Arizona Department of Transportation
Guidelines for Highways on Bureau of Land Management and U.S. Forest Service Lands 2008

Chapter Overview Presentations

Twelve Chapter Overview presentations supplement the Guidelines document. Chapters 1-11 each have a Chapter Overview and an additional one summarizes appendices A-O.

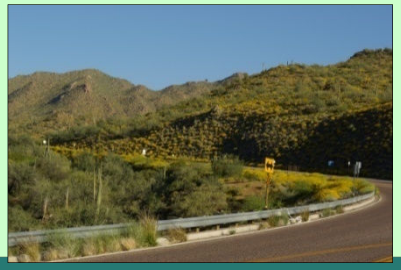
These self-paced presentations are designed for individual use or for small group presentations where discussion can be accommodated. It is helpful to have the Guidelines document as a reference when viewing the presentations.

The Chapter Overview presentations are available on the ADOT Roadside Development Section website.
http://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadway-design-standards-and-guidelines/guidelines-for-highways-on-bureau-of-land-management-and-us-forest-service-lands

Navigate the Chapter Overview by scrolling through the pages.

Arizona Department of Transportation
Guidelines for Highways
on
Bureau of Land Management and
U.S. Forest Service Lands
2008

Chapter 4: Roadway Design and Construction

Acknowledgments:

Arizona Department of Transportation

Guidelines for Highways
on
Bureau of Land Management and
U.S. Forest Service Lands

Steering Committee Members & Contributors

ADOT
Members:
LeRoy Brady
Richard Duarte*
Doug Forstie
John Louis*
Mary Viparina
Todd Williams

Contributors:
Thor Anderson
Nicole A. Carpenter
Lonnie Hendrix
Paul Langdale
Siobhan Nordhaugen

