Introducing:
The MassDOT Stormwater Design Guide (SDG)

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massDOT
Massachusetts Department of Transportation
Highway Division

vhb

Who You'll be Meeting Today

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Today's Presentation

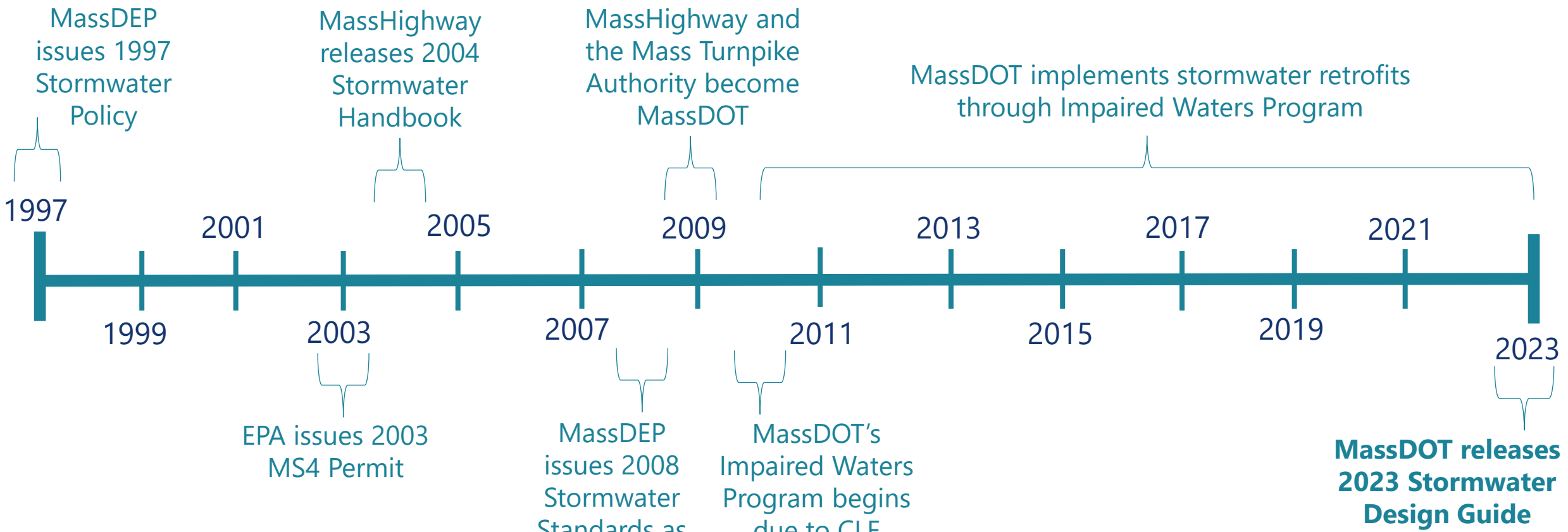
- MassDOT's Stormwater Program
- Purpose and Benefits
- Scope of the SDG
- SDG content (Chapters 1 – 4)
- Takeaways
- Questions

The SDG, posted on 8/11/23, serves as MassDOT's best available guidance for stormwater management designs.

Feel free to open and flip through the SDG while you're watching this presentation: https://www.mass.gov/doc/stormwater-design-guide/download

Background, Purpose, and Scope

Notable Events in Shaping MassDOT's Stormwater Program



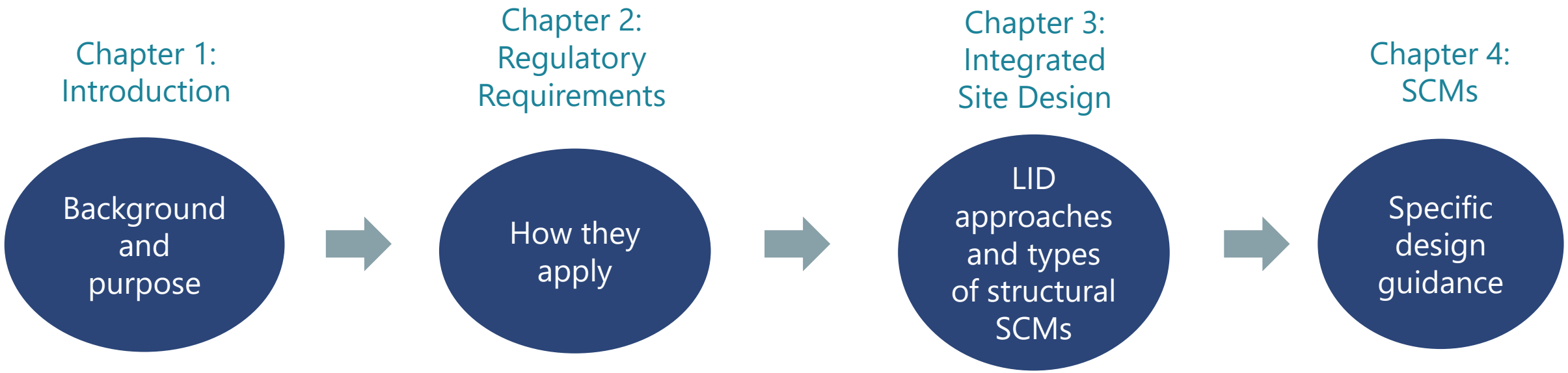
Purpose and Benefits of the SDG

- ✓ Provides clear and consistent guidance to all designers
- ✓ Incorporates latest regulations and policies, including EPA BMP Performance Curves
- ✓ Consolidates relevant regulations and policies
- ✓ Includes approaches for linear projects and addresses constraints
- ✓ Incorporates practitioner experience/ knowledge
- ✓ Promotes cost-effective Stormwater Control Measures (SCMs)* that require ready access and low maintenance

