



# Welcome to Part Two of the ADOT Stormwater Best Management Practices (BMP) Implementation Tutorial

This presentation complements the ADOT Erosion and Pollution Control Manual for Highway Design and Construction (EPCM). It focuses primarily on **HOW** to implement stormwater BMPs on a construction site. Prior knowledge and experience with ADOT Stormwater BMPs and the EPCM will enhance understanding of the material presented in this tutorial.

2012

# Stormwater BMP Implementation Tutorial

## Part 2 of 3

The ADOT Stormwater BMP Implementation Tutorial is covered in three presentations. This tutorial is **Part Two** of Three.



### Part One

- BMP & SWPPP Overview and Strategies
- BMP Selection
- Principles of Implementing BMPs:
  - Construction Site Planning & Management BMPs
  - Erosion Control BMPs



### Part Two

- Principles of Implementing BMPs:
  - Runoff Control BMPs
  - Sediment Control BMPs



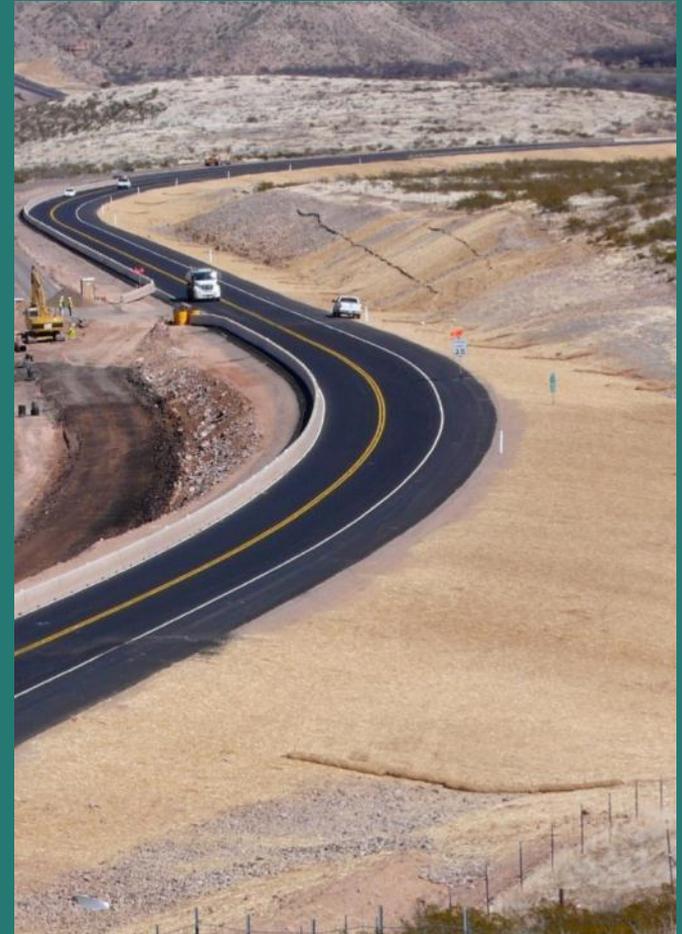
### Part Three

- Principles of Implementing BMPs:
  - Good Housekeeping BMPs
  - Non-Stormwater BMPs
  - Waste Management BMPs

The self-paced presentation is designed for individual use or for small group presentations where discussion can be accommodated. It is helpful to have the EPCM as a reference when viewing the tutorial.

## **Navigating the tutorial:**

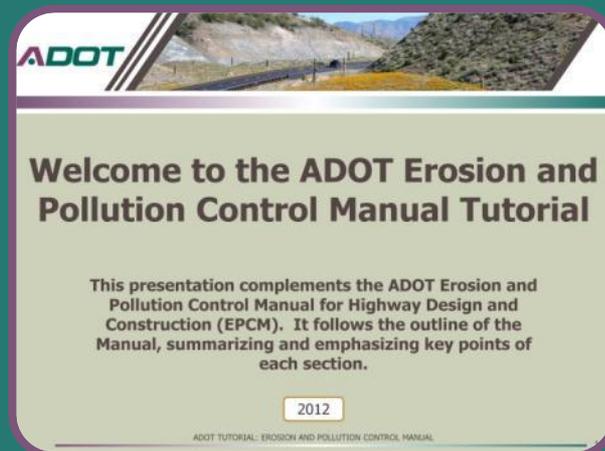
Click once to advance from slide to slide.



