Design Standards for Post Construction Stormwater Management

Massachusetts Department of Environmental Protection
Stormwater Advisory Committee

Meeting 4: October 15, 2020

Agenda

Time for Q&A

- Welcome, Agenda, Introductions, Meeting Protocols
- Stormwater Management Framework in MA
- Stormwater Standard 3, Recharge
- Stormwater Standard 4, Water Quality
- Break ----------
- Stormwater Standard 7, Redevelopment
- New Proposed Standard 11, TMDL Compliance
- Facilitated AC Discussion
- Public Q&A

Proposed Updates to WPA/WQC Regulations and MassDEP Stormwater Handbook

Lisa Rhodes, MassDEP Wetlands Program Chief

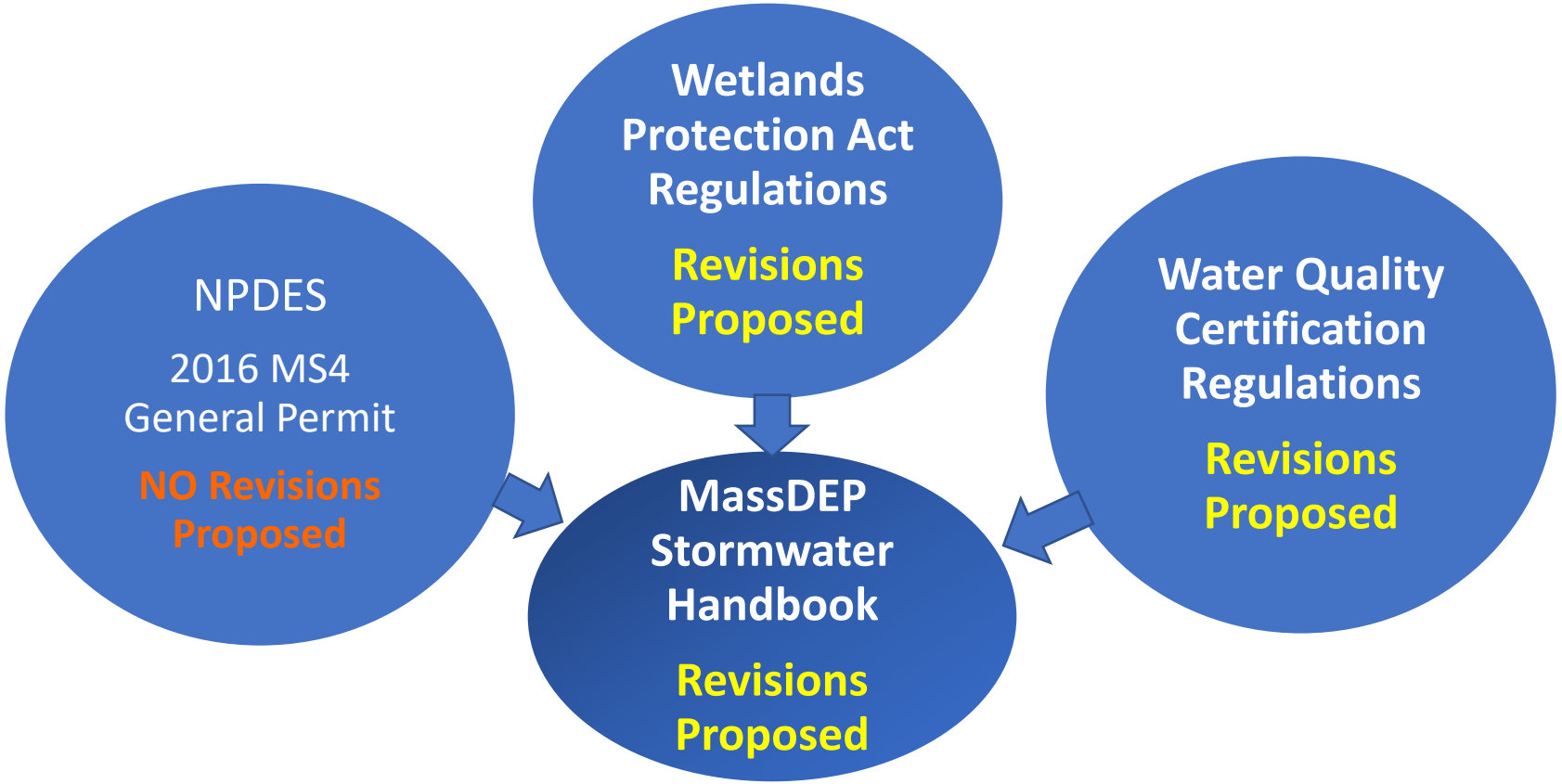
1. Overview of all Proposed Regulations and Stormwater Handbook Revisions – February 12, 2020