*Also known as Best Management Practices (BMPs)

Scope of the SDG

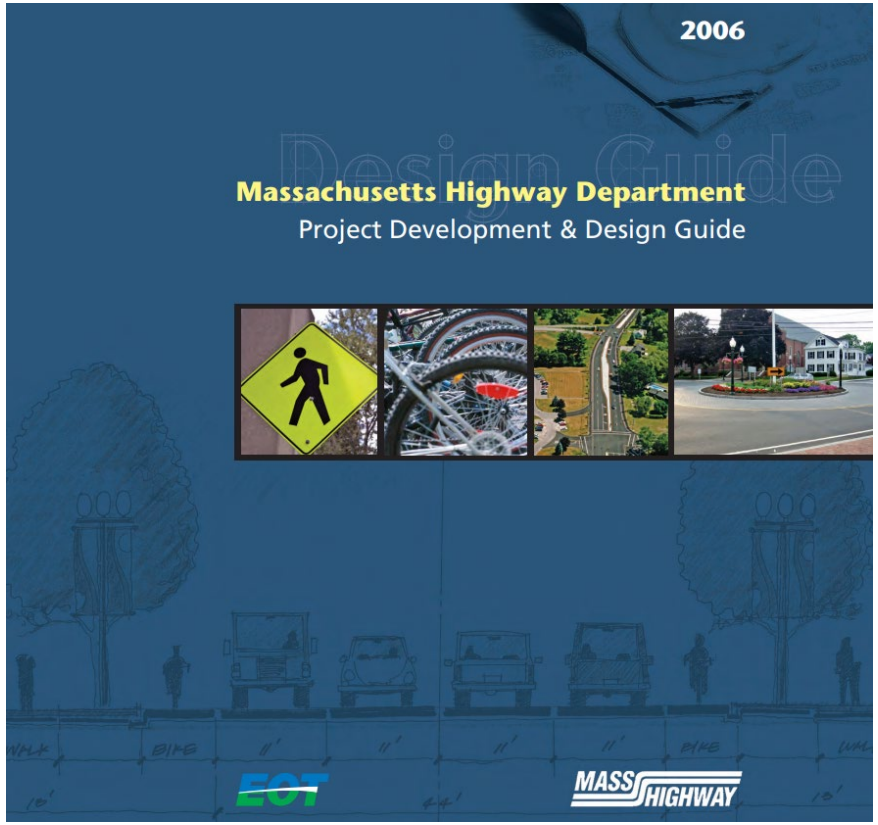
- ✓ Provides guidance on the **regulatory compliance, planning, and design** of structural SCMs focused on water quality treatment for MassDOT projects.



Note: projects that are "MassDOT-executed" (e.g., where MassDOT funds and/or constructs municipal projects) should follow SDG guidance.

What the SDG Does NOT Cover

- Closed drainage design
  → MassDOT PDDG
- Flooding and drainage vulnerability
  → MassDOT Vulnerability Framework is under development
- Erosion and sediment controls
  → MassDOT PDDG and MassDEP guidance
- Illicit Discharge Detection and Elimination
  → MassDOT Drainage Connection Policy & SOP
- O&M and source controls
  → MassDOT Programmatic O&M Plan is under development
- Anticipated regulatory changes
  → MassDEP Stormwater Standards
  → EPA's TS4 Permit



SDG Content

Chapter 1: Introduction
Chapter 2: Regulatory Requirements
Chapter 3: Integrated Site Design
Chapter 4: Stormwater Control Measures

Chapter 1: Introduction

1.1 Background on Stormwater

1.2 Regulatory Context

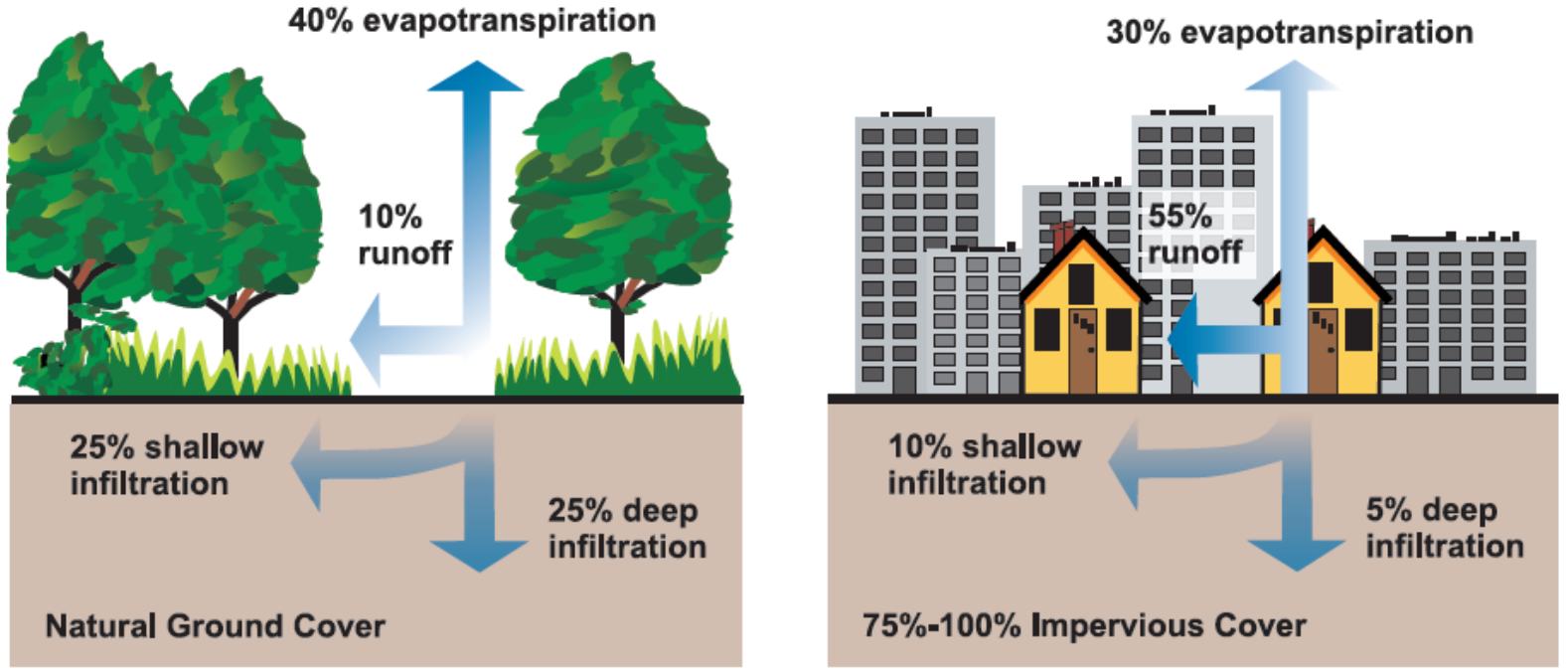
1.3 Stormwater Management for MassDOT Projects