Stormwater Tutorials available via the ADOT Roadside Development Section website include:

- ADOT Erosion and Pollution Control Manual
- Mastering the SWPPP
- Stormwater Best Management Practices Implementation

[http://www.azdot.gov/Highways/Roadway\\_Engineering/Roadside\\_Development/Resources.asp](http://www.azdot.gov/Highways/Roadway_Engineering/Roadside_Development/Resources.asp)



# Best Management Practices

## BMP categories (covered in Parts 1, 2, and 3 of this Tutorial)

- Construction Site Planning and Management (*covered in Part 1 of this tutorial*)
- Erosion Control, 1<sup>st</sup> line of defense (*covered in Part 1 of this tutorial*)
  - Purpose is to keep soil in place, minimizing suspension and transport.
  - Primary means of preventing stormwater pollution, implemented at beginning of construction and during construction as needed.
- **Runoff & Sediment Control, 2<sup>nd</sup> line of defense**
  - Use in conjunction with properly designed and installed Erosion Control BMPs.
- Good Housekeeping, Non-Stormwater and Waste Management Principles (*covered in Part 3 of this tutorial*)
  - Day to day operations on a construction site to manage erosion and pollution control. These BMPs are implemented throughout the construction process.

Runoff control BMPs are the second line of defense

## Runoff Control BMPs

RC-1: Earth Dikes/Drainage Swales and Lined Ditches

RC-2: Cut to Fill Slope Transitions

RC-3: Erosion Protection at Structures

RC-4: Rock Outlet Protection / Velocity Dissipation Devices

RC-5: Slope Drains

RC-6: Check Dams



Used primarily as a diversion technique

## Definition

Structures and grading techniques that intercept, divert, and convey surface runoff, usually sheet flow, to a desired location.



## Implementation

1. Consider volume and velocity of runoff to be diverted.
2. Evaluate erodibility of soils.
3. Construct and fully stabilize before any major land disturbance.
4. Stabilize outlets.

Size and construct properly to reduce erosion

## Definition

Rock riprap/rock mulch placed along cut to fill slope transitions.



## Implementation

1. Prepare subgrade properly prior to rock riprap/rock mulch placement.
2. Size rock riprap/rock mulch based on anticipated flow velocity.
3. Embed rock riprap/rock mulch such that the top is 1"-2" below adjacent finish grade.
4. Field adjust to meet existing roadside ditch.
5. Terminate at a planned or existing stabilized drainage.

Rock riprap placed at cut to fill slope transition

**Soil / Structure interfaces are highly erodible**

## Definition

Rock riprap/rock mulch placed along the interface of soil to concrete or metal structures such as spillways, pipes or drainage structures.



## Implementation

1. Size rock riprap/rock mulch based on volume of runoff expected and slope characteristics.
2. Consider wire-tied rock riprap/rock mulch if installed on steep slopes.
3. Embed rock riprap/rock mulch such that the top is 1"-2" below adjacent finish grade.

Specify durable, angular material

## Definition

Rock riprap, grouted or wire-tied riprap placed at outlet ends of culverts, conduits, or channels.



## Implementation

1. Size rock riprap/rock mulch based on volume of runoff expected and slope characteristics.
2. Provide a sediment trap below the outlet if runoff is predicted to be sediment-laden.

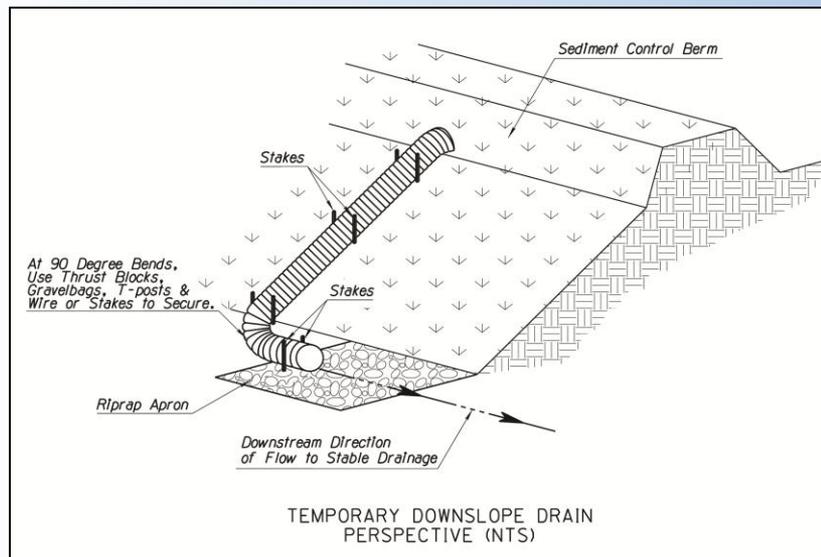
Most effective when used in combination with temporary embankment curb

## Definition

A temporary pipe drain used to intercept and convey runoff into a stabilized drainage.

