



Welcome to Part One 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 1 of 3

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



Part One

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



Part Two

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



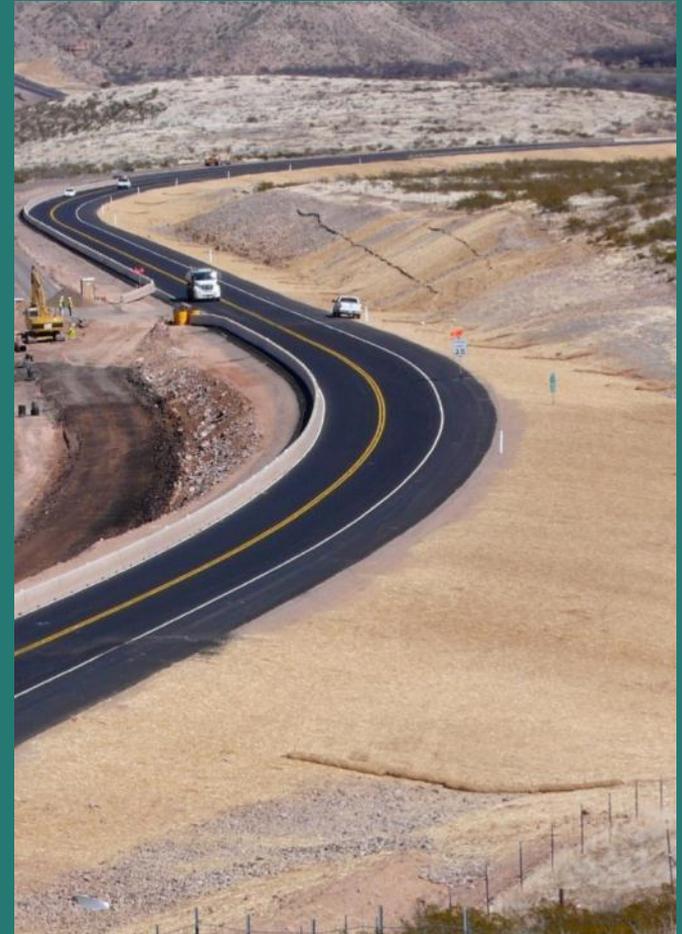
Part Three

- 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:

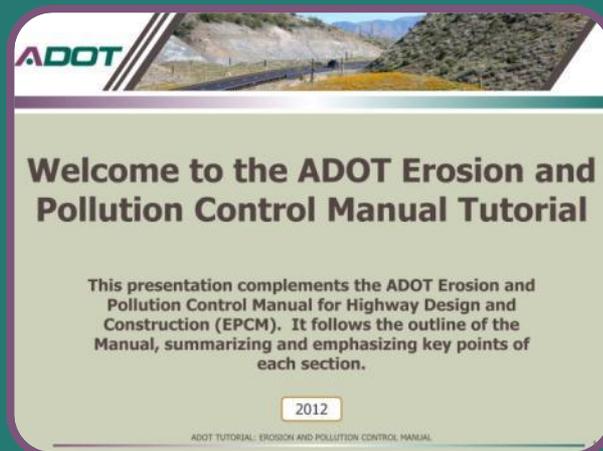
Click once to advance from slide to slide.



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



Resources available on the ADOT Stormwater Website include:

- ADOT SWPPP Template and Instructions
- ADOT Statewide Stormwater Discharge Permit
- ADOT Maintenance and Facilities BMP Manual
- Outstanding, Impaired, and Not-Attaining Waters Maps by County

http://www.azdot.gov/inside_adot/OES/Water_Quality/Stormwater/index.asp

Non-ADOT Stormwater Resources:

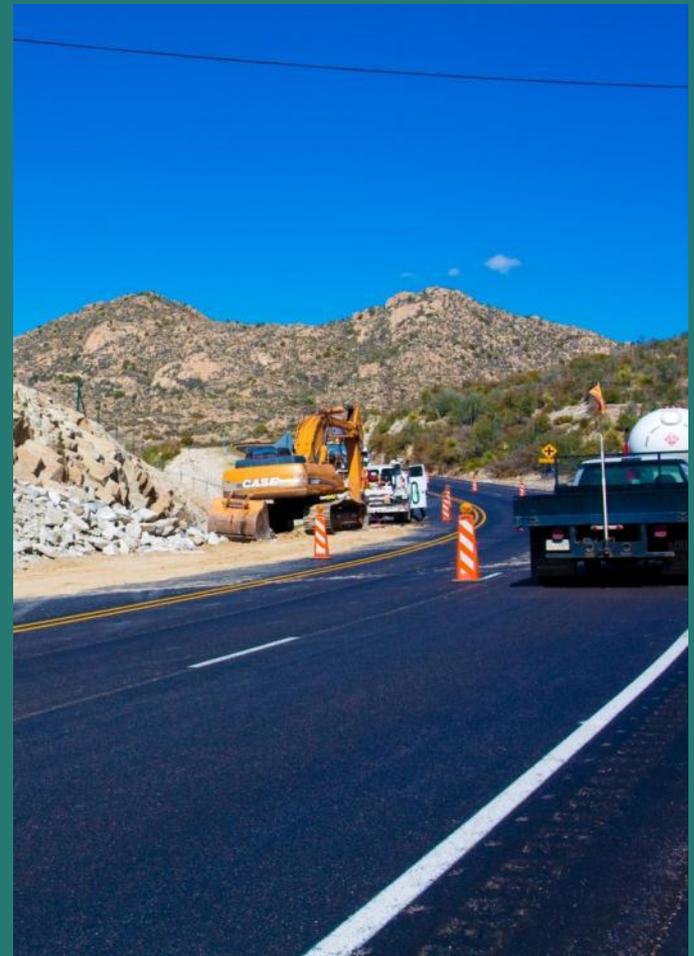
- ADEQ Water Quality Division (Smart NOI System, Permits)

<http://www.azdeq.gov/environ/water/permits/index.html>

- EPA “Developing Your Stormwater Pollution Prevention Plan – A Guide for Construction Sites”

<http://www.epa.gov/npdes/swpppguide>

ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AZCGP	Arizona Construction General Permit
AZPDES	Arizona Pollutant Discharge Elimination System
BMP	Best Management Practice
EPCM	Erosion and Pollution Control Manual
ECC	Erosion Control Coordinator
EPA	Environmental Protection Agency
Engineer	ADOT Resident Engineer or Resident Landscape Architect
FCGP	Federal Construction General Permit
NOI	Notice of Intent
NOT	Notice of Termination
SWPPP	Stormwater Pollution Prevention Plan

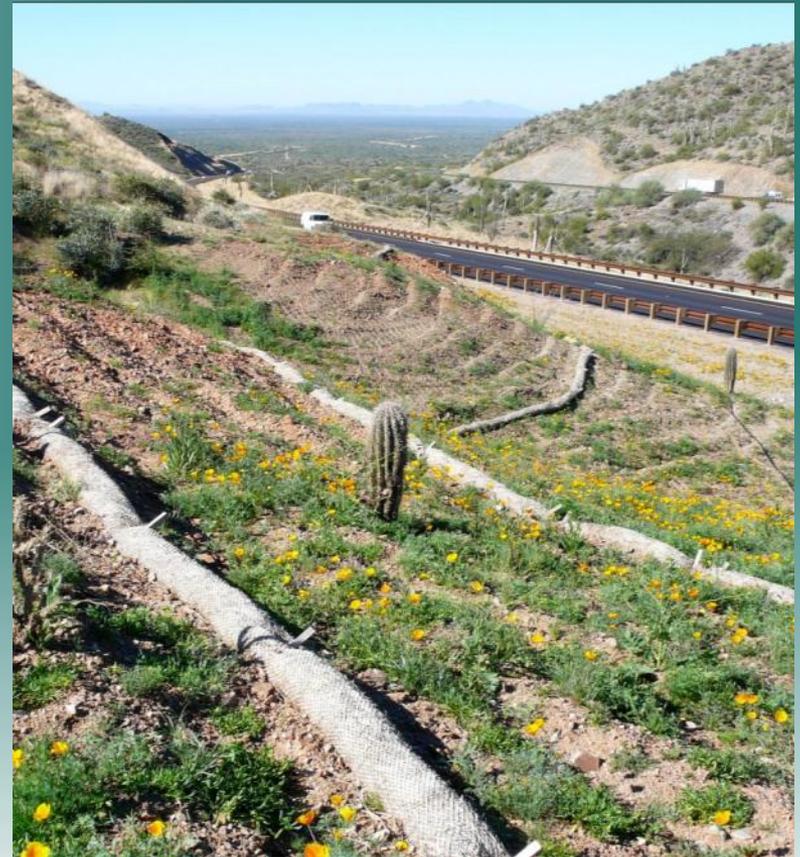


BMP Implementation Tutorial

Successful BMP implementation depends on many factors that begin in planning and continue through post-construction maintenance

