

## **Module 6: Construction Inspections of 15 Non-Proprietary BMPS**

### Objectives

- Recognize critical features of BMPs
- Identify and prioritize key BMP inspection points
- Describe key inspections elements across the 15 non-proprietary BMPs
- Use BMP specifications and approved stormwater management plans to locate relevant BMP design and construction details

## Specs include design criteria table

**Table 1.2: Simple Rooftop Disconnection Design Criteria**<sup>1</sup>

DESIGN FACTOR	SIMPLE DISCONNECTION
Maximum impervious (Rooftop) Area Treated	1,000 sq. ft. per disconnection
Longest flow path (roof/gutter)	75 feet
Disconnection Length	Equal to longest flow path, but no less than 40 feet <sup>2</sup>
Disconnection slope	< 2%, or < 5% with turf reinforcement <sup>3</sup>
Distance from buildings or foundations	Extend downspouts 5 ft. <sup>4</sup> (15 ft. in karst areas) away from building <i>if grade is less than 1%.</i>
Type of Pretreatment	External (leaf screens, etc)

<sup>1</sup> For alternative runoff reduction practices, see the applicable specification for design criteria. See Table 1 in this specification for eligible practices and associated specification numbers.

<sup>2</sup> An alternative runoff reduction practice must be used when the disconnection length is less than 40 feet.

<sup>3</sup> Turf reinforcement may include EC-2, EC-3, or other appropriate reinforcing materials that

## Specs include construction sequence

### SECTION 8: CONSTRUCTION

#### 8.1. Construction Sequence for Conserved Open Space Areas

The Conserved Open Space must be fully protected during the construction stage of development and kept outside the limits of disturbance on the Erosion and Sediment (E&S) Control Plan.

- No clearing, grading or heavy equipment access is allowed except temporary disturbances associated with incidental utility construction, restoration operations or management of nuisance vegetation.
- The perimeter of the Conserved Open Space shall be protected by super silt fence, chain link fence, orange safety fence, or other measures to prevent sediment discharge.
- The limits of disturbance should be clearly shown on all construction drawings and identified and protected in the field by acceptable signage, silt fence, snow fence or other protective barrier.

## Specs include maintenance inspection points

### 9.2. Maintenance Inspections

Annual inspections are used to trigger maintenance operations such as sediment removal, spot re-vegetation and level spreader repair. Ideally, inspections should be conducted in the non-growing season when it is easier to see the flow path. Example maintenance inspection checklists for Sheet Flow to a Filter Strip or Conserved Open Space areas can be accessed in Appendix C of Chapter 9 of the Virginia Stormwater Management Handbook or at the Center for Watershed Protection's website at:

[http://www.cwp.org/Resource\\_Library/Controlling\\_Runoff\\_and\\_Discharges/sm.htm](http://www.cwp.org/Resource_Library/Controlling_Runoff_and_Discharges/sm.htm)  
(scroll to Tool6: Plan Review, BMP Construction, and Maintenance Checklists)

Inspectors should check to ensure that:

- Flows through the Filter Strip do not short-circuit the overflow control section;
- Debris and sediment does not build up at the top of the Filter Strip;
- Foot or vehicular traffic does not compromise the gravel diaphragm;
- Scour and erosion do not occur within the Filter Strip;
- Sediments are cleaned out of Level Spreader forebays and flow splitters; and
- Vegetative density exceeds a 90% cover in the boundary zone or grass filter.

## Sample Construction Inspection Checklists (DEQ Training Page)

### Sample Construction Inspection Checklist: Permeable Pavement

The following checklist provides a basic outline of the anticipated items for the construction inspection of permeable pavement for use as stormwater BMPs. This checklist does not necessarily differentiate between the types of pavement materials and the different construction requirements. The designer and the VSMP Authority personnel should consult with the manufacturer of the material to ensure that proper construction oversight and inspections are provided. Also, users of this information may wish to incorporate these items into a VSMP Authority Construction Checklist format consistent with the format used for erosion and sediment control and BMP construction inspections.

- Pre-construction meeting**
  - Walk through site with builder/contractor/subcontractor to review the SWPPP (erosion and sediment control plan, the stormwater management plan, and the Pollution Prevention plan)
  - Determine when permeable pavement is built in project construction sequence; before or after building construction and determine measures for protection and surface cleaning.
  - Identify the tentative schedule for construction and verify the requirements and schedule for interim inspections and sign-off.

Design  
Specification No. 1  
Rooftop  
(Impervious  
Surface)  
Disconnection



BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

**Spec. 1 | Pg. 1**

Two disconnection  
types allowed:

1. Simple
2. Alternative



BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Type 1. Simple Disconnection

Rooftops and/or on-lot impervious surfaces are directed to pervious areas



BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Overview: Simple Disconnection

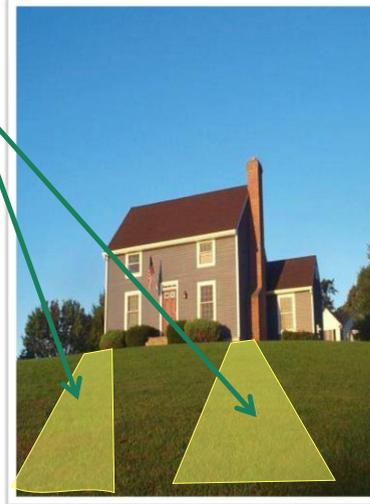
- Runoff volume reductions achieved by managing runoff as sheet flow close to its source and infiltrating into pervious areas



BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Key Considerations

- Advisable for lots > 6,000 ft<sup>2</sup>
- Filter corridors from downspout
- Level spreader required for concentrated inflow



BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Simple disconnection design criteria

Design Factor	Simple Disconnection
Maximum impervious (Rooftop) Area Treated	1,000 sq. ft. per disconnection
Longest flow path (roof/gutter)	75 feet
Disconnection Length	Equal to longest flow path (no less than 40 feet)
Disconnection slope	< 2% or < 5% with turf reinforcement
Distance from buildings or foundations	Extend downspouts 5 ft. (15 ft. in karst areas) away from building <i>if grade is less than 1%</i> .
Type of Pretreatment	External (leaf screens, etc)

## Key Considerations

### ➤ Table 1.2

- Disconnection length
- Disconnection slope
- Distance from building or foundations



BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Key Considerations

- Level Spreader for Concentrated Flow
  - Level spreader length should be equal to width of disconnection area



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## Type 2. Alternative Disconnection



BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Inspections: **CONSTRUCTION**

- Before installation:
  - Drainage area stabilized?
  - Downspouts and runoff diverted away?
  - Disconnection paths correctly positioned based on actual topography and downspout locations?

BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Inspections: CONSTRUCTION

- Check during installation:
  - Length, width, slope, elevations of disconnection path - **Must match plan**
  - Depth of soil if amendments used - **Must match plan**

BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Inspections: CONSTRUCTION

- Check during installation:
  - Compaction
  - Erosion control matting or straw is in place
  - Level spreader properly installed - **Must match plan**

BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

## Inspections: CONSTRUCTION

- After installation:
  - Ensure vegetation is stable before downspouts diverted back to disconnection path



BMP SPECIFICATIONS | ROOFTOP DISCONNECTION

Design specification  
No. 2  
Sheet Flow to a  
Vegetated Filter Strip or  
Conserved Open Space



BMP SPECIFICATIONS | SPEC NO. 2

## Two Types of Filter Strips

- 1) Conserved open space
- 2) Designed vegetated filter strips

## Remember...

- Stormwater **must** enter as sheet flow
  - Inflow from pipe or channel requires an engineered level spreader

## Conserved Open Space

- Outside limits of disturbance
- Marked on all construction drawings
- Protected by signage and erosion controls



## Vegetated Filter Strips

- Maximum slope steepness is 8% to maintain sheet flow through practice

## Vegetated Filter Strip

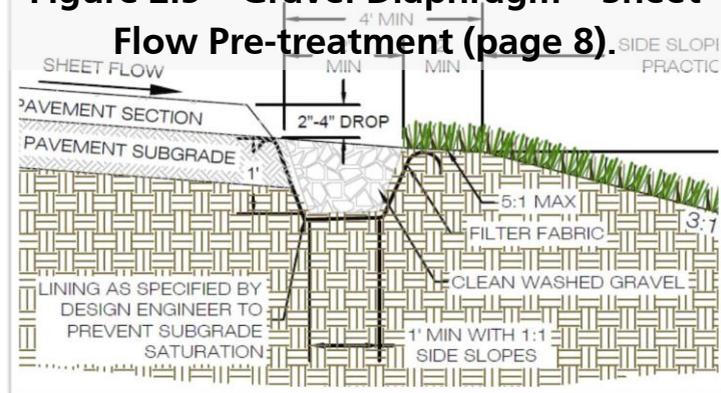
- Planting and Vegetation Management
  - 90% cover after second growing season
  - Seed, not sod
  - Compost soil amendments may be added

## Vegetated Filter Strips

- Gravel Diaphragms:
  - Pea gravel diaphragm at top of slope required for **both** Conserved Open Space and vegetated filter strips that receive sheet flow

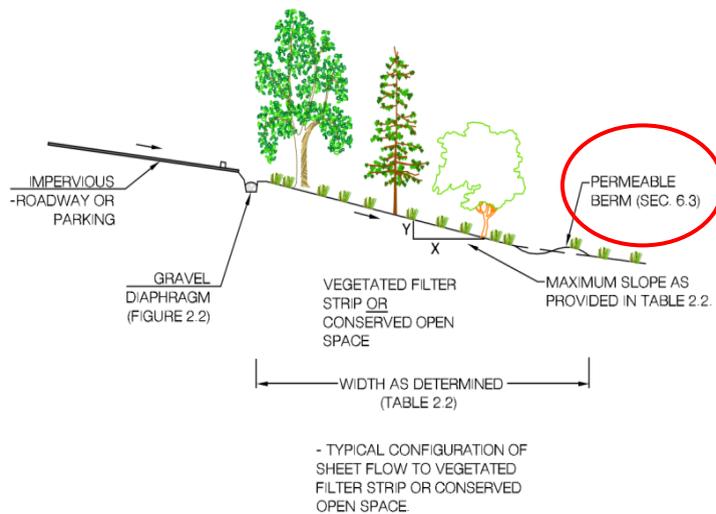
## Vegetated Filter Strip

**Figure 2.5 – Gravel Diaphragm – Sheet Flow Pre-treatment (page 8).**



BMP SPECIFICATIONS | SPEC NO. 2

## Vegetated Filter Strip



BMP SPECIFICATIONS | SPEC NO. 2

## Vegetated Filter Strip

- Engineered Level Spreaders
  - Concrete, metal, non-erodible material
  - Well anchored footer
  - Ends of level spreader section should be tied back into slope to avoid scouring around ends

## Inspection: **CONSTRUCTION**

- ✓ Water diverted around filter strip area **prior to** installation?



## Inspection: CONSTRUCTION

- ✓ Topsoil and/or compost even across filter strip?



## Inspection: CONSTRUCTION

- ✓ Dimensions match approved plan?



## Inspection: CONSTRUCTION

- ✓ Runoff diverted to filter only after vegetation is well established?



## Inspection: CONSTRUCTION

- ✓ Filter strip ok after first big storm?



Photo: R. Winston; BAE Stormwater Engineering Group, NCSU

## Design Specification

No. 3

## Grass Channels



BMP SPECIFICATIONS | GRASS CHANNELS

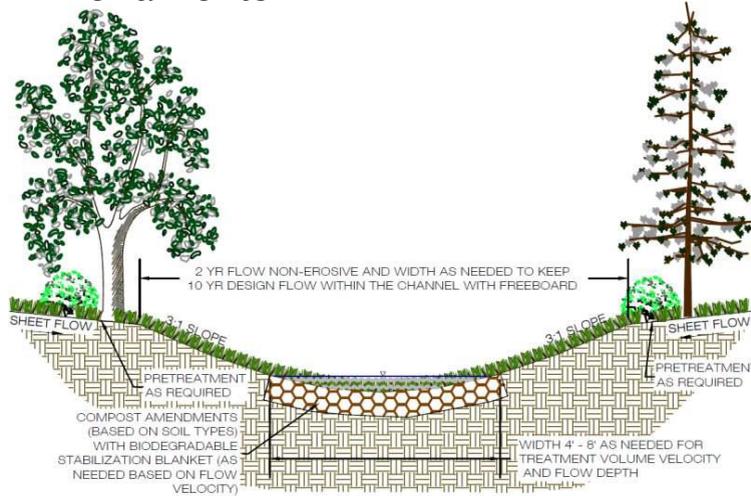
**Spec. 3 | Section 3 | Pg. 2**

## Grass Channel Design Guidance

- Bottom width of channel should be between 4 to 8 feet wide
- Channel side-slopes should be 3:1 or flatter
- Maximum total contributing drainage area to any individual grass channel is 5 acres