## Implementation

1. Size pipe based on anticipated velocity and volume of flow.
2. Daylight pipe at stable drainage.



Consider effects of impounded water and sediment before implementing

## Definition

A small dam constructed across a roadside ditch or channel.



## Implementation

1. Calculate acreage that channel is draining to determine size and spacing.
2. Place rock material into the channel to create dam.
3. Ensure base of upstream dam is at same elevation as top of next downstream dam.
4. Remove dams only after contributing drainage area is stabilized.



**Sediment control BMPs are the second line of defense**

## Sediment Control BMPs

- SC-1: Sediment Control Berm
- SC-2: Silt Fence
- SC-3: Sediment Trap
- SC-4: Sediment Basin
- SC-5: Sediment Wattle
- SC-6: Sediment Log
- SC-7: Gravel Bag Protection
- SC-8: Storm Drain Inlet Protection
- SC-9: Curb Inlet Protection
- SC-10: Stabilized Construction Entrance/Exit
- SC-11: Stabilized Construction Roadway
- SC-12: Compost Sock
- SC-13: Rock Berm



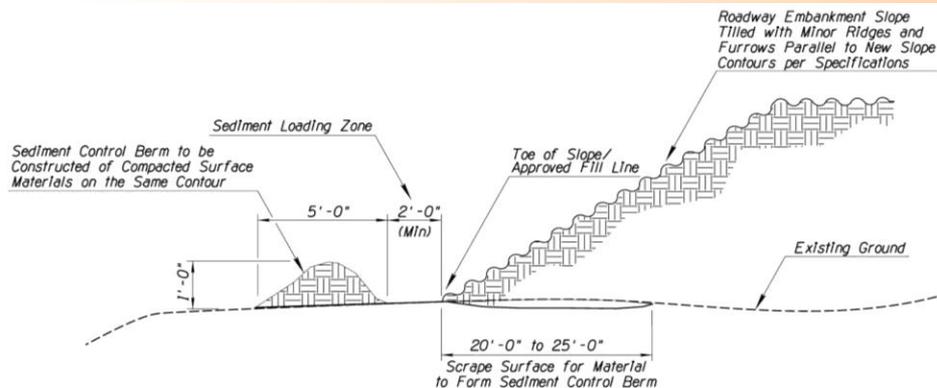
Consider utilizing in place of silt fence or sediment wattles

## Definition

A temporary barrier of salvaged topsoil, surface soils and/or compacted vegetation pushed into a small berm at top or toe of fill slopes.

## Implementation

1. Construct prior to placement of roadway embankment.
2. Construct along contour and allow for a two foot wide (minimum) sediment loading zone between toe of slope and berm.
3. Place outside of vehicle recovery area.
4. Construct in conjunction with topsoil salvage operations.
5. Stabilize berm to minimize erosion.



SEDIMENT CONTROL BERM SECTION (NTS)

**Silt Fence cannot be properly installed in rocky/hard soils**

## Definition

A temporary sediment barrier consisting of filter fabric that is entrenched into the soil and attached to posts and wire fence for support.



## Implementation

1. Locate at low or downslope areas of relatively small disturbance construction sites.
2. Properly entrench bottom of silt fence for maximum functionality, per details.
3. Overlap ends of silt fence where a continuous length of fence is not possible.
4. Remove accumulated sediment when 1/3 fence height is reached.

Consider ease of maintenance and inspection when locating

## Definition

An impoundment formed by excavation and/or constructing an embankment to temporarily detain sediment-laden runoff.



## Implementation

1. Use for drainage areas of 5 acres or less.
2. Ensure soils are suitable for infiltration.
3. Locate to minimize potential for groundwater contamination.
4. Construct so that bottom of sediment trap is flat.
5. Ensure that depth of spillway remains 1.5 feet below low point of trap embankment.
6. Remove accumulated sediment when 50% sediment capacity is reached.

Where safety is a concern, plan for protective fencing around basin perimeter

## Definition

A temporary basin formed by excavation and/or constructing an embankment so that sediment-laden runoff is temporarily detained.