FHWA
Members:
Ken Davis
Steve Thomas

Contributors:
Layne Patton

BLM
Members:
Carol Kershaw*
Angela Mogel

Contributors:
John Reid

USFS
Members:
Marjorie Apodaca
Mathew O'Grady*
Bill Woodward*

Contributors:
Terry Brennan
Rob Ingram

* Past Member

Prepared by Wheat Scharf Associates and the Guidelines Steering Committee

Guidelines Contents

1 Introduction

2 ADOT Development Process on BLM and USFS Lands

3 Habitat Connectivity

4 Roadway Design and Construction

5 Major Structure Design and Construction

6 Drainage Design and Construction

7 Landscape Restoration

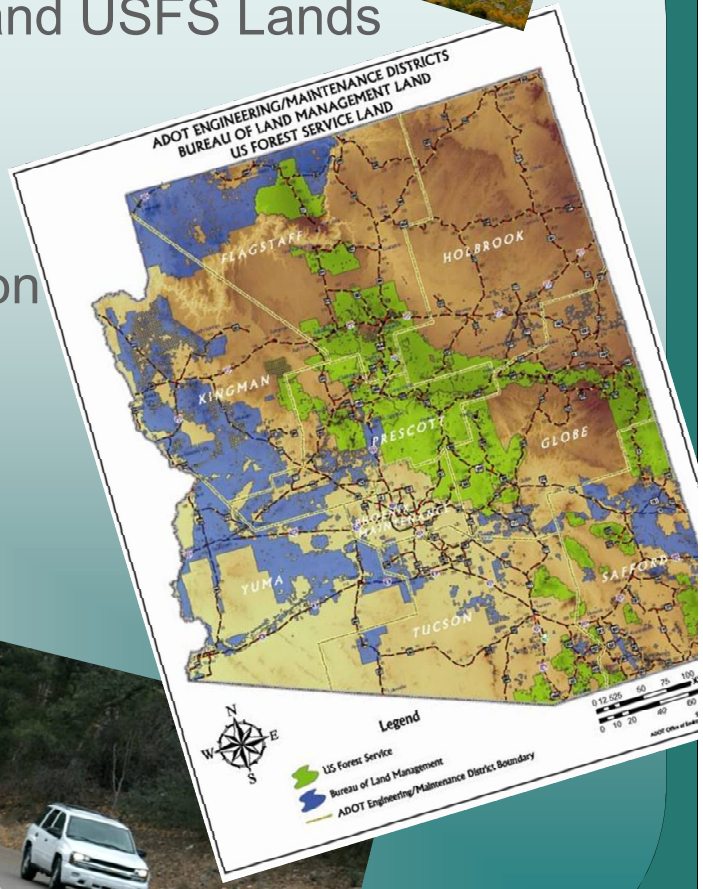
8 Storm Water and Pollution Control

9 Material Sites

10 Construction

11 Maintenance Operations

Appendices A - O



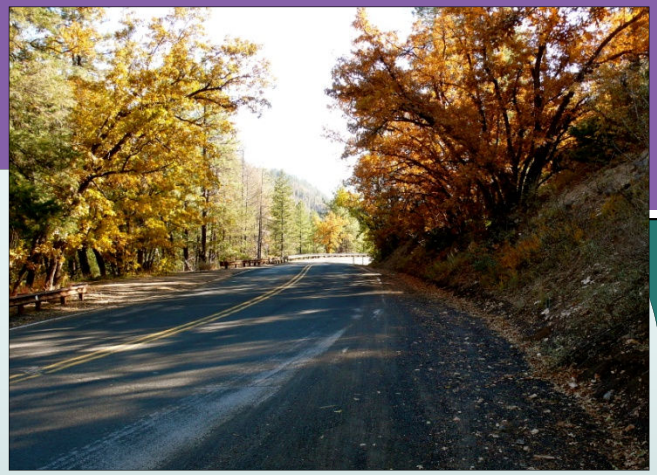
After reviewing the Chapter 4 Tutorial you should…

- Understand how successful integration of the highway corridor into the surrounding natural landscape is dependent on the existing terrain, and the roadway alignment and design criteria established in the project scoping document.
- Be familiar with these design and construction terms/concepts:
  - Bifurcated Alignment
  - Geotechnical Report
  - Clear Zone
  - Roadside Ditch
  - Roadside Barrier
  - Truck Escape Ramp
  - Earthwork Balance
  - Excess Waste
  - Soil Cut Slopes
  - Rock Cut Slopes
  - Ripping

And you should also…

- Be familiar with these design and construction terms/concepts:
  - Mini-Benches
  - Rounding
  - Warping
  - Laying Back
  - Crown Ditches
  - Rockfall Containment
  - Wire Mesh
  - Soil Nail
  - Obliteration
  - Wall Aesthetics
  - MSE Wall
  - Gabion
- Understand the importance of a pre-bid site meeting and topics to discuss.
- Be able to access ADOT websites for additional information.

Chapter 4 Contents



4.1 Chapter Goals

4.2 Scoping and NEPA Processes

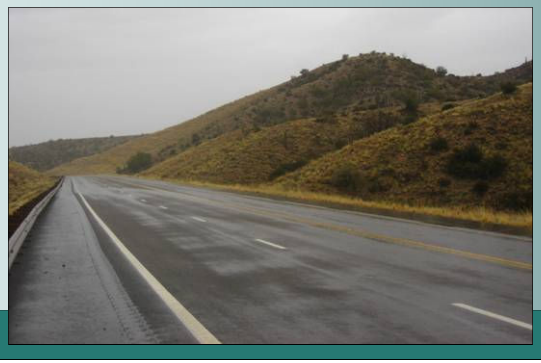
4.3 Design

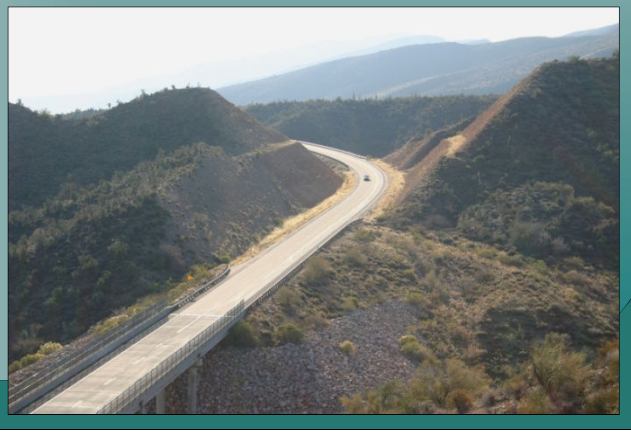
4.4 Construction

4.5 Additional Resources

4.1 Chapter Goals

- Describe Context Sensitive Design strategies that may be used to address impacts caused by proposed highways projects.
- Describe the planning, design and construction of highway alignments and engineered slopes that are visually integrated with the surrounding landscape.
- Discuss slope design for successful revegetation.
- Summarize mitigation techniques that may address NEPA requirements for grading, slope configuration and earthwork balance.