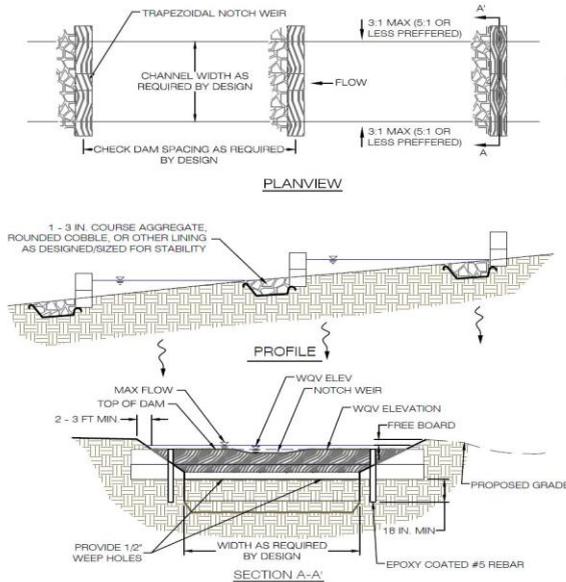
BMP SPECIFICATIONS | GRASS CHANNELS

## Grass Channel with Compost Amendments



BMP SPECIFICATIONS | GRASS CHANNELS

## Grass channel with check dams



Must match the plan!

NOTE: CHECK DAM CONSTRUCTED OF RAILROAD TIES, PRESSURE TREATED LOGS OR TIMBERS, OR CONCRETE.

## Inspection: CONSTRUCTION

- ✓ Drainage area stable OR water diverted around grass channel area **prior to** installation?
- ✓ Length, width, slope, and elevations of grass channel correct according to plan?
- ✓ Outfall protection/energy dissipation at concentrated inflows stable?

BMP SPECIFICATIONS

## Inspection: CONSTRUCTION

- ✓ Soil amendments (if called for in plan) added at correct depth and distributed evenly across channel bottom?



BMP SPECIFICATIONS | GRASS CHANNELS

## Inspection: **CONSTRUCTION**

- ✓ Turf coverage achieved and/or proper erosion control fabric installed **following** construction?



BMP SPECIFICATIONS | GRASS CHANNELS

Design Specification

No. 4

Soil Compost  
Amendment



BMP SPECIFICATIONS | SOIL COMPOST AMENDMENT

## Soil Compost Amendments

- Compacted disturbed urban soils: challenge and opportunity



BMP SPECIFICATIONS | SOIL COMPOST AMENDMENT



## Applications

- Used to enhance runoff reduction practices

## Methods of Incorporation

- Deep Ripping/Subsoiler
- Spread & incorporate compost
- Grass/plant establishment
- NOTE: Some applications with deep incorporation of compost may require excavation and replacing soil/compost in lifts.



Photo Credit: Jeremy Balousek, P.E., Dane County, WI Land and Water Resources Department

## Perpendicular to Flow Direction



Photo Credit: Jeremy Balousek, P.E., Dane County, WI Land and Water Resources Department

BMP SPECIFICATIONS | SOIL COMPOST AMENDMENT

## Smaller Areas

- Rototiller, tiller
- Hand spreading compost
- Seed & straw



Photo Credit: Richard McLaughlin, Ph.D., North Carolina State University

BMP SPECIFICATIONS | SOIL COMPOST AMENDMENT

## Establish Vegetation



BMP SPECIFICATIONS | SOIL COMPOST AMENDMENT

## Use Simple E&S Measures For Areas > 2,500 sf **Spec. 4 | Pg. 7**



BMP SPECIFICATIONS | SOIL COMPOST AMENDMENT

## **Spec. 4 | Pg. 7**

### Inspection: **CONSTRUCTION**

- Drainage Area Stabilized?
- Correct mix?
- Simple E&S measures for larger areas?
- Compost incorporated using right equipment to right depth?



Photo Credit: Richard McLaughlin, Ph.D.,  
North Carolina State University

BMP SPECIFICATIONS | SOIL COMPOST AMENDMENT

## Inspection: CONSTRUCTION

- Dig test pit to verify depth of compost at one location per 10,000 ft<sup>2</sup>



BMP SPECIFICATIONS | SOIL COMPOST AMENDMENT

## Design Specification

### No. 5 Vegetated Roof



BMP SPECIFICATIONS | VEGETATED ROOF

## Green Roof Basics



1050K Street  
Washington DC

Image courtesy of Timmons Group

- Extensive
- Intensive

BMP SPECIFICATIONS | VEGETATED ROOF

## Green Roof Design Elements:



Created or  
Manufactured System



Images courtesy of Timmons Group

BMP SPECIFICATIONS | VEGETATED ROOF

## Inspection: **CONSTRUCTION**

- Ensure proper coordination is taking place



BMP SPECIFICATIONS | VEGETATED ROOF

## Design Specification

### No. 6 Rainwater Harvesting



BMP SPECIFICATIONS | RAINWATER HARVESTING

## Rainwater Harvesting

- Rainwater harvesting systems intercept, divert, store and release rainfall for future non-potable uses:
  - Flushing of toilets and urinals
  - Landscape irrigation
  - Exterior washing
  - Fire suppression (sprinkler) systems

## Rainwater Harvesting

Secondary practices can include:

- **Rooftop Disconnection**
  - (Design Specification No. 1)
- **Grass Channel**
  - (Design Specification No. 3)
- **Micro-Bioretenion or rain garden**
  - (Design Specification No. 9)

## Inspection: CONSTRUCTION

- ✓ This is mostly in the hands of the architect, project engineers, building contractor, and other vendors.
- ✓ Inspector should ensure that proper coordination is taking place.

## Inspection: CONSTRUCTION

- ✓ Construction runoff should not enter tank during installation
- ✓ Rooftop area size & materials match plan



## Inspection: CONSTRUCTION

- ✓ Tank foundation properly installed



Source: Clay Dills, Dills Architects

BMP SPECIFICATIONS | RAINWATER HARVESTING

## Inspection: CONSTRUCTION

- ✓ Diversion system (e.g., downspouts and pipes) is properly sized and installed to deliver roof runoff to tank.