Introduces stormwater management principles, federal and state regulations, and MassDOT's approach to stormwater management.

Understand the background and purpose of stormwater management in MassDOT projects.

Chapter 1 – Why is Stormwater Important?

- Increased development disrupts the natural water cycle
- SCMs should be used to mitigate for impacts



Relationship between impervious cover and surface runoff © EPA

Chapter 1 – MassDOT Policy for Structural SCMs

MassDOT requires SCMs when:

1. State or federal stormwater regulations require them.
2. As directed by the Water Quality Data Form (WQDF) to meet impaired waters and TMDL requirements.
3. Project will result in a significant increase of impervious cover.
4. Drainage-related issues have been identified.

A WQDF should be completed for all MassDOT projects

Chapter 2: Regulatory Compliance

2.1 EPA Stormwater Management Programs

2.2 Massachusetts Stormwater Regulations

2.3 MassDOT Approaches and Documentation

2.4 Applicability of Stormwater Regulations for MassDOT Projects

Provides guidance for designing MassDOT stormwater management systems that comply with federal and state regulations.

Understand regulatory requirements and how they apply to your project before starting design.

This chapter should be used in conjunction with, and as supplement to, EPA and MassDEP regulations.

Chapter 2 – Federal and State Stormwater Regulations

EPA

- 2003 NPDES Municipal Separate Storm Sewer System (MS4) Permit
- **Anticipated** NPDES Transportation Separate Storm Sewer System (TS4) Permit

MCM 5: Post-construction stormwater management
Impaired Waters and TMDLs

MassDEP

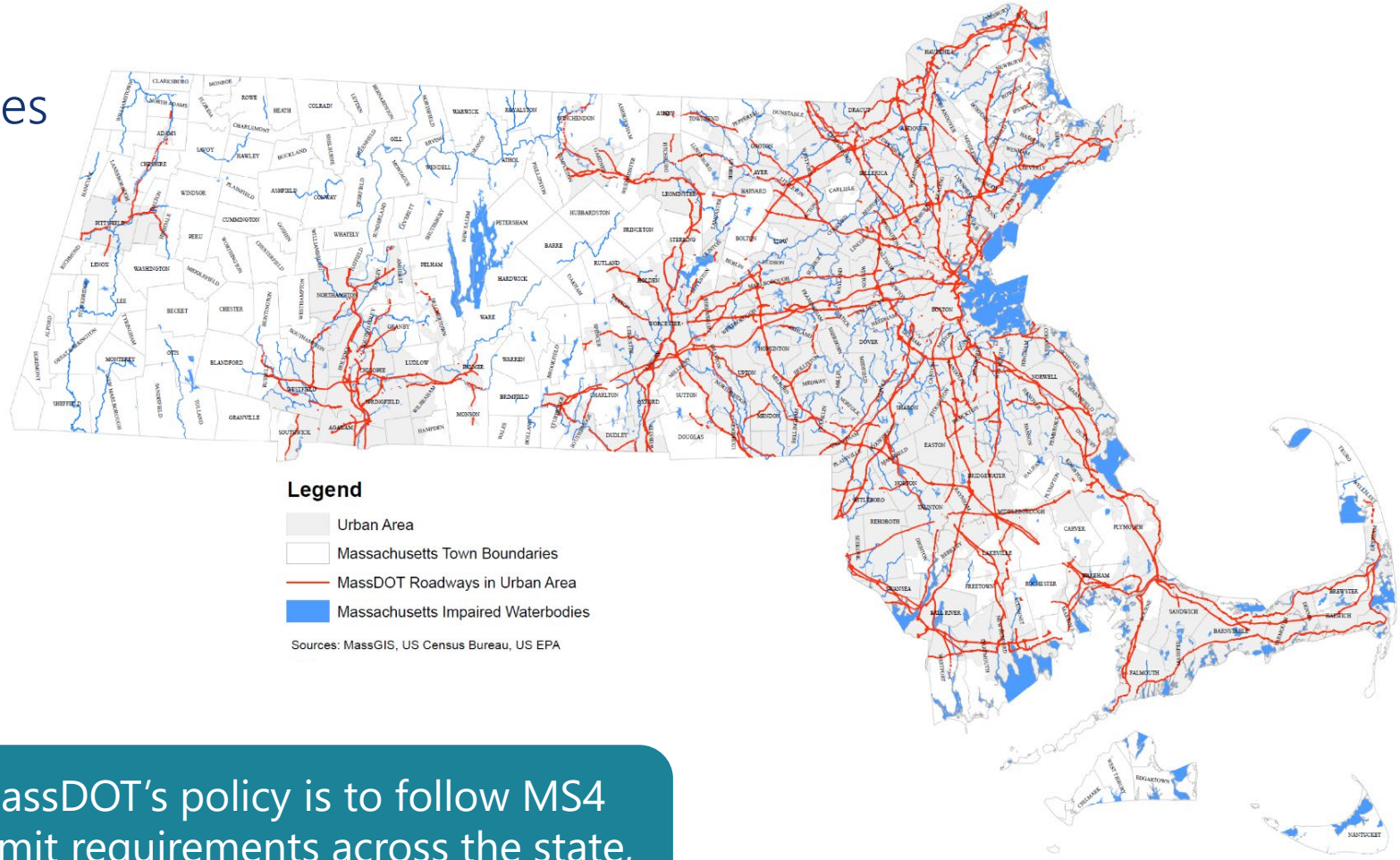
- Wetlands Protection Act (WPA)
- Section 401 Water Quality Certification (WQC) for Discharge of Dredged or Fill Material