The BMP Implementation Presentation Addresses:

- Stormwater Pollution Prevention Plans (SWPPP) and BMPs.
- Process of Selecting BMPs.
- Categories and Principles of Using BMPs.
 - Erosion Control
 - Runoff Control
 - Sediment Control
 - Good Housekeeping
 - Non-Stormwater
 - Waste Management
- Implementation Strategies.



Tutorial Objectives

After viewing this tutorial, you should...

- Understand the purpose and intent of the ADOT stormwater BMPs in fulfilling the requirements of Clean Water Act quality regulations .
- Grasp the approach and process in selecting BMPs specific to the project.
- Know the general BMP Categories and 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.

Please note that this tutorial is designed to accompany ADOT's Erosion and Pollution Control Manual and Details. These resources should be consulted when selecting and implementing BMPs for a construction project. The tutorial is a general overview of BMPs and is not intended to stand alone as a reference.

Stormwater Pollution Prevention Plan

A SWPPP is the combination of documents, plans, checklists and permit requirements that....

- Identifies controls to minimize the negative impacts from stormwater discharges to waters of the US. These controls minimize erosion and run-off of sediment and other pollutants.
- Establishes procedures for minimizing pollution from stormwater discharges. These procedures emphasize the use and proper implementation of Stormwater Management BMPs.

Stormwater Pollution Prevention Plan

ADOT Project Name: _____
Federal Aid No.: _____
ADOT Project No.: _____
Route: _____ Begin Milepost: _____ End Milepost: _____
Begin Latitude: _____ End Latitude: _____
Begin Longitude: _____ End Longitude: _____

Provide the latitude/longitude of the construction site at the point nearest the receiving water. Latitude: _____ Longitude: _____

Submittal Number: 1 Date: _____
 2 Date: _____
 3 Date: _____

Identify receiving water: _____
Is this project located within ¼ mile of unique or impaired waters? Yes No

Prepared for:

Prepared by:

Owner:

Arizona Department of Transportation
207 S. 17th Avenue
Phoenix, AZ 85007-3213

NOI No.: ????

SWPPP – Inspect, Adjust, Maintain, and Document

A SWPPP is a living document that will be modified as the project progresses

- Inspect the site regularly to ensure that BMPs are functioning properly.
- Inspection Reports and records of any follow-up actions taken shall be retained as part of the SWPPP.
- Adjust the SWPPP to fit site conditions. BMPs may need to be added or modified based on performance.
- The SWPPP must be kept current with the changes and adjustments made in the field.
- Maintain all BMPs in effective operational condition.



This failed BMP needs to be replaced and likely augmented with additional measures to ensure effectiveness.

Best Management Practices

What are BMPs?

- Both physical (structural) controls and/or operational activities (non-structural) that reduce erosion and discharge of pollutants and minimize potential impacts upon receiving waters.
 - Physical controls include soil stabilization and sediment control.
 - Operational activities include good housekeeping practices, spill control and response plan, employee training, and routine site inspections.

When are BMPs Selected?

- BMP selection begins in the design phase and is coordinated among ADOT, the Landscape Architect and the Engineer. Erosion/Sediment Control and Water Quality Protection Plans, which include BMP selection and placement, are developed to guide the Contractor.
- Prior to construction, Contractor prepares SWPPP and selects site-appropriate BMPs.
- During construction, the Contractor may need to select alternate BMPs based upon construction site conditions and BMP performance.