2. Highway Specific Considerations for MassDOT projects – August 25, 2020

3. Precipitation Intensity and Frequency Data - September 22, 2020

4. TODAY: Align WPA/WQC Regulations and SW Handbook with 2016 MS4 General Permit

Stormwater Regulatory Framework



Stormwater Management in Massachusetts

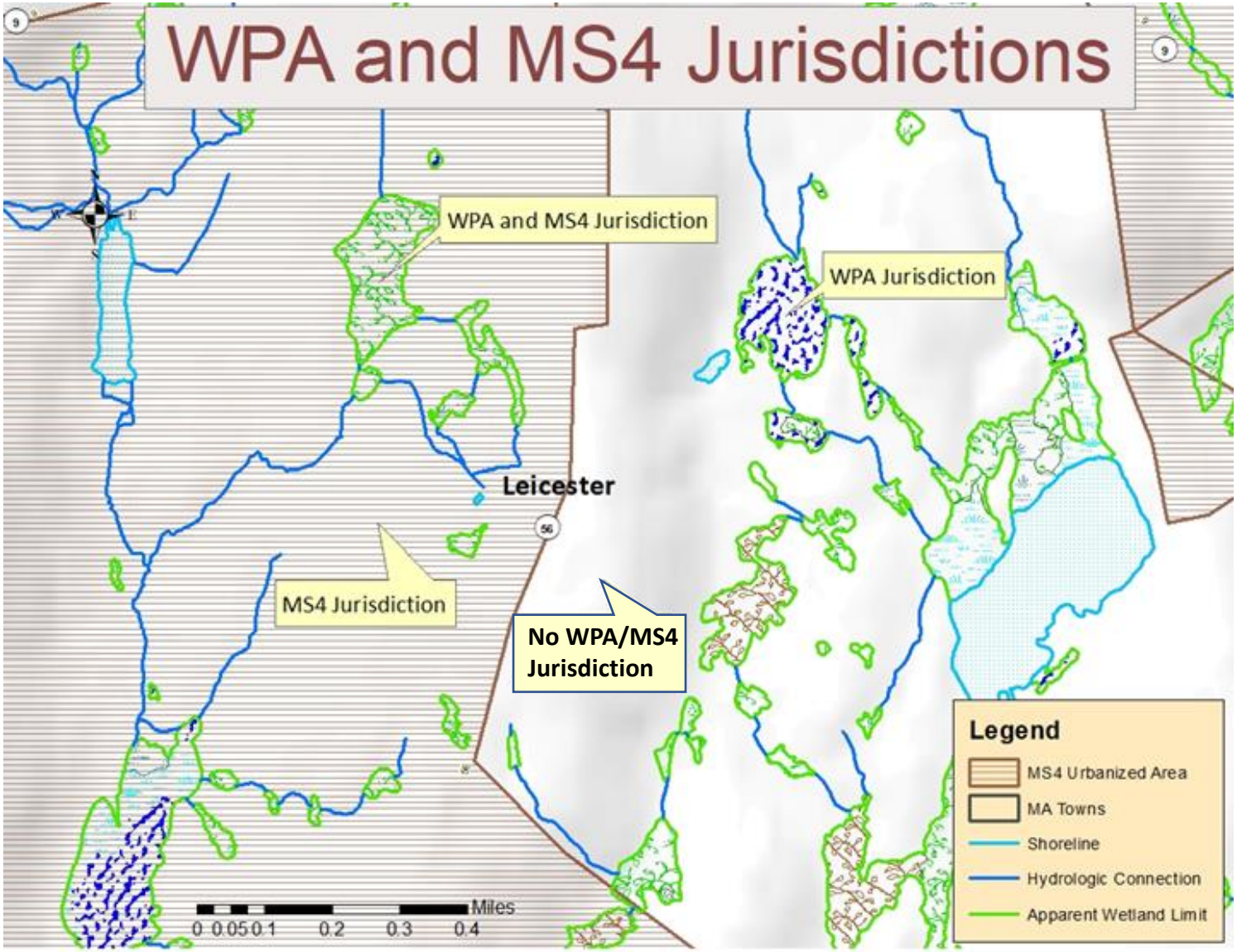
Wetlands Protection/WQC Regs

- Applies to Projects Impacting wetland resource areas and buffer zones in 351 cities and towns
- Last major stormwater update in 2008
  - **Precipitation** and **urbanization** increased

NPDES MA 2016 Small MS4 Permit

- Authorizes 260 cities and towns (MS4 designated areas) to discharge stormwater to waters subject to ongoing management of systems
  - Also Non-Traditional MS4s
- 5-year permit term
  - Permit went into effect in 2018
  - Local bylaw or ordinance that meets MA Stormwater Standards by June 30, 2021

WPA and MS4 Jurisdictions



MassDEP

2016 MS4 General Permit Minimum Control Measures

1. Public Education and Outreach
   - Municipality provides education material on stormwater to residents
2. Public Involvement and Participation
   - Municipality seeks input on and makes Stormwater Management Plan accessible to public
3. Construction Site Stormwater Runoff Control
   - Sediment and erosion control required for MS4 operations, land disturbance 1-acre or more, or through Order of Conditions when within Wetlands Jurisdiction.
4. Post-Construction Stormwater Management
   - Stormwater management standards on new development and redevelopment sites
     - Pollution removal, low impact development, runoff reduction
     - Implemented via local bylaw or ordinance
5. Illicit Discharge Detection and Elimination
   - System maintenance and assurance of stormwater discharges only
     - Implemented via local bylaw or ordinance
6. Good Housekeeping and Pollution Prevention
   - Proper handling and storage of materials