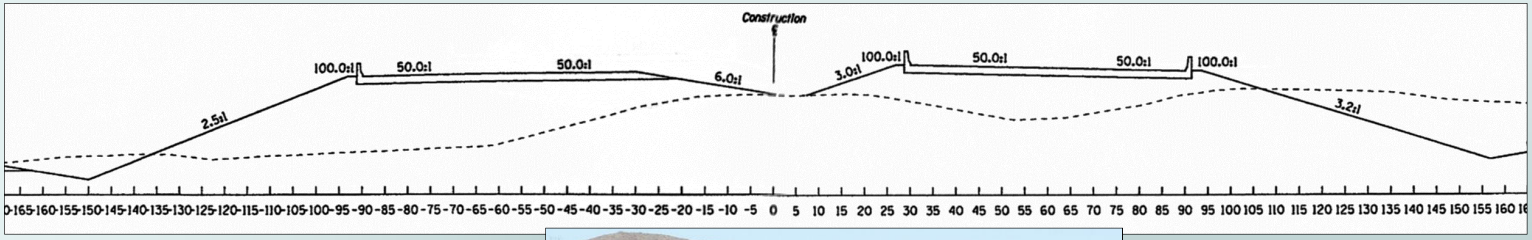


4.2 Scoping and NEPA Processes

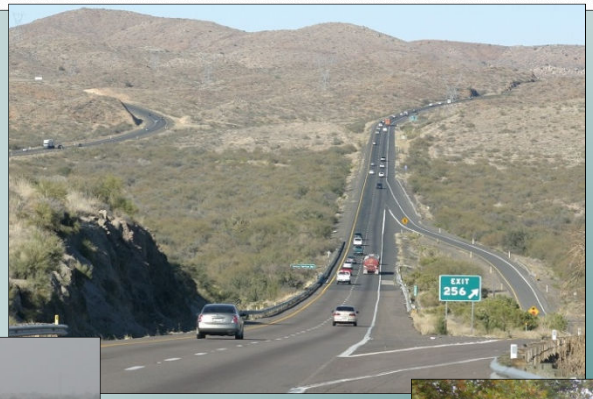
- Existing Topography
  - Blend highway corridors with the existing natural environment
- Alternative Alignment Considerations
  - Impact on sensitive environments
  - Mitigation measures to offset negative impacts
    - Bifurcated roadway
    - Bridges

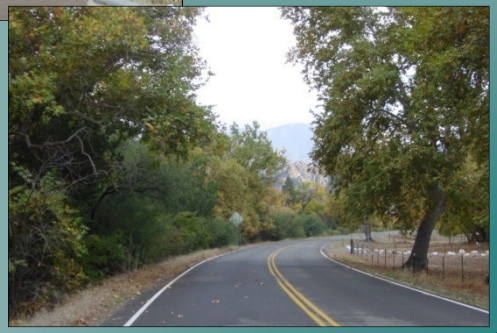
4.2 Scoping and NEPA Processes

- Design Criteria that may impact existing slopes
  - Roadway Width



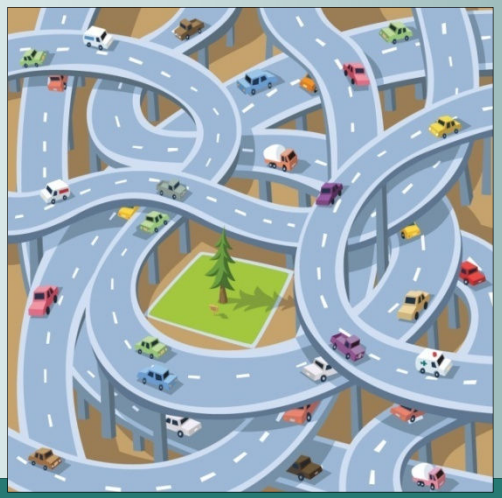
  - Design Speed
    - Roadway Grades
    - Turning Radii
    - Sight Distances