BMP Implementation

Follow these steps to BMP success

Successful BMP Implementation depends on many factors including:

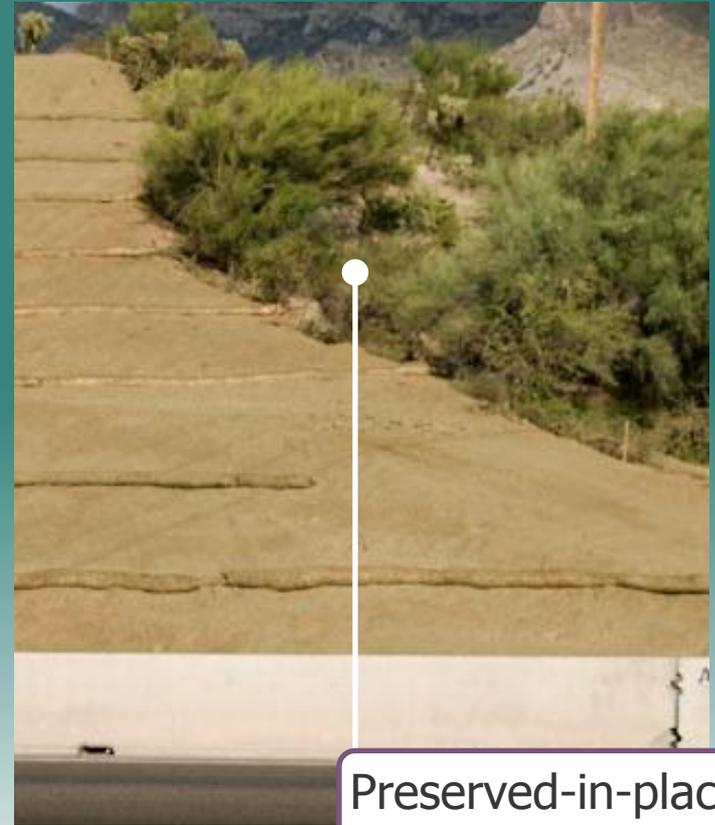
- Thorough project site assessment prior to BMP installation.
- Comprehensive review of plans, details, and specifications.
- Development of the SWPPP, including accurate maps of BMP locations.
- Identification of strategies to limit extent of disturbance.
 - Maximize the preservation of existing vegetation.
 - Limit the steepness of cut slopes to increase probability of successful vegetation.
- Routine monitoring and inspection of BMPs.
- In-the-field BMP changes / adjustments as necessitated by site conditions and / or performance.

BMP Implementation Process

Proper planning will help achieve SWPPP compliance

BMP Implementation typically follows a similar process on all projects:

- Construction Site Planning and Design.
- Identification of Preserve-in-place Vegetation.
- Establishment of Construction Entrances/Exits.
- Placement of Diversion/Run-On or Perimeter Controls.
- Implementation of Erosion and Runoff Controls.
- Implementation of Sediment Controls.



Preserved-in-place
vegetation

BMP Strategies

Maximize BMP effectiveness

- Use BMPs in combination to maximize effectiveness.
- Progressively size BMPs down the watershed.
- Achieve final stabilization of disturbed areas as the project progresses.
- Inspect, maintain and repair or replace BMPs.
- Conduct on-going employee training.
- Document inspections, performance and maintenance.



Sediment Log
Check Dams

Soil Roughening
and Mulch Cover

Inlet Protection
composed of
Rock Mulch and
Sediment Wattle

Best Management Practices

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

- **Construction Site Planning and Management**
- **Erosion Control, 1st line of defense**
 - 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, 2nd line of defense** (*covered in Part 2 of this tutorial*)
 - 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.

Plan, inspect, and maintain for successful and compliant projects

CP BMPs

CP-1: Construction Sequencing

CP-2: BMP Inspection and
Maintenance



Plan for success

Definition

The development of a work schedule for every project that includes sequencing of construction and land disturbing activities in conjunction with the implementation of construction site BMPs.