Stormwater Standards being discussed today

1. No new untreated stormwater conveyances
2. Post-development peak discharge rates
3. **Eliminate or minimize loss of recharge**
4. **Pollutant removal for Post-Development**
5. Land Uses With Higher Potential Pollutant Loads
6. Critical area protection, including public drinking waters
7. **Redevelopment Projects**
8. Implement Erosion and sedimentation control during construction
9. Implement Long-term operation and maintenance of stormwater controls
10. Prohibit Illicit discharges to stormwater controls and wetlands
11. **TMDL compliance**

WPA/WQC Standard 3: Recharge

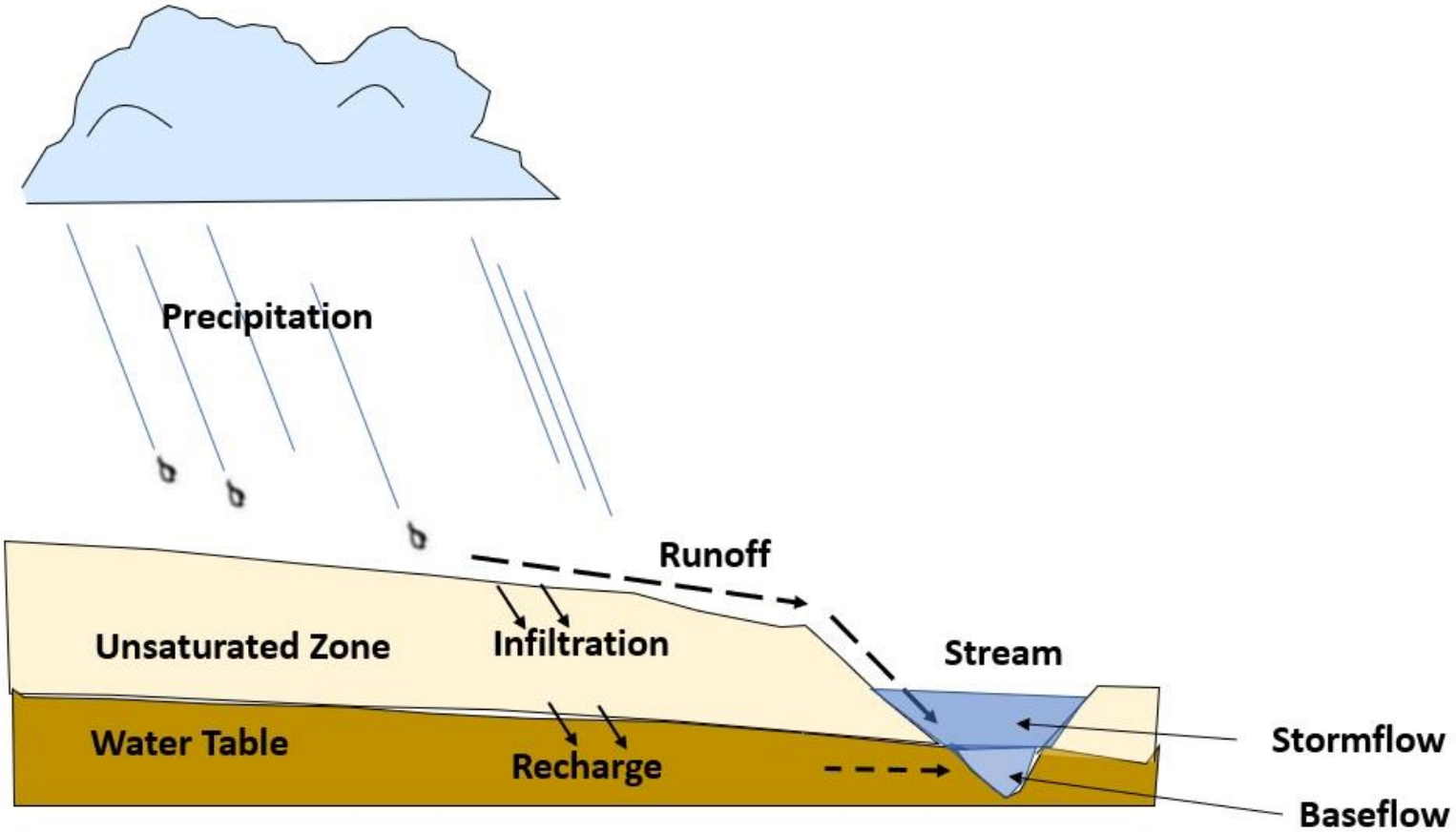
Thomas Maguire, MassDEP Wetlands Program

Purpose: To sustain water levels in wetland resource areas and drinking water well levels

Existing regulation: "Loss of *annual* recharge to ground water shall be eliminated or minimized through…*environmentally sensitive site design, low impact development techniques,* stormwater best management practices, and good operation and maintenance."

"At a minimum, the *annual recharge* from the post-development site shall approximate the *annual recharge* from the pre-development conditions based on soil type."