(Source: Rainwater Management Solutions)

BMP SPECIFICATIONS | RAINWATER HARVESTING

## Inspection: CONSTRUCTION

- ✓ Pre-treatment properly installed
- ✓ Mosquito screens installed on all openings (as needed).



Source: Rainwater Management Solutions

## Inspection: CONSTRUCTION

- ✓ Overflow device installed at proper elevation and with stable erosion control at outfall

## Inspection: CONSTRUCTION

- ✓ Secondary runoff reduction practice(s) properly installed.



BMP SPECIFICATIONS | RAINWATER HARVESTING

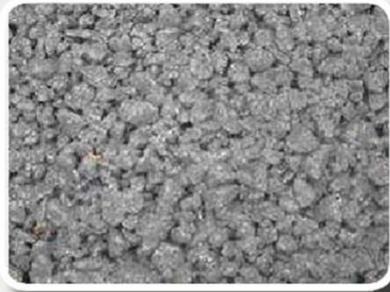
## DESIGN SPECIFICATION

### No. 7 Permeable Pavement



BMP SPECIFICATIONS | PERMEABLE PAVEMENT

## Permeable Pavement



Pervious Concrete (PC)

BMP SPECIFICATIONS | PERMEABLE PAVEMENT

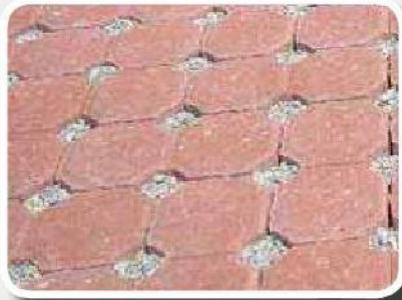
## Permeable Pavement



Porous Asphalt (PA)

BMP SPECIFICATIONS | PERMEABLE PAVEMENT

## Permeable Pavement



**Permeable Interlocking Concrete Pavers (PICP)**

BMP SPECIFICATIONS | PERMEABLE PAVEMENT

## Permeable Pavement



**Concrete Grid Pavers**

BMP SPECIFICATIONS | PERMEABLE PAVEMENT

## Permeable Pavement



**Plastic Reinforced  
Grid Pavers**



**Other:  
XeriPave; Flexi Pave**

BMP SPECIFICATIONS | PERMEABLE PAVEMENT

## Permeable Pavement

- **Micro scale**
  - 250 – 1,000 ft.<sup>2</sup>
- **Small scale**
  - 1,000 – 10,000 ft.<sup>2</sup>
- **Large scale**
  - >10,000 ft.<sup>2</sup>

BMP SPECIFICATIONS | PERMEABLE PAVEMENT

## Inspection: CONSTRUCTION

1. Protect area during construction
2. Stabilize drainage area
3. Excavation
4. Reservoir & bedding layers
5. Pavement surface

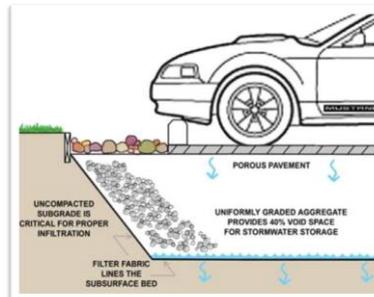


BMP SPECIFICATIONS | PERMEABLE PAVEMENT

1. Protect Area from Heavy Equipment & Construction Traffic
  - Keep Pavement Area Outside of Limits of Disturbance



Photo Credit: Rob Roseen,  
Geosyntec, Inc.



BMP SPECIFICATIONS | PERMEABLE PAVEMENT

## 2: Stabilize Drainage Area - Divert Water if Necessary – SEDIMENT IS THE ENEMY!



Installed too early during construction; fouled with construction sediment



Photo Credit:  
Conservation Design  
Forum



Clean work area, with curb to divert drainage around work site

BMP SPECIFICATIONS | PERMEABLE PAVEMENT

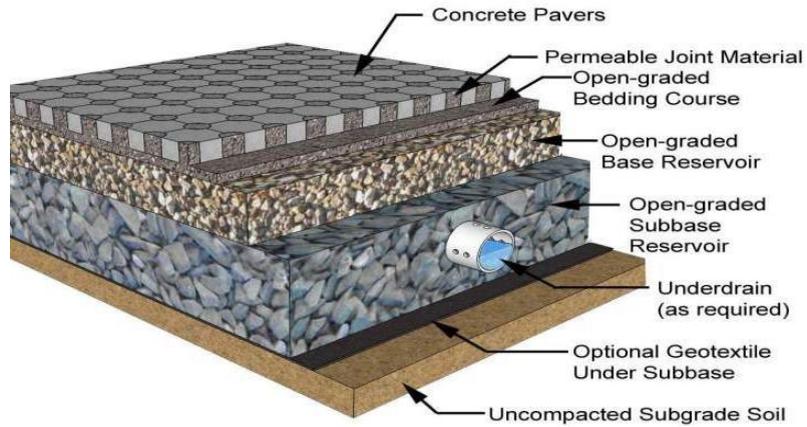
## 3: Excavation and Stone Reservoir Installation



In most cases, bottom of excavation should be FLAT.  
On slopes, individual cells should be flat.