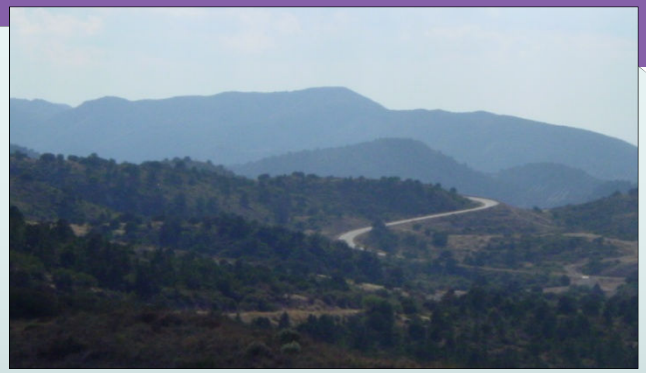
4.2 Scoping and NEPA Processes

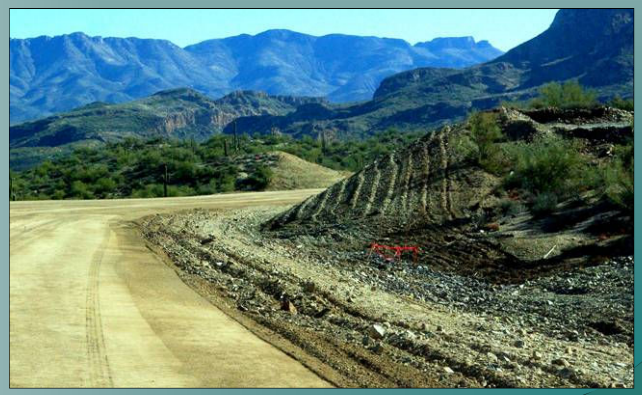
- Environmental Mitigation
  - The NEPA process may reveal the need for mitigation both within and outside the highway easement.
- Geotechnical Investigation and Report
  - Land surveying usually begins during scoping since findings may impact the preferred roadway alignment.
  - Geotechnical investigations typically require NEPA documentation prior to onset of work.



4.3 Design

- Design Considerations
  - Integrate highway corridor with surrounding natural landscape.
  - Consider existing topography.
  - Evaluate alternative highway alignments.
  - Identify environmental mitigation requirements.





4.3 Design

- Safety

Clear Zone

Roadside Ditch

Roadside Barrier

Truck Escape Ramp

4.3 Design

- Earthwork
  - Earthwork Balance of cut and fill is one goal of roadway designers.

  - Excess Waste is excavation material generated during construction not planned for use on the project.

4.3 Design

- Soil Cut Slopes:

Ripping

Mini-Benching

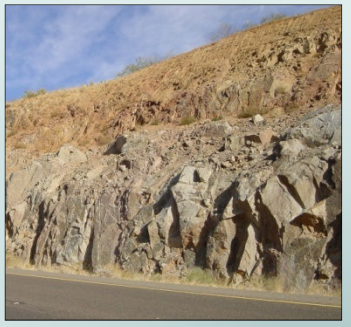
Rounding

Crown Ditch

4.3 Design

- Rock Cut Slopes:

MSE Wall



Rockfall Containment

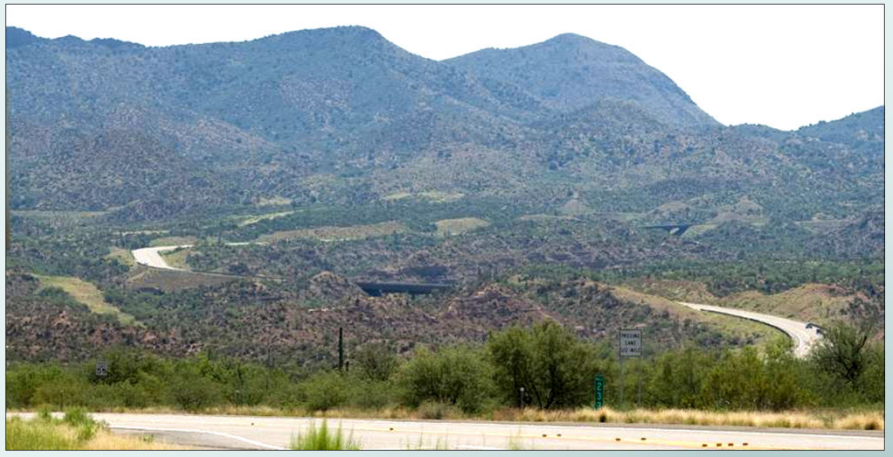
Wire Mesh

Soil Nail Wall

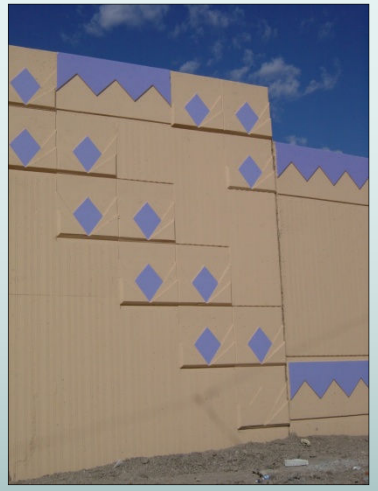
4.3 Design

- **Laying Back** is the progressive flattening of the end of a cut at a cut/fill transition.
- **Warping** is the removal of material so the cut face is variable, rounding and blending into the natural topography.

4.3 Design



Obliteration

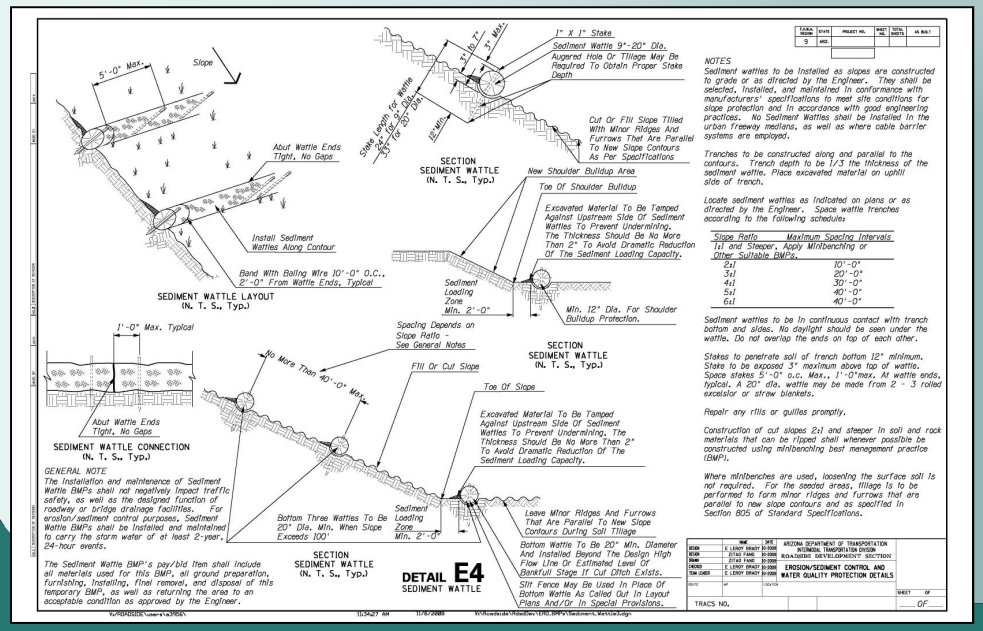


Wall Aesthetics

Gabion

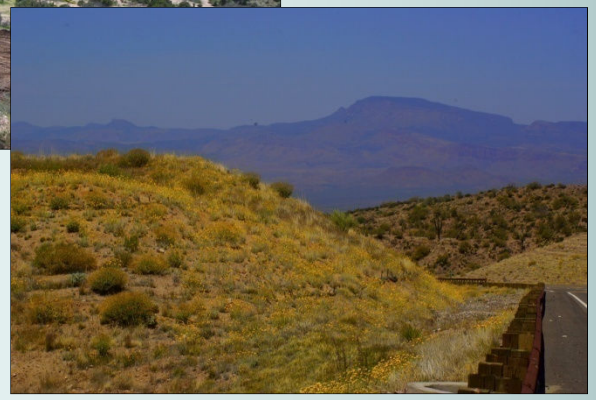
4.4 Construction

- Resource Management concerns should be addressed in the contract documents and discussed at pre-bid and partnering meetings.
- Those concerns may include:
  - Water source development
  - SWPPP-Erosion Control Plans