Recharge is the precipitation portion that enters the groundwater



Predevelopment: Approximately 70% of Precipitation is Recharge Statewide

USGS Gage	Period (Years)	Recharge /Baseflow (Percent of Annual Precipitation)
Charles River at Wellesley MA	61	73%
Charles River at Dover MA	82.8	72%
Jones River at Kingston MA	54.1	72%
Ipswich River Near Ipswich MA	90.2	71%
Threemile River at North Dighton MA	54.1	71%
Merrimack River Below Concord River at Lowell MA	97.2	70%
Connecticut River at Montague City MA	116.4	65%

Existing Recharge Sizing Is Based On Soil Runoff Depth x Impervious Area

MassDEP

Size the volume of the recharge by using the onsite Hydrologic Soil Groups (HSG) or the Environmentally Sensitive Site Design Credits:

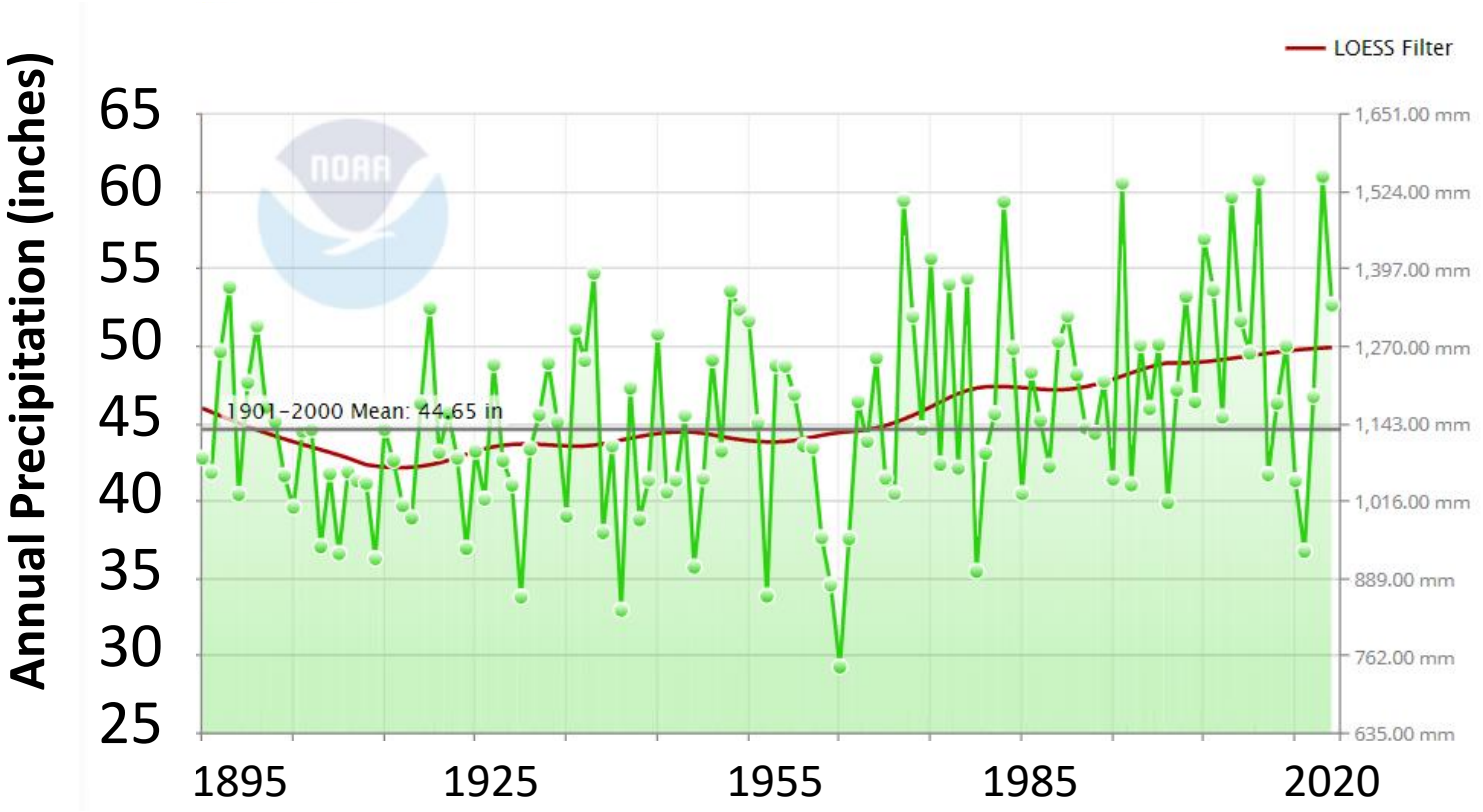
- HSG A = 0.60 inch x impervious area
- HSG B = 0.35 in x impervious area
- HSG C = 0.25 in x impervious area
- HSG D = 0.10 in x impervious area
- Qualifying Pervious Area: Recharge Met

MS4 Permit

Size the volume of treatment may include:

- Retaining 1-inch of runoff times the impervious area meets pollutant removal requirement