Massachusetts Stormwater Standards

Chapter 2 – MassDOT's Impaired Waters Program

Goal: reduce pollutants that originate from MassDOT properties and drain to impaired waters.

The WQDF provides project-specific guidance to meet MassDOT's TMDL and impaired waters requirements.



MassDOT's policy is to follow MS4 permit requirements across the state, not just urbanized areas

Chapter 2 - Water Quality Data Form

- **Main Goal of WQDF:** Incorporate SCMs into MassDOT programmed projects to cost-effectively improve water quality while also collecting SCM design data as part of IWP Water Quality tracking and accounting

Chapter 2 – Stormwater Standards

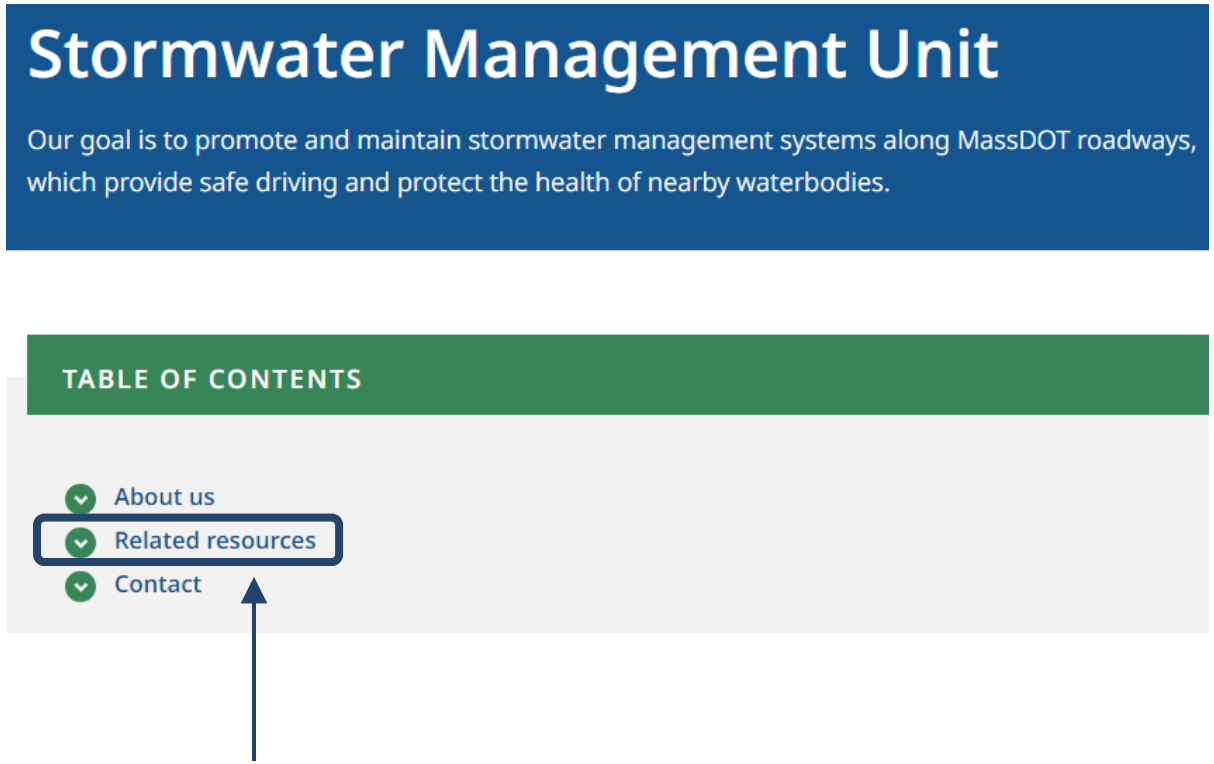
Presents each of the ten Stormwater Standards and provides:

- Summary including requirements based on redevelopment or new development
- MassDOT's approach to compliance
- MassDOT's evaluation method
- Congruency with other standards

Includes special information sheets on LUHPPLs and Critical Areas

Chapter 2 – MassDOT Approaches and Documentation

- MassDOT Templates
  - Stormwater report
  - O&M Plan
  - LTPPP
- EPA BMP Performance Curves
  - MassDOT SCM Water Quality Curves
    - See the WQDF
- MassDOT Macro Approach
  - How to achieve compliance with Stormwater Standards on a project-wide scale for linear projects
    - See Macro Approach Example



You can find all MassDOT stormwater templates, tools, and examples at: https://www.mass.gov/info-details/stormwater-management-unit

Chapter 2 – Applicability of Stormwater Regulations for MassDOT Projects

- Minor activities and routine roadway maintenance
- Stormwater management system maintenance
- Activities and facilities within Riverfront Area
- Emergency repairs
- Limited projects
- New footpaths, bikepaths, and other pedestrian paths
- Replacement bridges
- Stormwater retrofit projects
- Other
  - SCMs as regulated areas
  - Underground Injection Control Regulations

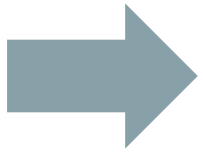
Chapter 3: Integrated Site Design (ISD)

3.1 Context

3.2 Objectives

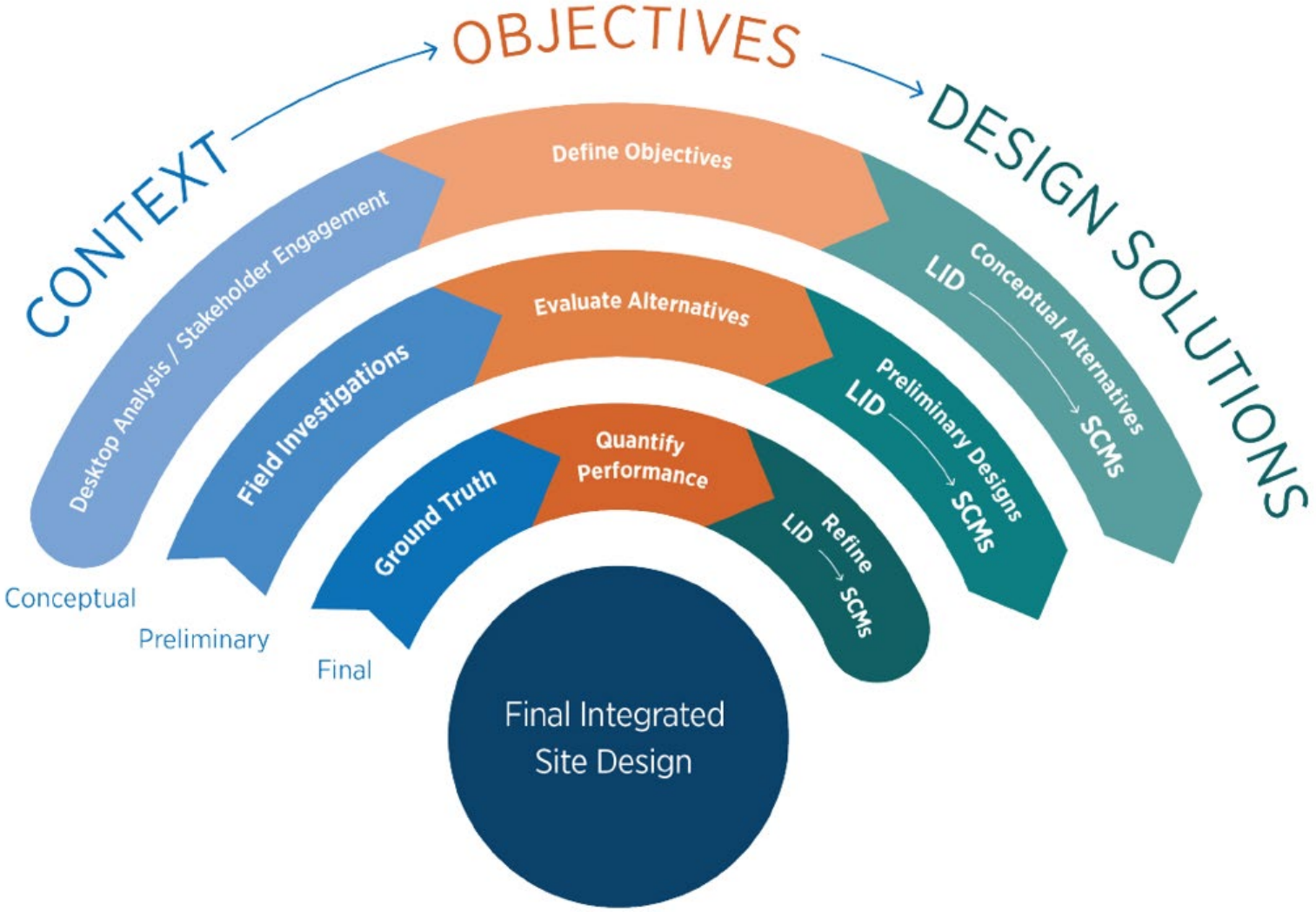
3.3 Design Solutions

Describes how to use ISD in developing MassDOT stormwater designs.



Select LID approaches and structural SCM types that best suit the project site.

