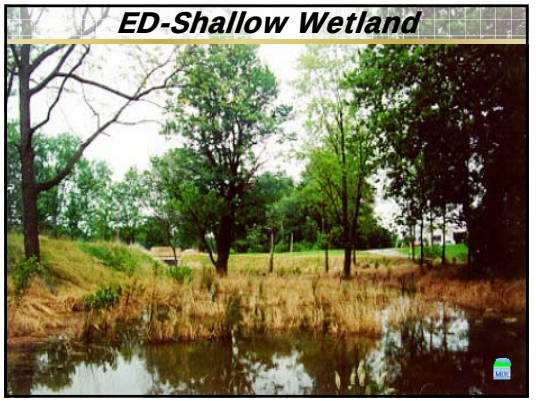
Wet Pond


TOTAL POND FRONT UNITS: 16
TOTAL INCREASE IN UNIT SALES: $7,500
TOTAL INCREASE IN SALES $120,000
TOTAL COST TO CONSTRUCT POND $60,000
TOTAL ADDITIONAL REVENUE $60,000


Wet ED Pond

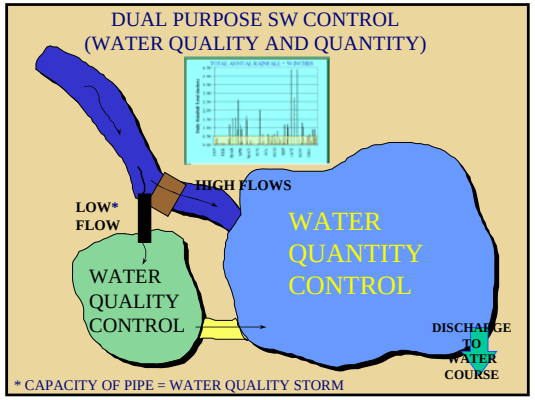

Multiple Pond


Shallow Wetland


ED-Shallow Wetland

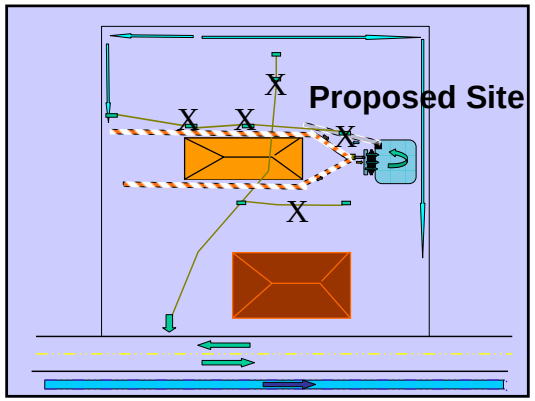

Pocket Wetland

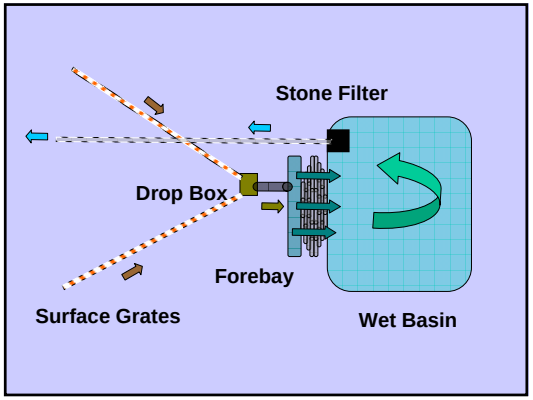

Pond-Wetland System

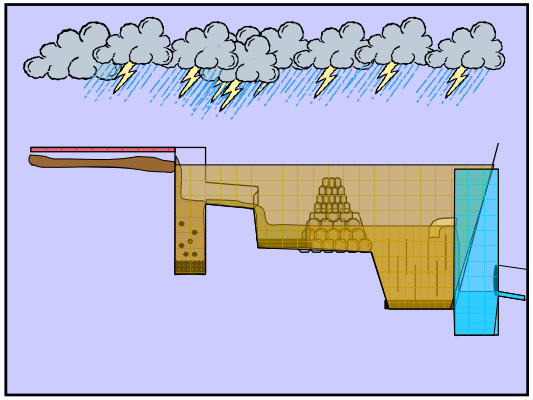

DUAL PURPOSE SW CONTROL
(WATER QUALITY AND QUANTITY)
HIGH FLOWS
LOW*
FLOW
WATER
QUALITY
CONTROL
WATER
QUANTITY
CONTROL
DISCHARGE
TO
WATER
COURSE
* CAPACITY OF PIPE = WATER QUALITY STORM


The Treatment Train


08/12/2004


Proposed Site


Stone Filter
Drop Box
Forebay
Surface Grates
Wet Basin



The next big thing in Architecture: Green Roofs

Best Management Practices (BMP's)

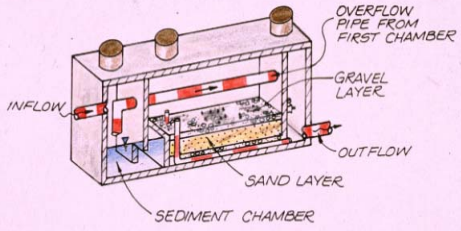
Filtration

Pocket Sand Filter

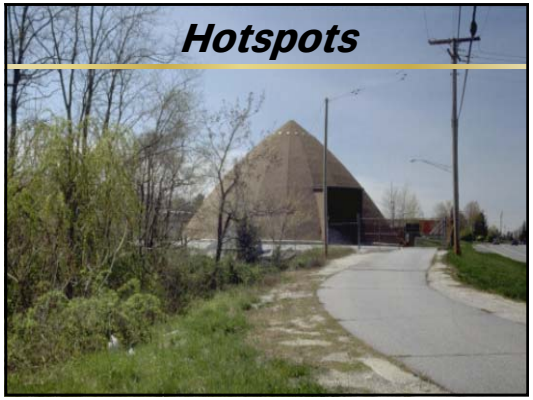
Organic Filters

Surface Sand Filter

Underground Sand Filter



UNDERGROUND SAND FILTER W/ BYPASS PIPE



Questions ? ? ? ? ? ?