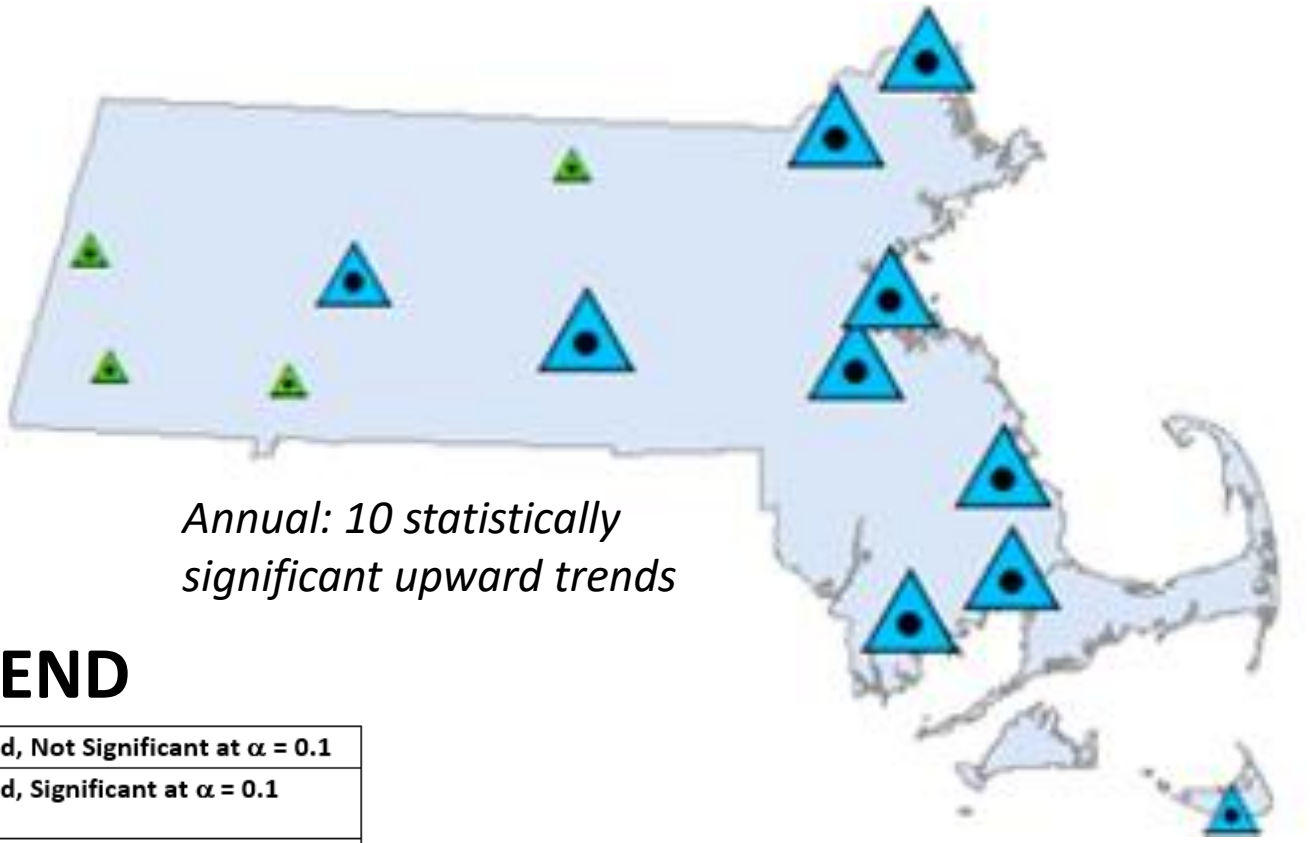
Annual Precipitation Is Increasing



NOAA National Centers for Environmental information, Climate at a Glance: Statewide Time Series, published October 2020, retrieved on October 9, 2020 from https://www.ncdc.noaa.gov/cag/