Chapter 3 – the ISD Approach

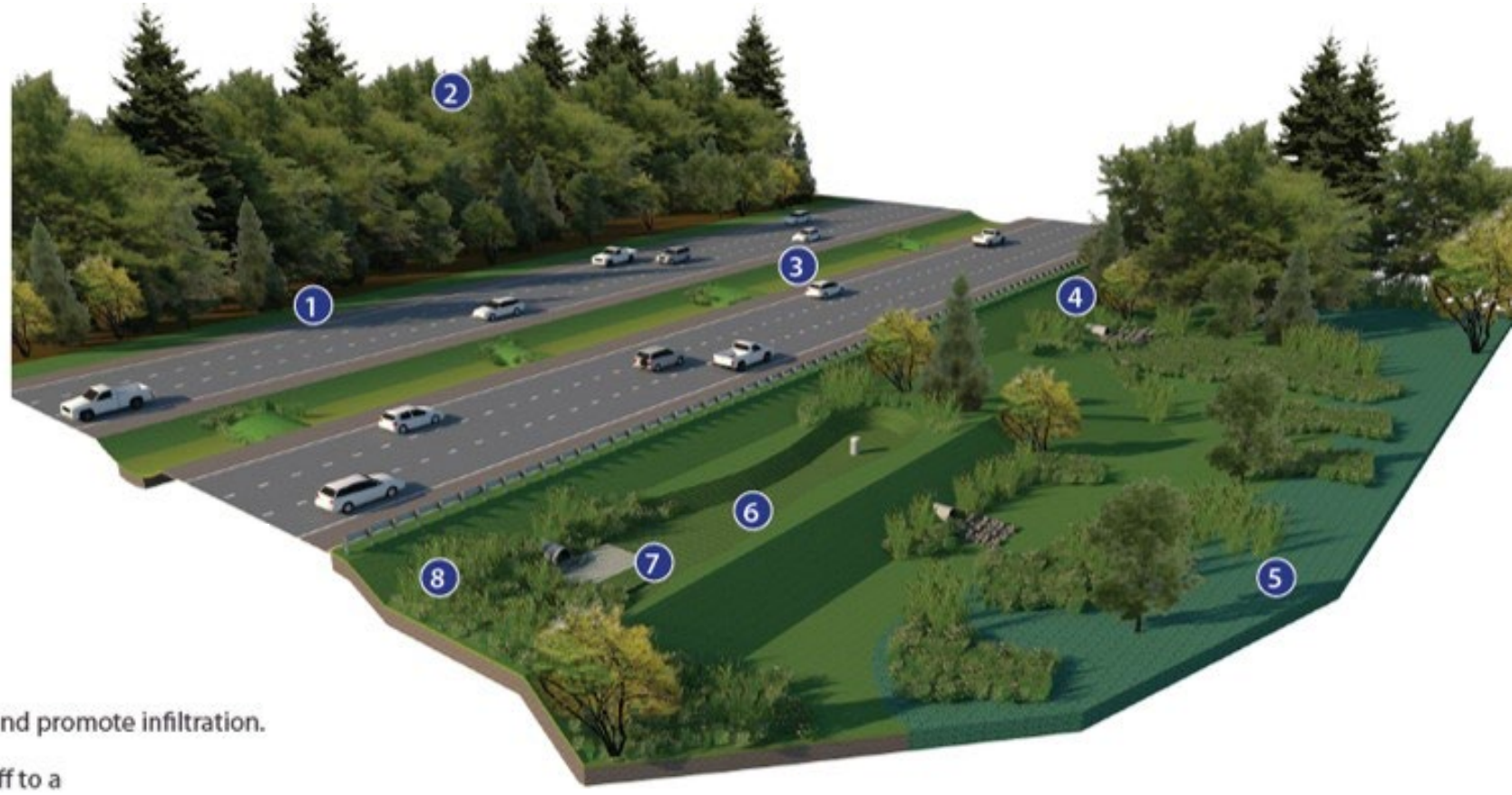


- ISD is an iterative process
- Context, objectives, and design solutions are refined as project moves through design
- Design solutions are a mix of LID and structural SCMs
- LID should be first maximized throughout the site before structural SCMs are implemented

Chapter 3 – ISD Example in Urban Setting

1. Preserve existing street trees.
2. Minimize impervious cover using pervious median.
3. Integrate stormwater treatment into traffic calming and pedestrian safety features, such as bioretention curb bump-outs.
4. Disconnect pavement where possible, such as grading sidewalks to drain to a qualifying pervious area or vegetated filter strip.
5. Include underdrain in porous pavement sidewalks where site conditions preclude infiltration.
6. Locate curb inlets to direct gutter flow into bioretention planter.
7. Select small-footprint SCMs like leaching basins to overcome space constraints.

Chapter 3 – ISD Example in Highway Setting



1. Disconnect pavement where possible to a qualifying pervious area or vegetated filter strip.
2. Preserve existing trees and vegetation.
3. Grade in vegetated linear practices with check dams to slow flow and promote infiltration.
4. Relocate outfall to vegetated upland area if not able to direct runoff to a stormwater control measure.
5. Protect wetland resource areas.
6. Locate treatment in existing open areas where possible.
7. Maximize treatment capacity with infiltration measures, such as an infiltration basin with sediment forebay.
8. Establish and maintain vegetation to stabilize roadway embankment.