ID	Task Name	Duration	Start	Finish	May 15, '11							May 22, '11									
					W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
1	DARK STAR/ SR-90	7 days	Thu 5/19/11	Fri 5/27/11																	
2	QWEST	7 days	Thu 5/19/11	Fri 5/27/11																	
3	FENCE/GATES	5 days	Thu 5/19/11	Wed 5/25/11																	
4																					
5	I-10 NEW WEST BOUND AND EAST BOUND	16 days?	Thu 5/19/11	Thu 6/9/11																	
6	SWPPP	7 days	Thu 5/19/11	Fri 5/27/11																	
7	SUBGRADE PREP	2 days	Thu 5/19/11	Fri 5/20/11																	
8	TRUCK HAUL	14 days	Thu 5/19/11	Tue 6/7/11																	
9	STORMDRAIN	14 days	Thu 5/19/11	Tue 6/7/11																	
10	ELECTRICAL	14 days	Mon 5/23/11	Thu 6/9/11																	
11	BC5	5 days	Thu 5/19/11	Wed 5/25/11																	
12	FENCE	7 days	Thu 5/19/11	Fri 5/27/11																	
13	ABC	2 days	Thu 5/19/11	Fri 5/20/11																	
14	PAVE (W/B MAINLINE)	1 day?	Fri 5/20/11	Fri 5/20/11																	
15																					
16	SR-90	12 days	Thu 5/19/11	Fri 6/3/11																	
17	SOIL NAIL (PERMANENT WEST/EAST)	12 days	Thu 5/19/11	Fri 6/3/11																	
18																					
19	GRAVES BORROW SITE	14 days	Thu 5/19/11	Tue 6/7/11																	
20	EARTH WORK	14 days	Thu 5/19/11	Tue 6/7/11																	

Implementation

1. Install stabilization measures as work progresses.
2. Contractor limited to no more than 750,000 SF of exposed area at any one time.
3. Monitor weather forecast to ensure implementation of appropriate BMPs prior to rain events.
4. Monitor in-place BMPs and modify to minimize impacts to water quality.

BMPs are only as good as their installation and maintenance

Definition

Routine (planned) and non-routine (repair) BMP inspection and maintenance can help identify potential problems and are critical to successful construction site stormwater management.



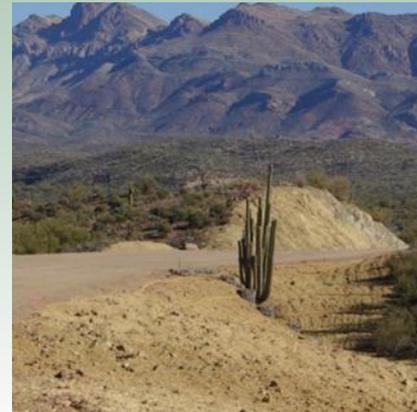
Implementation

1. Adhere to inspection schedule developed per applicable requirements.
2. Stockpiles of materials may be necessary to ensure timely BMP repair and/or replacement.
3. Contractor and Engineer regularly inspect and maintain each BMP throughout the construction process.

Erosion control BMPs are the first line of defense

Erosion Control BMPs

- EC-1: Preserve Existing Vegetation
- EC-2: Minibenches/Slope Roughening
- EC-3: Mulch Cover
- EC-4: Seeding
- EC-5: Geotextiles/Erosion Control Blankets
- EC-6: Soil Binders
- EC-7: Crown Ditch



Preserve Existing Vegetation

Maximizing protection of vegetation minimizes soil exposed to erosive forces

Definition

The planned protection of in-place, undisturbed natural vegetation within the construction site right-of-way.



Implementation

1. Preserve existing natural features, vegetation and soil in-place.
2. Adjust cut and fill lines during design to avoid vegetation.
3. Stage clearing, grubbing and grading operations to maximize preserve-in-place vegetation.
4. Identify and clearly mark vegetation not in direct conflict with construction.
5. Locate temporary roads and staging areas to avoid vegetation
6. Utilize landform grading practices required for slope rounding.

Minibenches / Slope Roughening

Roughened soil slows runoff, increases infiltration, traps sediment, and improves seed germination

Definition

Increasing the relief of a bare soil surface by stepping, ripping or tilling to create horizontal and vertical undulations on the soil surface. Minibench vertical dimensions range from 1-2', horizontal dimensions vary according to slope ratio; ripping and tilling yields furrows 1' apart and 6-12" deep.



Implementation

1. Evaluate slope ratio, soil type and equipment availability to determine method of roughening.
2. Construct from the top of a cut slope down DURING slope construction.
3. Seed roughened areas as slopes are constructed.



Temporary stabilization measure that also aids in seeding establishment

Definition

Placement of a layer of organic material on slopes and other disturbed areas and incorporating it into the soil through mechanical means or by a tackifier that adheres the material to the soil surface.