## Implementation

1. Use for drainage areas of 5-100 acres.
2. Ensure soils are suitable for infiltration.
3. Locate to minimize potential for groundwater contamination.
4. Inspect after each rainfall to ensure functionality.

Proper staking and entrenching are critical to wattle effectiveness

## Definition

Excelsior wood fiber, wheat or rice straw, or compost bound into a tight tubular roll secured with long-term biodegradable natural fiber netting or UV-degradable polypropylene netting.



## Implementation

1. Size and space wattles according to slope ratio.
2. Abut adjacent wattles tightly.
3. Must be properly trenched and staked to ensure continuous contact with ground.
4. Place along contours, perpendicular to slope.
5. Turn terminal ends of wattles upslope 45 degrees.

Consider use as a check dam for small runoff volumes in ditches or channels

## Definition

Excelsior wood fiber bound into a tight tubular roll secured with long-term biodegradable natural fiber netting or UV-degradable polypropylene netting.



## Implementation

1. Trenching or burial is not necessary except when used at toe of slope.
2. Maintain continuous contact with ground.
3. Remove accumulated sediment when it reaches one-half the height of the log.



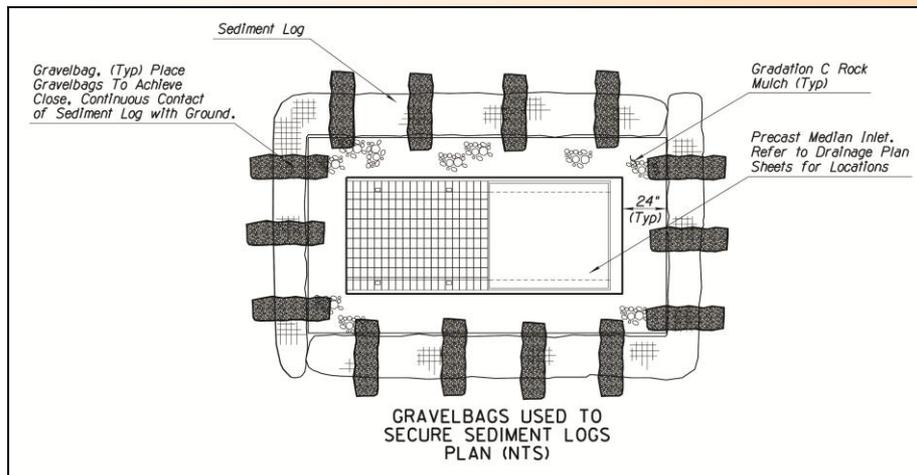
Be sure to specify Gravel bags, not Sand bags

## Definition

Bags made of a woven geotextile material, filled with angular gravel.

## Implementation

1. Utilize in situations where staking a wattle or log is not possible.
2. Stack bags using an overlapping, stair-stepped approach.
3. Abut ends of adjoining gravel bags tightly.



Typically used for areas draining one acre or less

## Definition

Combination of sediment log, fabric filter and rock riprap/rock mulch surrounding or placed at storm drain inlets.



## Implementation

1. Select type of protection based on site conditions and construction sequencing.
2. Identify inlets to be protected and implement before disturbance occurs.
3. Prepare and excavate soil prior to implementation.
4. Place, do not dump, rock riprap/rock mulch around drain inlets.



Make sure to use in combination with upslope BMPs

## Definition

A temporary filtering device placed in the flow line of completed curb inlets before final stabilization has been achieved.



## Implementation

1. Identify inlets to be protected and install before disturbance occurs.
2. Select type of protection based on site conditions and construction sequencing.
3. Maintain regularly to keep accumulated sediment and debris out of vehicular travel ways and storm sewer.



Consider including a tire wash area to improve BMP performance

## Definition

Temporary placement of gravel or gravel in combination with shaker plates or rumble strips where traffic will enter and exit a construction site.



## Implementation

1. Implement at all entrances/exits prior to construction disturbance.
2. Size the gravel pad to accommodate all vehicles, allow for two vehicles to pass side-by-side.
3. Install filter fabric between gravel and soil.
4. Add gravel or stone as needed to maintain effectiveness.
5. Construct new stabilized entrances as construction progresses, as necessary.

Consider where mud tracking or dust are a concern

## Definition

A temporary access road connecting existing public roads to a remote construction area.