BMP SPECIFICATIONS | PERMEABLE PAVEMENT

## 4: Reservoir & Bedding Layer



- Details vary – check on approved plan

## 5: Placement of Pavement Surface



# DESIGN SPECIFICATION

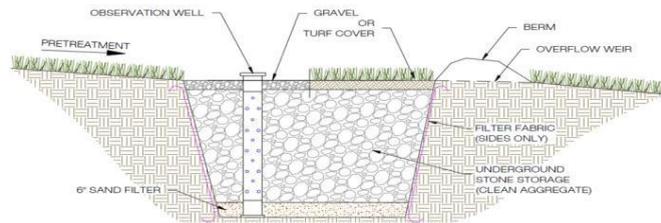
## No. 8 Infiltration Practices



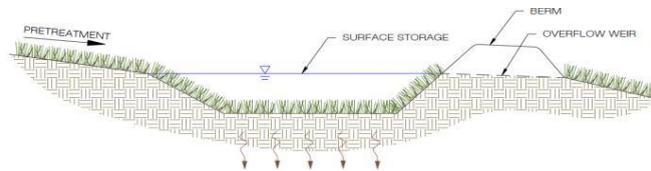
BMP SPECIFICATIONS | INFILTRATION PRACTICES

Spec. 8 | Pg. 3

## Types of Infiltration Practices



**Infiltration Trench**



**Infiltration Basin**

BMP SPECIFICATIONS | INFILTRATION PRACTICES

## Infiltration Trench



BMP SPECIFICATIONS | INFILTRATION PRACTICES

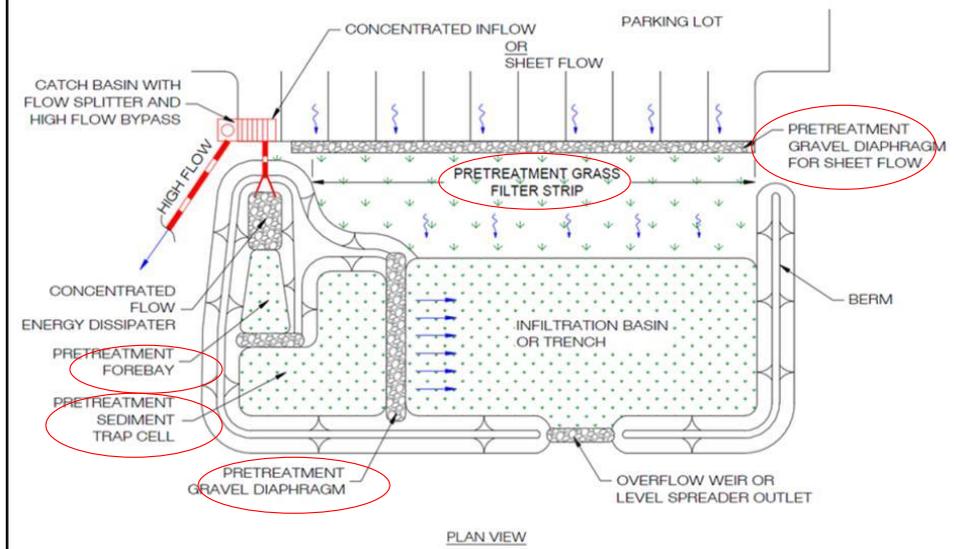
## Infiltration Basin



Source: epa.gov

BMP SPECIFICATIONS | INFILTRATION PRACTICES

## Multiple Types of Pre-Treatment



## Examples of Pre-Treatment

- Grass filter strips (pictured);
- Gravel diaphragm
- Sediment forebays



BMP SPECIFICATIONS | INFILTRATION PRACTICES

## Inspection: CONSTRUCTION

- Protect area during construction; follow proper sequence
- Soil testing
- Ready to install -E&S measures
- Excavation, filter & reservoir layers
- Pre-treatment
- Open drainage area connection



BMP SPECIFICATIONS | INFILTRATION PRACTICES

## Avoid Compaction, Disturbance During Construction



- Construction traffic
- Material storage, stockpiles
- Other sources of sediment
- Outside limits of disturbance if possible

BMP SPECIFICATIONS | INFILTRATION PRACTICES

## Soil Investigation: Verify It's Done



BMP SPECIFICATIONS | INFILTRATION PRACTICES

## Drainage Area Stabilized



BMP SPECIFICATIONS | INFILTRATION PRACTICES

## Equipment Operating From Sides



BMP SPECIFICATIONS | INFILTRATION PRACTICES

## Material Installation

- Filter fabric – on sides only
- Bottom of trench should be scarified
- Observation well
- Stone – installed in 1-foot lift
- Turf cover

BMP SPECIFICATIONS | INFILTRATION PRACTICES

## DESIGN SPECIFICATION

### No. 9 Bioretention & No. 10 Dry Swale

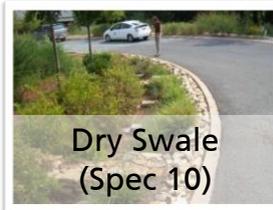


BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

## Applications/Types



Bioretention  
(Spec 9)



Dry Swale  
(Spec 10)



Urban  
Bioretention  
(Spec 9)



Residential Rain  
Garden  
(Spec 9)

BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

## Micro Scale Applications



- Drainage Area = 250 to 2,500 square feet (Mostly impervious)

BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

## Typical Scale Applications



## Basin Scale: Bioretention Basins



- Impervious Area Treated = Up to 5 acres & 2.5 acres of impervious

BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

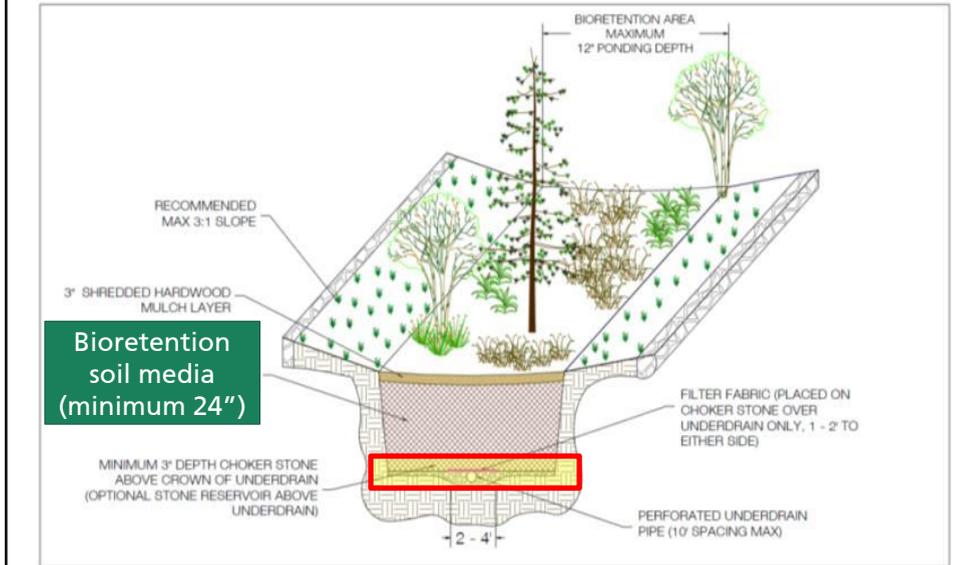
## Linear Applications: Dry Swale



BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

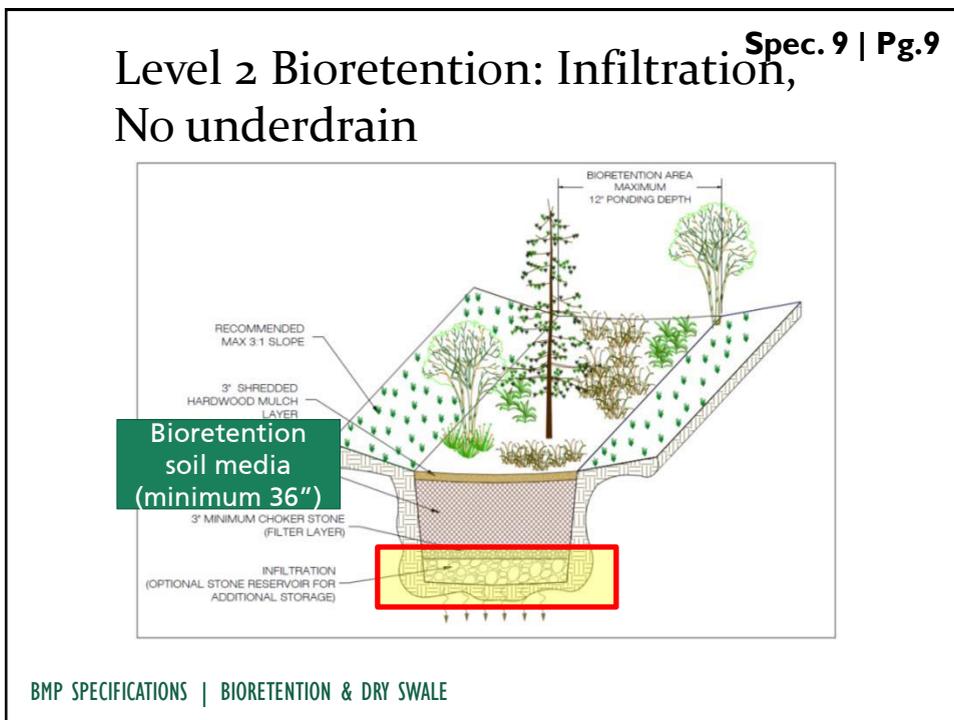
## Level 1 Bioretention: Underdrain, No infiltration sump

Spec. 9 | Pg.9



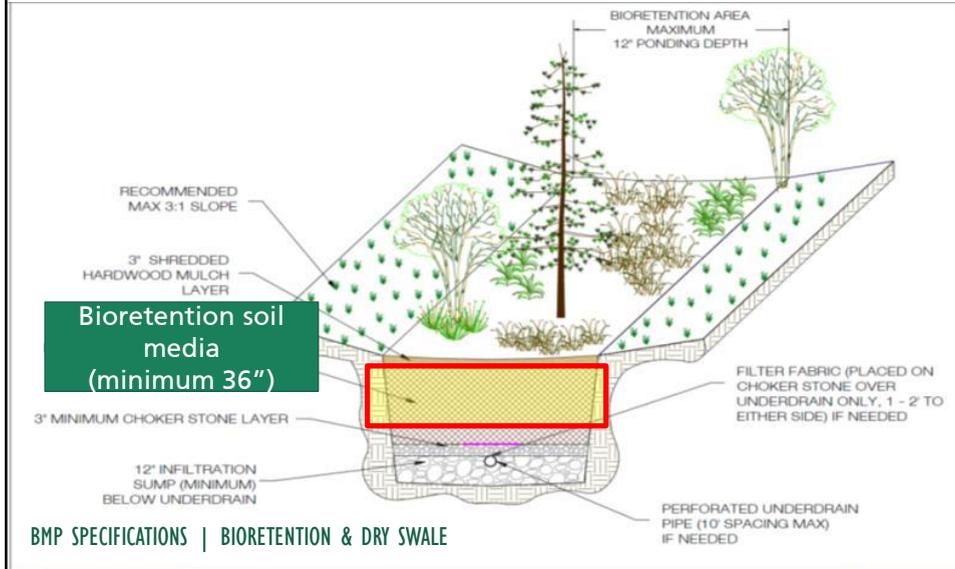
## Level 2 Bioretention: Infiltration, No underdrain