Implementation

1. Evaluate slope ratio, soil type and equipment accessibility to determine type of mulch cover to use.
2. Apply as grading proceeds.
3. Crimp or tack any mulch material that may be prone to wind erosion.



Perennial vegetation cover is the ultimate soil stabilizer

Definition

The ADOT seeding process includes tillage and amending the soil prior to seed application, and straw mulching after seed application to protect exposed soils from erosion by water and wind.



Implementation

1. Adhere to Section 805 of the ADOT Specifications, including:
 - Evaluate site conditions (soil type, topography, climate and season, etc.) to determine appropriate seed species and rate of application.
 - Follow the ADOT seeding steps.



Proper selection, design, and installation are critical to ensure effectiveness

Definition

Installation of a natural (excelsior, straw, coconut, etc.) or synthetic material made of woven or bonded fibers onto disturbed areas to reduce soil erosion by wind or water.



Implementation

1. **Limited Application: Must obtain approval from ADOT Roadside Development Section prior to use.**
2. Evaluate soil type, slope ratio and topography to determine appropriate geotextile material.
3. Properly prepare site (till soil) based on type of geotextile material used.
4. Properly anchor material to ensure continuous contact with the ground.

Consider implementing in areas that will be re-disturbed

Definition

Soil stabilizing materials such as polymeric, psyllium or guar products may be applied to soil surface to temporarily prevent water or wind erosion.



Implementation

1. Evaluate soil type, slope ratio, topography and wind velocity to determine appropriate soil stabilizer.
2. Protect adjacent vegetation, vehicular ways, and structures from overspray.
3. Inspect after rainfall – reapplication may be necessary.



Implement at the tops of slopes

Definition

Structures that intercept, divert and convey surface run-on, usually sheet flow over slopes, to minimize erosion.



Implementation

1. Determine stormwater flow, velocity and volume prior to implementation.
2. Evaluate top of slope vegetation and soil infiltration rates.
3. Periodically divert water by warping ditch into undisturbed slopes.
4. Provide stabilized outlets.

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

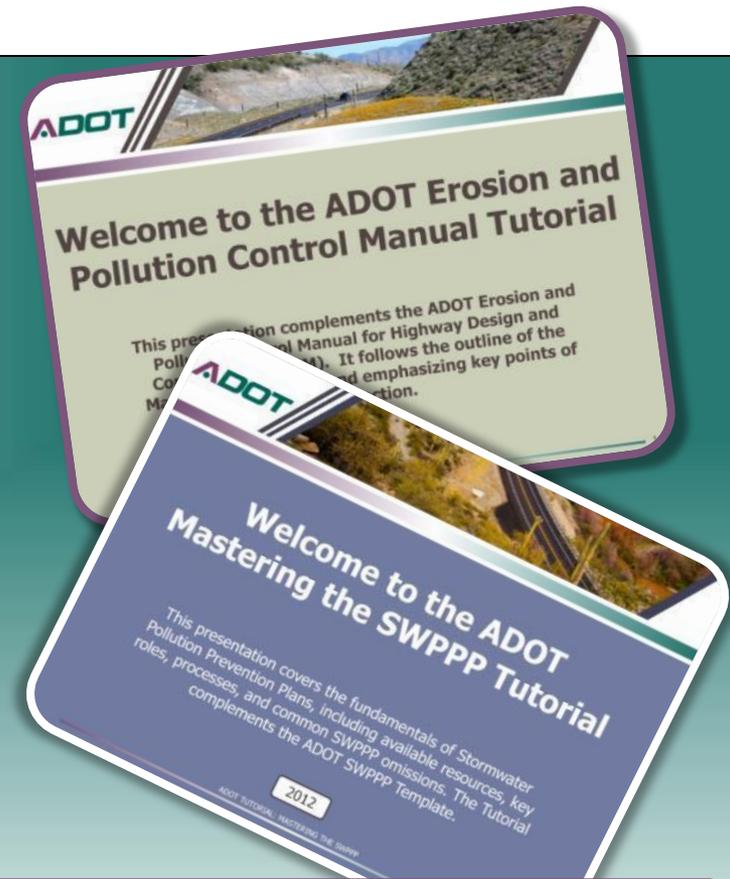
Watch more, Learn more...

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BMP Smart

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



Thank you for viewing **Part 1** 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.