Chapter 3 – Other Main Points

- Evaluate opportunities to **reduce impervious cover**
- Use surface SCMs to meet MassDOT O&M initiatives and **avoid undergound SCMs**
- **Infiltration is MassDOT's preferred stormwater approach**
- Locate SCMs for **easy access** to construct and maintain

Chapter 4: Stormwater Control Measures

4.1 – 4.5 SCM Design Sheets

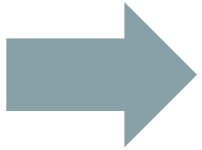
4.6 SCM Accessories

4.7 Design Guidance for all SCMs

4.8 Design Guidance for Infiltration SCMs

4.9 – 4.10 Design Guidance for Basins and Linear Practices

Presents the design guidelines for structural SCMs supported by MassDOT.



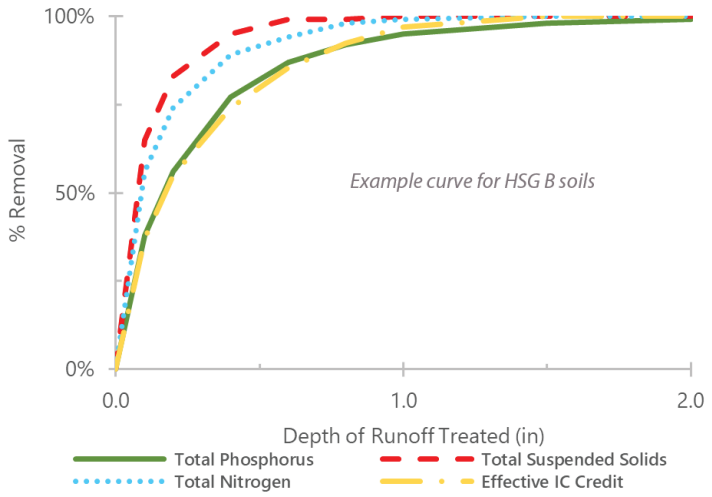
Select and design the specific SCMs for your project site.

Chapter 4 – Structural SCMs Supported by MassDOT

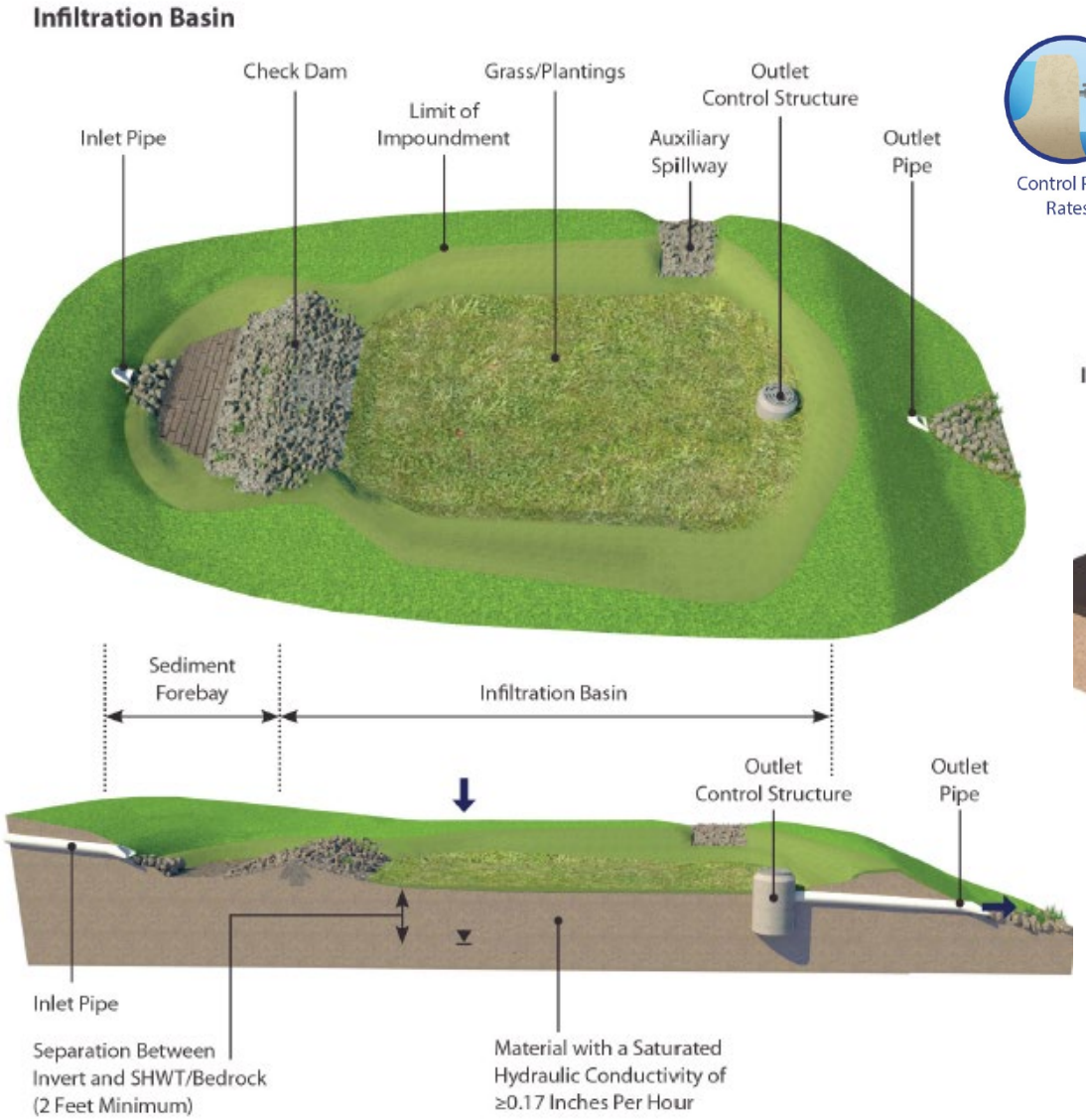
- Pretreatment
  - Deep-sump catch basin
  - Sediment forebay
  - Open-graded friction course
    - consult with Pavement Management
- Infiltration
  - Pavement disconnection
  - Infiltration basin and linear practice*
  - Leaching basin
  - Subsurface infiltration system
    - for parking areas, not roadways
  - Porous pavement
    - consult with Stormwater Unit
- Stormwater wetlands
  - Constructed stormwater wetland
  - Gravel wetland
- Bioretention Area and linear practice
- Other SCMs
  - Wet basin and linear practice
  - Vegetated riprap