Spec. 9 | Pg.9

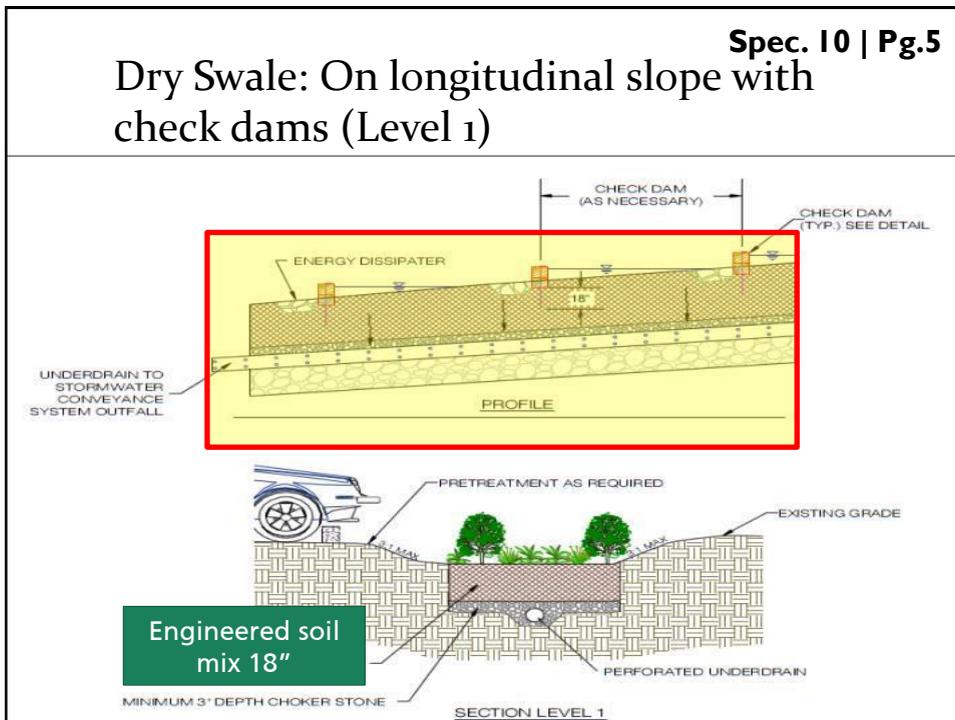


BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

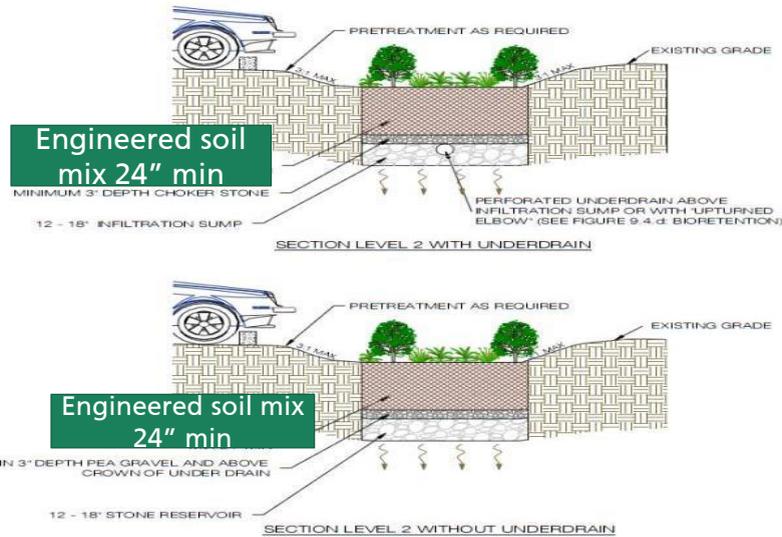
## Level 2 Bioretention: Infiltration sump as part of underdrain



## Dry Swale: On longitudinal slope with check dams (Level 1)



## Dry Swale: Longitudinal slope, check dams (Level 2)



## The BIG 5 Construction Issues

1. Stabilize drainage area
2. Check for Filter Fabric or Choker Stone
3. Verify Soil Media and Depth
4. Make Sure Water Gets In Inlets
5. Check for Level Filter Bed or Correct Slope for Dry Swales

1. Make Sure Drainage Area is Stabilized.  
Block Inlets and/or Divert Water if  
Necessary



BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

2. Check for Choker Stone Layer  
Between Underdrain & Soil; Filter Fabric  
on Sides Only (optional)



### 3. Verify Appropriate Soil Media and Depth



### 4. Make Sure Water Gets in Inlets!



## 5. Check for Level Filter Bed



Unlevel filter bed concentrates water in only one area ; uneven filtering



Level filter bed -just like a bathtub - even distribution of flow across surface

BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

## Longitudinal Slope for Dry Swales: Possible Use of Check dams



Examples of longitudinal slope with or without check dams

BMP SPECIFICATIONS | BIORETENTION & DRY SWALE

## DESIGN SPECIFICATION

### No. 12 Filtering Practices



BMP SPECIFICATIONS

**Spec. 12 | Pg. 1**

### Filtering Practices

- Treat stormwater runoff from small, highly impervious sites
- Specialized treatment at designated stormwater hotspots

BMP SPECIFICATIONS | FILTERING PRACTICES

## Types of Filters

Quite the range of system configurations and filter media:

- Surface Sand Filter
- Pocket Sand Filter
- Organic Filter
- Perimeter Sand Filter
- Underground Sand Filter
- Bioretention\*

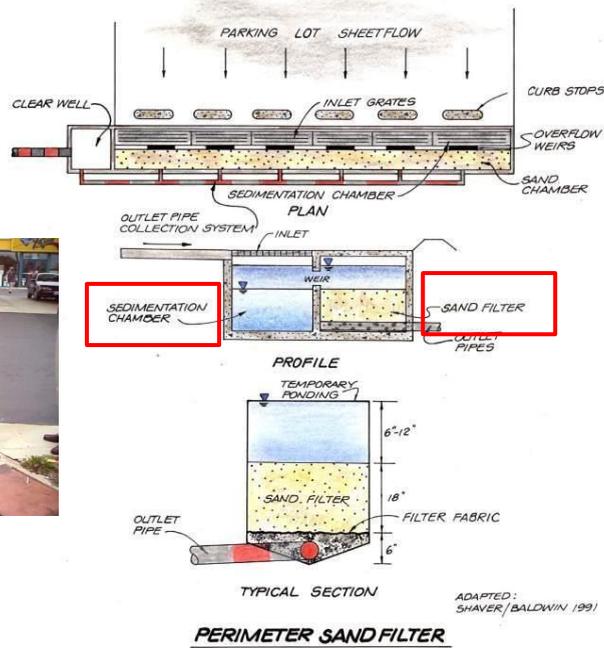


\*Bioretention is a form of a filter media, however it will not be covered in this session. Please refer to the Bioretention training module for a detailed presentation of Bioretention design.

## Types of Filters

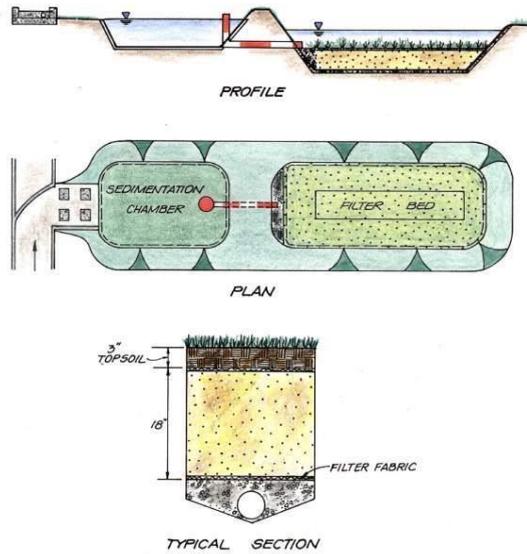


# Perimeter or Delaware Sand Filter



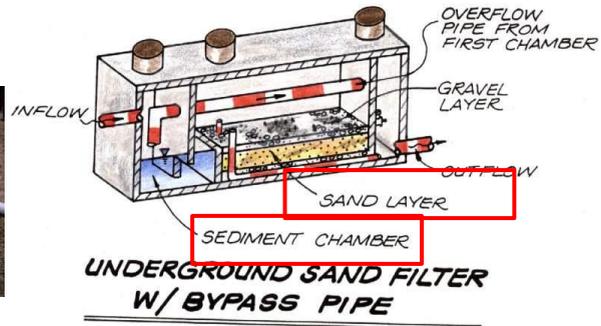
Copyright 2000, CWP

# Surface Sand Filter



Copyright 2000, CWP

## Underground Sand Filter



Copyright 2000, CWP

## Other: Organic Media Filters – Modular, Change-Out Design



## Other: Soil Filter – “Bioretention in a Box”



Spec. 12 | Pg. 13

### Inspection: **CONSTRUCTION**

- Ready to Install?
- Divert Drainage Area Connection
- Grading, Installation of Structure (e.g., concrete box)