## Implementation

1. Design to support the heaviest anticipated vehicles and equipment.
2. Consider project duration, required performance, and site conditions when determining roadway stabilization method .
3. Limit speed of vehicles to control dust.
4. Grade roadway to prevent runoff from leaving the construction site.

Can be used as an alternative to silt fence, wattles, logs & inlet protection

## Definition

Tubular netting filled with composted material that is placed perpendicular to sheet-flow runoff.



## Implementation

1. Ensure uniform contact of sock with ground.
2. Refer to manufacturer's specifications for minimum anchoring requirements. Site conditions may dictate additional anchoring.
3. No trenching required for installation.
4. Select appropriate diameter sock based on use.

## A BMP for highly erosive slopes

### Definition

A stabilization method consisting of angular riprap trenched into the slope face parallel to slope contours.



### Implementation

1. Take care to preserve vegetation in place on existing slopes.
2. Select a color of riprap that will blend with the adjacent landscape.
3. Adjust berm spacing based on soil erosivity: decrease spacing if soils are more erosive, increase spacing if soils are less erosive.
4. Receive approval from ADOT prior to implementing this BMP.

# BMP Strategies

## Remember these BMP Implementation Strategies to Maximize Effectiveness

- Use multiple types of BMPs in combination with one another to be most effective.
- Progressively size BMPs down the watershed.
- Limit the amount of disturbed area on site at any one time.
- Achieve final stabilization of disturbed areas as the project progresses.



Sediment wattles  
installed on contour

Rock mulch  
headwall protection

Hydroseed  
on tilled soil

Erosion control  
blanket

Vegetation  
preserved-in-place

# Knowledge Check

## Do you...

- Understand the purpose and intent of the ADOT stormwater BMPs in fulfilling the requirements of water quality regulations?
- Know how to select BMPs specific to the project?
- Have familiarity with the BMP categories and understand the optimal implementation sequence on a project?
- Understand the importance of using combinations of BMPs for the most effective stormwater pollution prevention?
- Know how to implement BMPs on the construction project site?



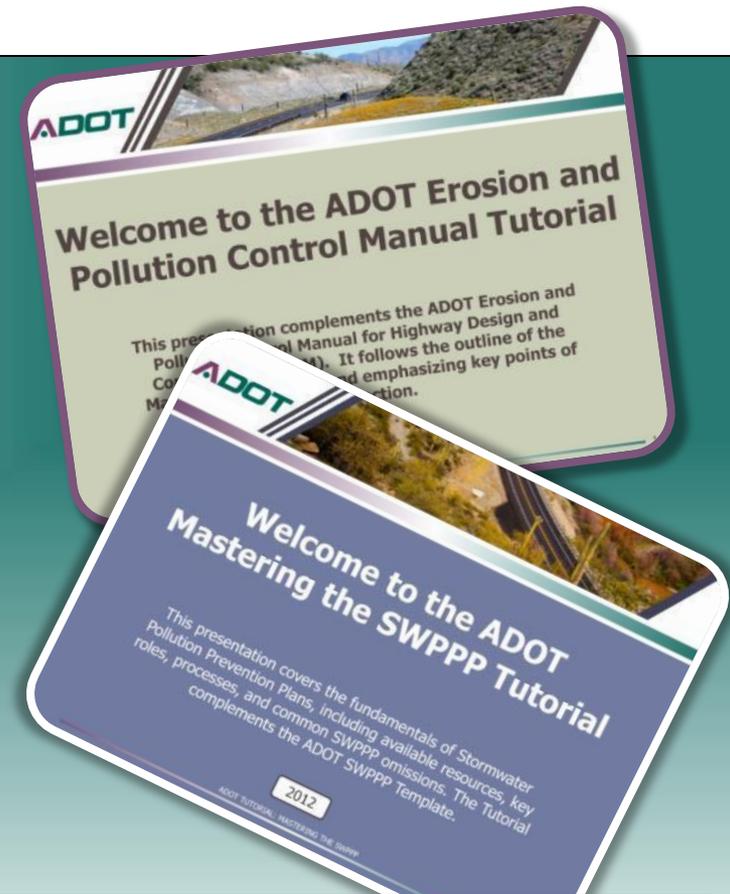
# ADOT Stormwater Tutorials

Watch more, Learn more...

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# BMP Smart

A BMP a day keeps the sediment and erosion control doctor away



Thank you for viewing **Part 2** of the Stormwater Best Management Practices Implementation Tutorial. Contact ADOT Roadway Engineering Group, Roadside Development Section, with comments or questions regarding material contained in this presentation.