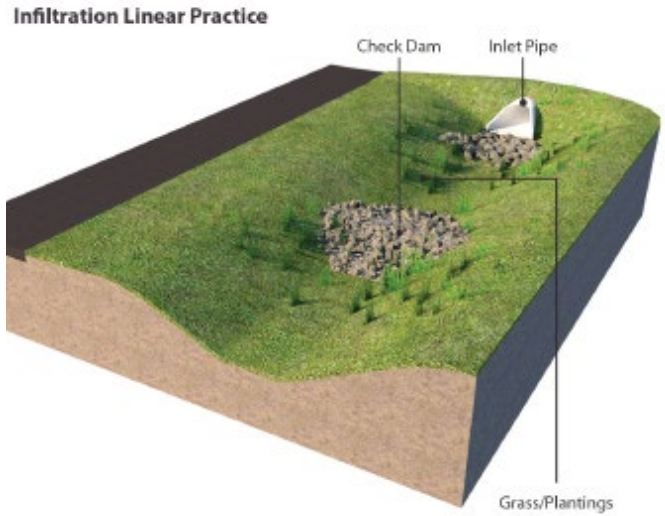
*MassDOT linear practices are same shape as "swales" but focus on treatment, not conveyance.

Chapter 4 – SCM Design Sheets



- Description
- Additional info:
  - Accessories
  - Pretreatment
  - Siting and design criteria
  - Storage volume
  - Design references





Chapter 4 – SCM Accessories

- Check dams
  - Design depends on location in or out of clear zone
  - Engineering directive for slope and length requirements
- Inlet and outlet treatments
- Low-permeability liner
- Subsurface (i.e., underdrains)

Example of a bioretention linear practice with an underdrain being installed (note the pipe within the crushed stone)

Chapter 4 – Additional Guidance on SCM Type and Shape

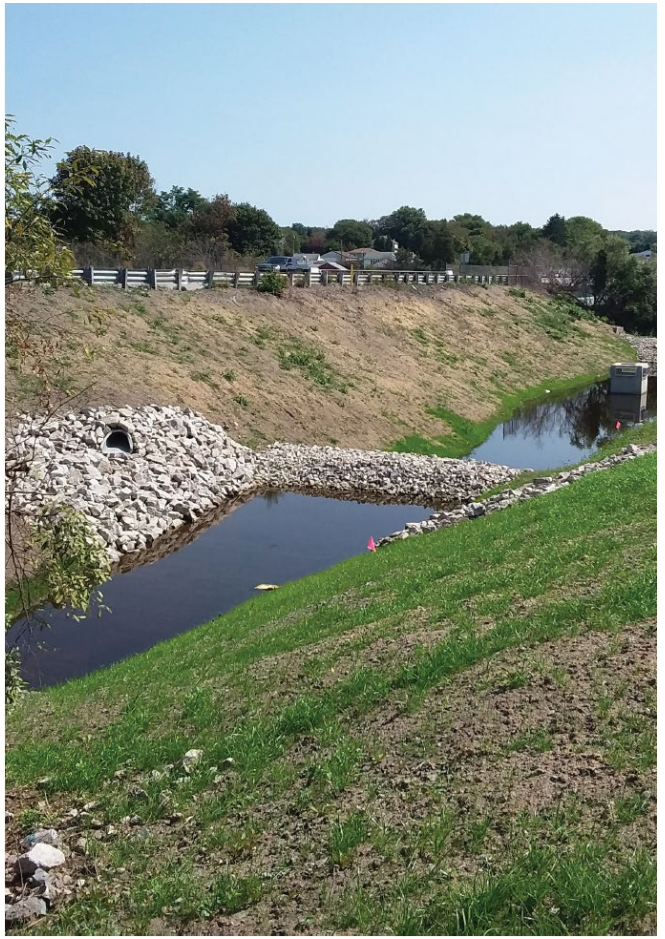
- All SCMs:
  - Soil evaluation
  - Setbacks
  - Surface design materials
  - Access
  - Safety
- Specific to infiltration SCMs:
  - Soils and siting criteria
  - Pretreatment
  - Construction considerations
- Basins and linear practices:
  - Hydrologic and hydraulic evaluation
  - Other components/elements to consider depending on shape of SCM

Infiltration basin under construction © MassDOT

Takeaways and Questions

Takeaways on the SDG

- Brings focus to how MassDOT projects can best comply with state and federal stormwater regulations
- Provides guidance on structural SCMs that are most appropriate for constrained corridors while adhering to MassDOT policies
- Promotes use of the EPA BMP Performance Curves
- Promotes a holistic approach (i.e., site planning) to integrating stormwater design into highway projects
- One of MassDOT's several tools to implement statewide stormwater management focused on improving water quality



Find the MassDOT SDG (and other resources) here:
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Questions?

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