4.4 Construction

- Topsoil salvage
- Noxious/invasive plant species control
- Erodible slope surface treatment
- Permanent drainage control devices
- Temporary erosion control devices



4.5 Additional Resources

- ADOT Roadside Development Section

  http://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadside-development

- ADOT Roadway Engineering Group

  http://www.azdot.gov/business/engineering-and-construction/roadway-engineering

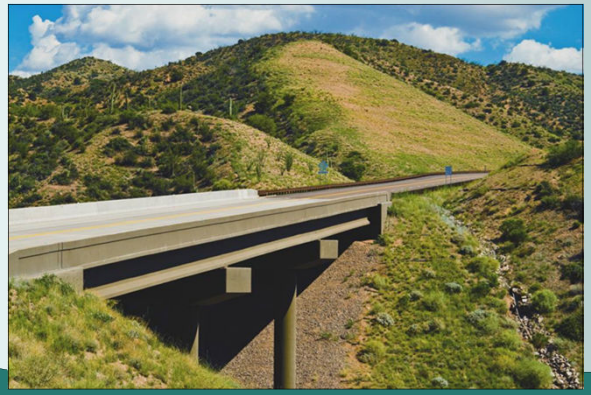
- ADOT Intermodal Transportation Division: Bridge Design Service

  http://www.azdot.gov/business/engineering-and-construction/bridge/Staff/BgDesignService.asp

Highlights



- Read Chapter 4…….
  - To understand how to plan, design and construct highways to visually integrate with the surrounding landscape.
  - To learn which slope designs and techniques yield successful revegetation.
  - For a review of slope design and construction terms/concepts.
  - To understand how mitigation techniques may address NEPA requirements for grading, slope configuration and earthwork balance.



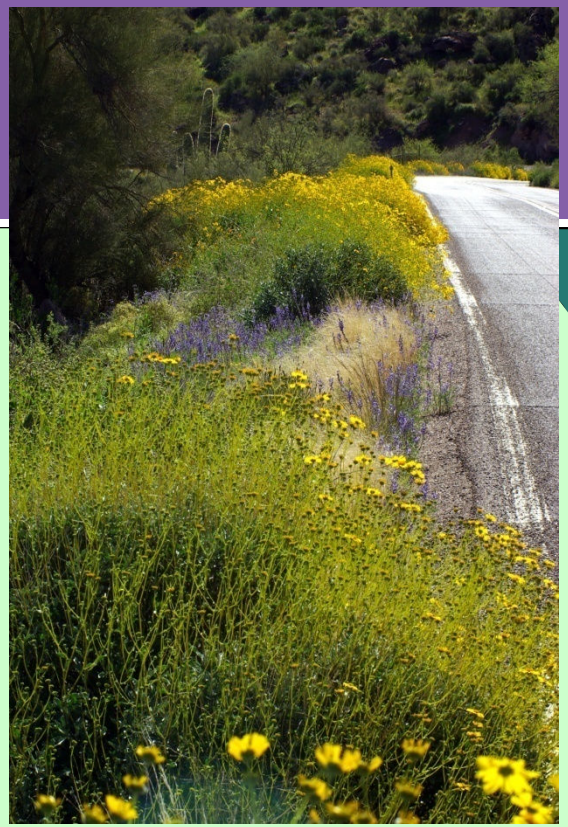

Knowledge Check: Do you……

- ✓ Understand how successful integration of the highway corridor into the surrounding natural landscape is dependent on the existing terrain, roadway alignment and design criteria established in the project scoping document?
- ✓ Have a basic understanding of these design and construction terms/concepts:
  - ✓ Bifurcated Alignment
  - ✓ Geotechnical Report
  - ✓ Clear Zone
  - ✓ Roadside Ditch
  - ✓ Roadside Barrier
  - ✓ Truck Escape Ramp
  - ✓ Earthwork Balance
  - ✓ Excess Waste
  - ✓ Soil Cut Slopes
  - ✓ Rock Cut Slopes
  - ✓ Ripping

And do you……

- ✓ Have a basic understanding of these design and construction terms/concepts:
  - ✓ Mini-Benches
  - ✓ Rounding
  - ✓ Warping
  - ✓ Laying Back
  - ✓ Crown Ditches
  - ✓ Rockfall Containment
  - ✓ Wire Mesh
  - ✓ Soil Nail
  - ✓ Obliteration
  - ✓ Wall Aesthetics
  - ✓ MSE Wall
  - ✓ Gabion
- ✓ Understand the importance of a pre-bid site meeting and topics to discuss?
- ✓ Know how to access ADOT websites for additional information?