Data from the GHCN Massachusetts Network: Approximately 308 Stations

Annual Precipitation Trend Is Significant: Affects Recharge Target

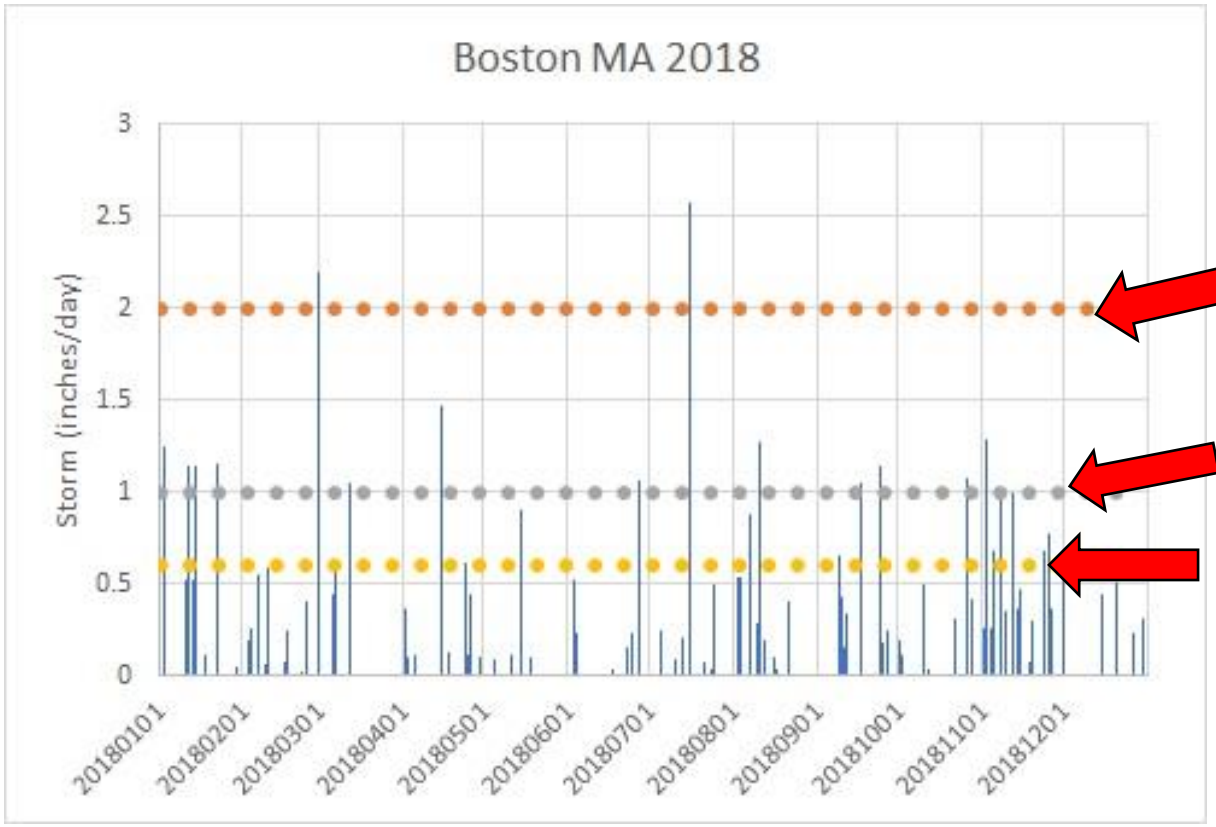


Annual: 10 statistically significant upward trends

LEGEND

	Positive Trend, Not Significant at $\alpha = 0.1$
	Positive Trend, Significant at $\alpha = 0.1$
	Negative Trend, Not Significant at $\alpha = 0.1$
	Negative Trend, Significant at $\alpha = 0.1$

Recharge Needs to Be Increased To Approximate Existing Predevelopment



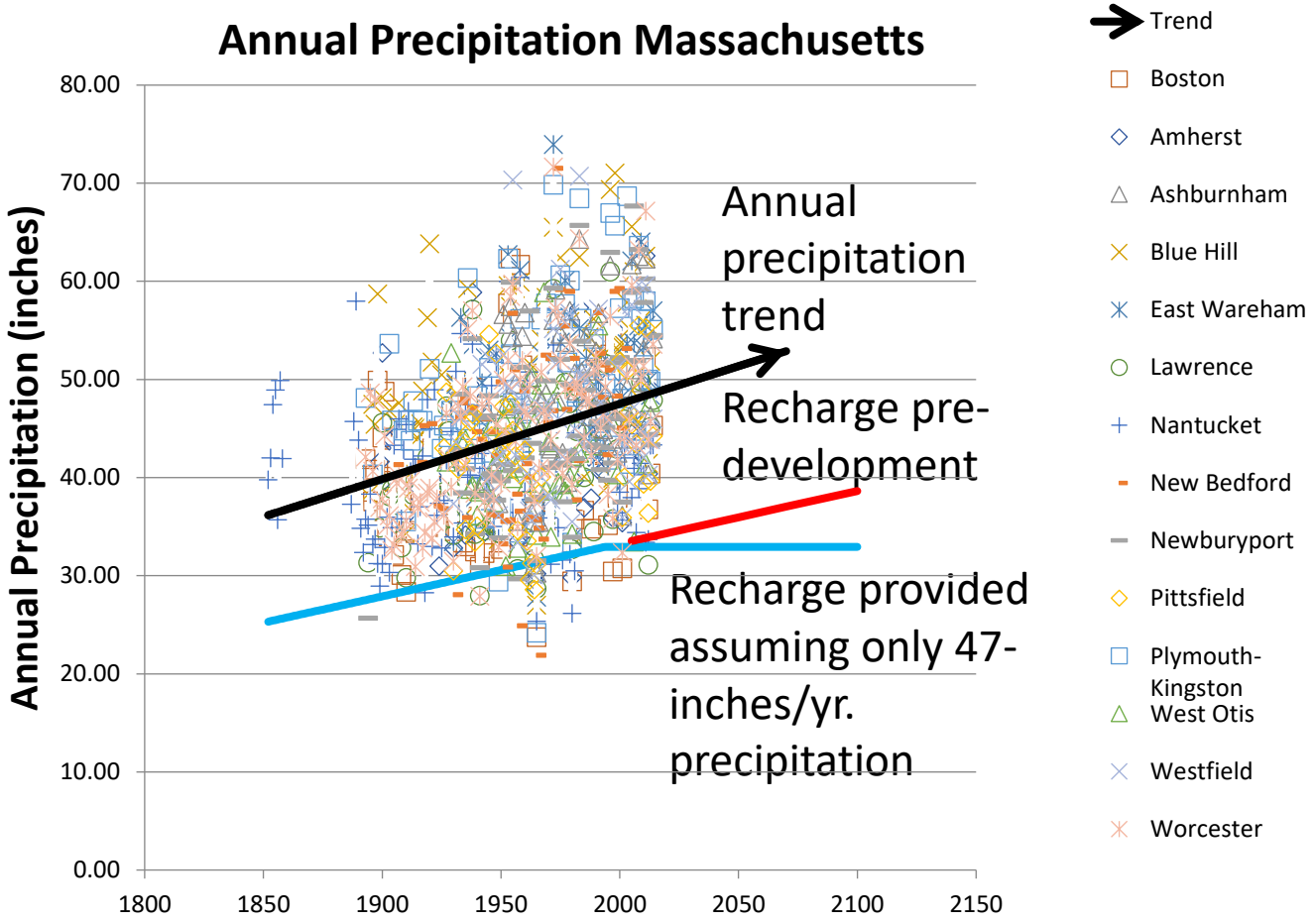
Recharge Needed to Approximate Pre-Development = 70% of annual precipitation