BMP SPECIFICATIONS | FILTERING PRACTICES

## Inspection: CONSTRUCTION

- Installation of underdrain & filter media
- Vegetation, stabilization
- Open drainage area connection



BMP SPECIFICATIONS | FILTERING PRACTICES

## Drainage Area Stabilized?



BMP SPECIFICATIONS | FILTERING PRACTICES

## Stabilized?



BMP SPECIFICATIONS | FILTERING PRACTICES

## Inspection: **CONSTRUCTION**

- Inlets, Weirs, Flow Splitters – Clogging, Debris?
- Filter Bed – Sediment, Trash & Debris, Clogging, Standing Water 48 hours after storm
- Sedimentation Chamber – Need Cleaning Out?
- Observation Wells & Underdrain Clean-Outs – Check for standing water, blockages
- Drainage Area – Sources of sediment, oil, etc.?

BMP SPECIFICATIONS | FILTERING PRACTICES

## DESIGN SPECIFICATION

### No. 13 Constructed Wetlands & No. 11 Wet Swales



BMP SPECIFICATIONS

Spec. 13 | Pg. 1

## Constructed Wetlands



## Inspection: **CONSTRUCTION**

- Check approved plan
- Conversions from E&S basins
- Planting plan

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### Ready to Install?

- Drainage area stabilized?
- Secondary E&S measures in place?
- Water diverted around wetland during installation?

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## Conversions From ESC Facilities

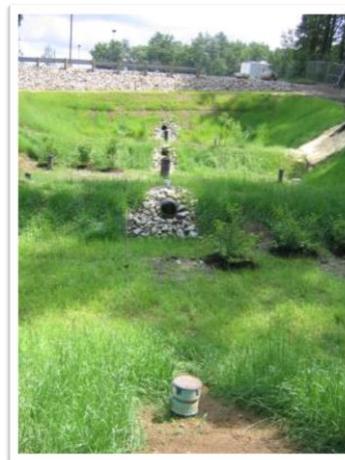
- Dewater
- Dredge
- Re-grade to rough design elevations



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## Construction Inspection: **Stage 1**

- Critical points:
  - Embankments & Spillways
  - Internal berms/weirs
  - Micro-topographic features
  - Stabilize exposed areas
  - May be necessary to divert drainage area during installation



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## Internal Weir To Create Cells, Long Flow Path - Elevations Are Critical



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## Gabion Weirs to Lengthen Flow Path



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## Multiple Cells: Forebay, Wetland Cells



Triangle Park Stormwater Treatment Wet Swale, Town of Rising Sun, MD

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## Construction Inspection: **Stage 2**

- Critical Points

- Soil amendments in wetland areas?
- Open drainage area connection
- Check vegetation zones, types, plant stock
- Consult with contractor, design professional on plant substitutions
- Goose protection
- Check inundation zones/status



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## After Planting: Protect Plants from Geese Predation



- Orange fence along perimeter
- Web of white string criss-crossing over wetland surface
- Keep in place until plants are big enough to not be enticing to geese

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## Initial Establishment



- Drainage area stabilized?
- Spot reseeding
- Watering of trees
- Reinforcement plantings

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## DESIGN SPECIFICATION

### No. 14: Wet Pond & No. 15: Extended Detention Ponds



BMP SPECIFICATIONS

## Wet Ponds & ED Ponds

### Wet Pond

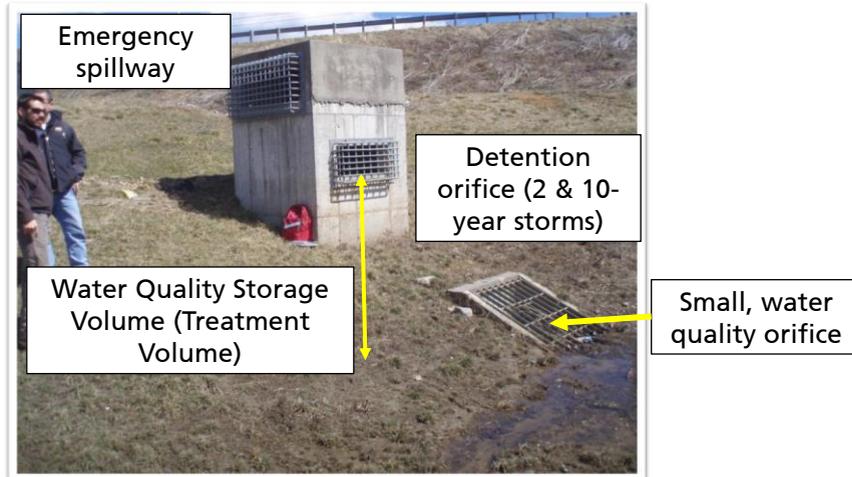
- Permanent pool
- Incoming water displaces pool water

### ED Pond

- Ponds only short time after storm
- Incoming water pools temporarily and allows settling

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## ED Pond (typical)



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## ED Pond (typical)



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## Wet Pond (typical)



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## Most ponds will do double duty as E&S basins during construction



BMP SPECIFICATIONS | WET POND & ED POND

**Spec. 14 | Pg. 17 and Spec. 15 | Pg. 13-14**

## Inspection: **CONSTRUCTION**

- Geotechnical
- Ready to convert from E&S basin?
- Dewater & dredge
- E&S measures during conversion
- Re-grade to design
- Riser & spillway configurations
- Design depth in pools
- Landscaping & final stabilization



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**Spec. 14 | Pg. 17 and Spec. 15 | Pg. 13-14**

## Coordination with E&S



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## Soils & Geotechnical

- Geotechnical tests should be conducted by operator to determine infiltration rates and other properties of soils underlying proposed pond

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## Dewatering Practices During Conversion



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# Appendices



- BMP Clearinghouse Appendices:
  - Earthen Embankments
  - Principal & Emergency Spillways
  - Sediment Forebay
  - Pond Landscaping

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