Guidelines Appendices



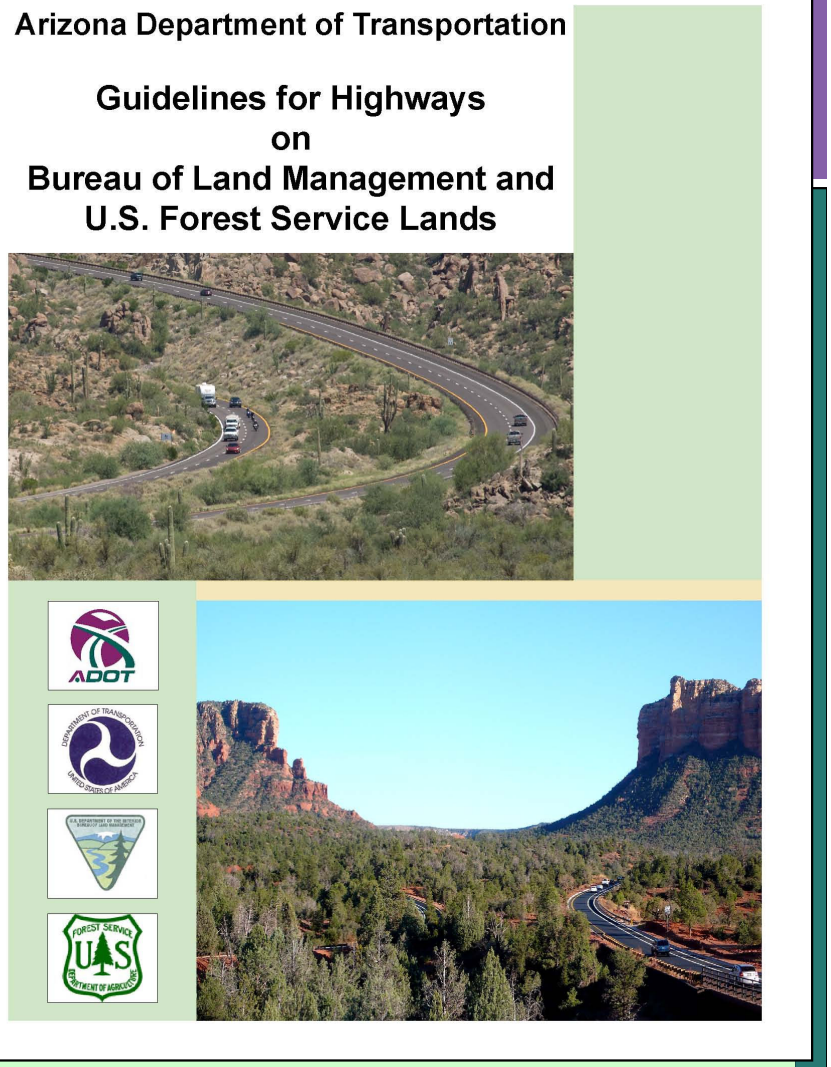
- Acronyms and Abbreviations
- Glossary of Terms
- ADOT-FHWA-USFS MOU
- ADOT-FHWA-BLM MOU
- Slope Design Details
- Easement Development
- Section 106 Process on Forest Service Lands
- Typical Blasting Plan Content
- Comparison of Permit Processes for Material Sites
- Signing
- Project Reference Fact Sheet
- Native Plant Salvage & Replanting Evaluation Guidelines
- References and Photography Credits
- Additional Photos (online appendix)
- Document Revision History

Document Availability

Purchase from:
ADOT Engineering Records Section
1655 W. Jackson Room 175
Mail Drop 112F
Phoenix, Arizona 85007-3217
Telephone: 602-712-8216 or 712-7498
Fax: 602-712-3235

For availability and cost:
http://www.azdot.gov/business/ContractsandSpecifications

Download from:
http://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadway-design-standards-and-guidelines/guidelines-for-highways-on-bureau-of-land-management-and-us-forest-service-lands




DO
NOT
PASS