2-inch = 88% ALL storms
= 61% w/o winter

1-inch = 73% ALL storms
= 55% w/o winter

0.6-inch = 59% ALL storms
= 44% w/o winter

Recharge Depth Needs to Increase to Keep Pace With Increasing Annual Precipitation



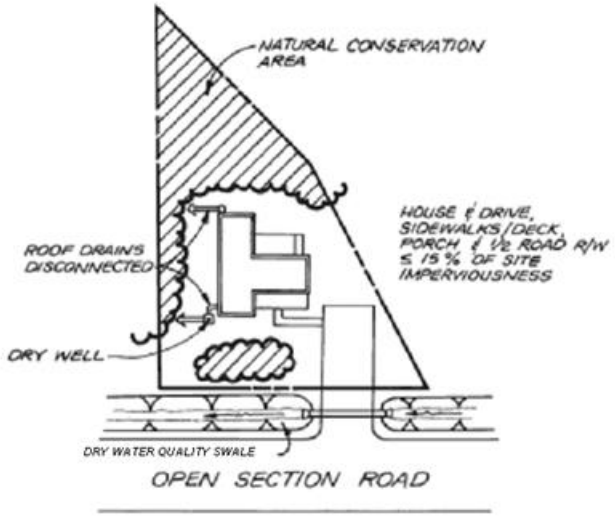
Standard 3: Recharge Proposal

NRCS Hydrologic Soil Group	Current Recharge Requirements (inch)	Proposed Recharge Requirements (inch)	MS4 Retention Option (inch)
A	0.6	1	1
B	0.35	1	1
C	0.25	1	1
D	0.1	1, Maximum Extent Practicable (MEP)	1

MEP: D soil, bedrock at or near the surface, and hazardous and solid waste sites. *ESSD strategies that incorporate LID techniques must be implemented.*

Environmentally Sensitive Site Design/Low Impact Development

Parameter	Existing Regulation	Proposed Regulation
ESSD/LID	Loss of recharge shall be eliminated or minimized through ESS/LID	Must be incorporated unless not feasible



MassDEP
LID Site Design Credit 1

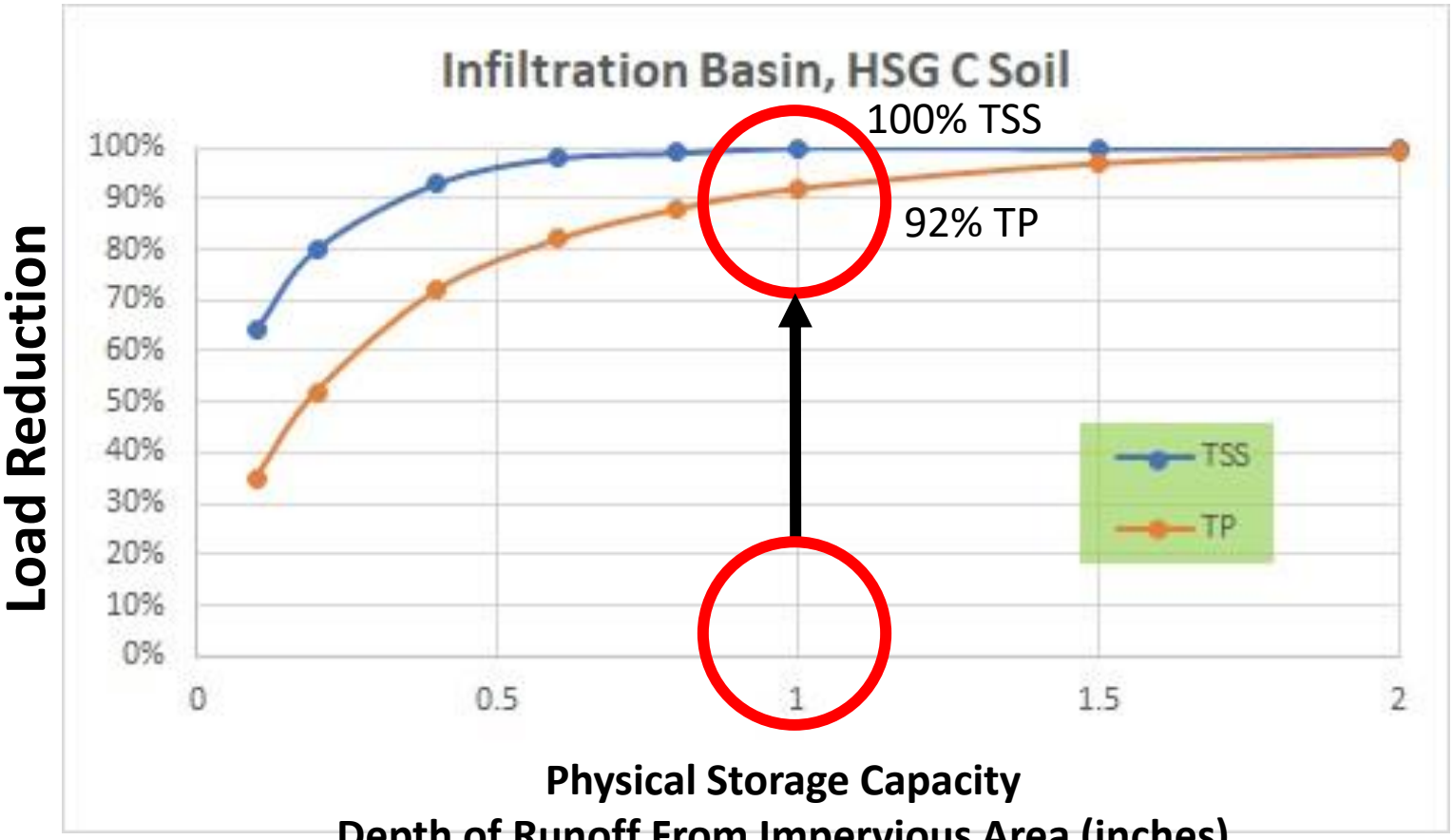
1-inch Recharge Can Be Achieved in All Soils

NRCS Hydrologic Soil Group	NRCS 2009 infiltration rate (in/hr)	NRCS 2009 Infiltration Rate (in/72-hours)
A	>1.42 in/hr	>102 in
B	>0.57 to <1.42 in/hr	>41 to <102 in
C	>0.06 to <0.57 in/hr	>4 to <41 in
D	<0.06 in/hr	<4 in

NRCS 2009 Part 630 National Engineering Handbook Chapter 7 criteria for assignment of hydrologic soil groups when any water impermeable layer exists at a depth greater than 100 centimeters [40 inches]

1-inch Recharge Meets MS4 Pollutant Removal

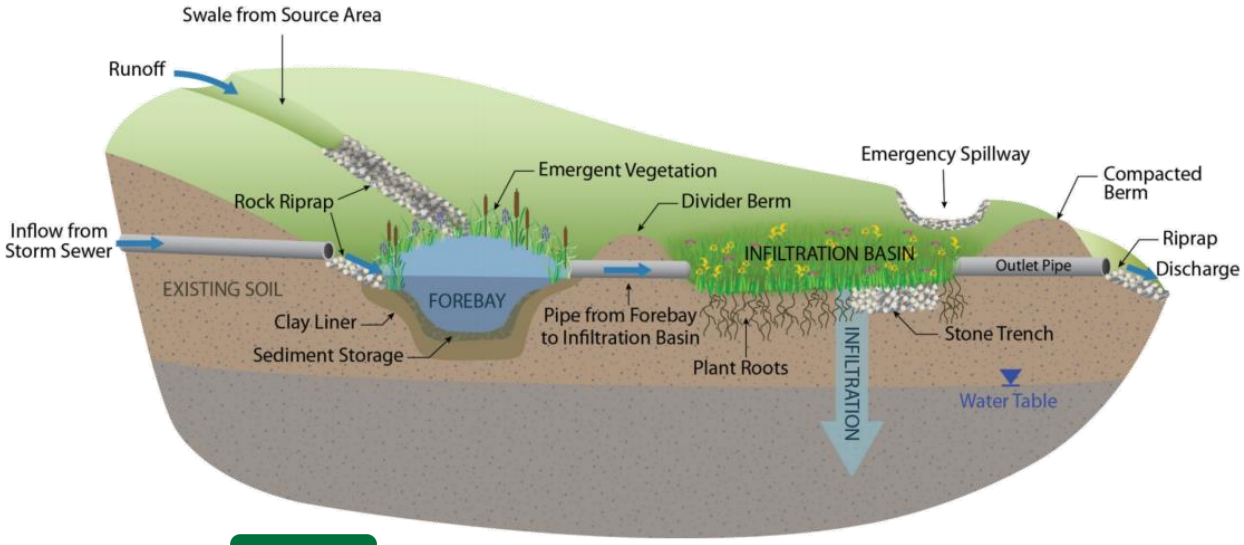
EPA Pollutant Removal Curve



1-inch Recharge Meets 1-inch MS4 Retention Option for 90% TSS/60% TP Removal

- Recharge = precipitation that enters the groundwater

- Retention = variety of measures to keep precipitation on-site (e.g. recharge, evaporation, reuse)



https://megamanual.geosyntec.com/npsmanual/infiltrationrechargebasins.aspx

Questions and Answers – Recharge Standard

Standard 4: Pollutant Removal

Laura Schifman, Stormwater Coordinator

Purpose: To prevent pollutants from contaminating wetland resource areas including public drinking waters

Existing regulation: “Remove 80% of the average annual load of Total Suspended Solids.”

Standard 4 Proposal: Remove 90% TSS and 60% TP

Current MassDEP Rule	MS4 Requirement
▪ Remove 80% TSS ▪ Treat 0.5“ for most sites; ▪ Treat 1“ for Outstanding Resource Water, critical areas, Land Use with Higher Potential Pollutant Load	▪ Remove 90% Total Suspended Solids ▪ Remove 60% Total Phosphorus ▪ Off-site mitigation allowed within HUC 12

Proposal: Remove 90% TSS and 60% TP.
Can be met by recharging 1“ on site
OR
MassDEP approved BMP designed to 1”
OR
EPA Pollutant Reduction Curves*

*not applicable if LUHPPL, ORW, Critical Area, bedrock near surface, D soil, high infiltration rate, pretreatment

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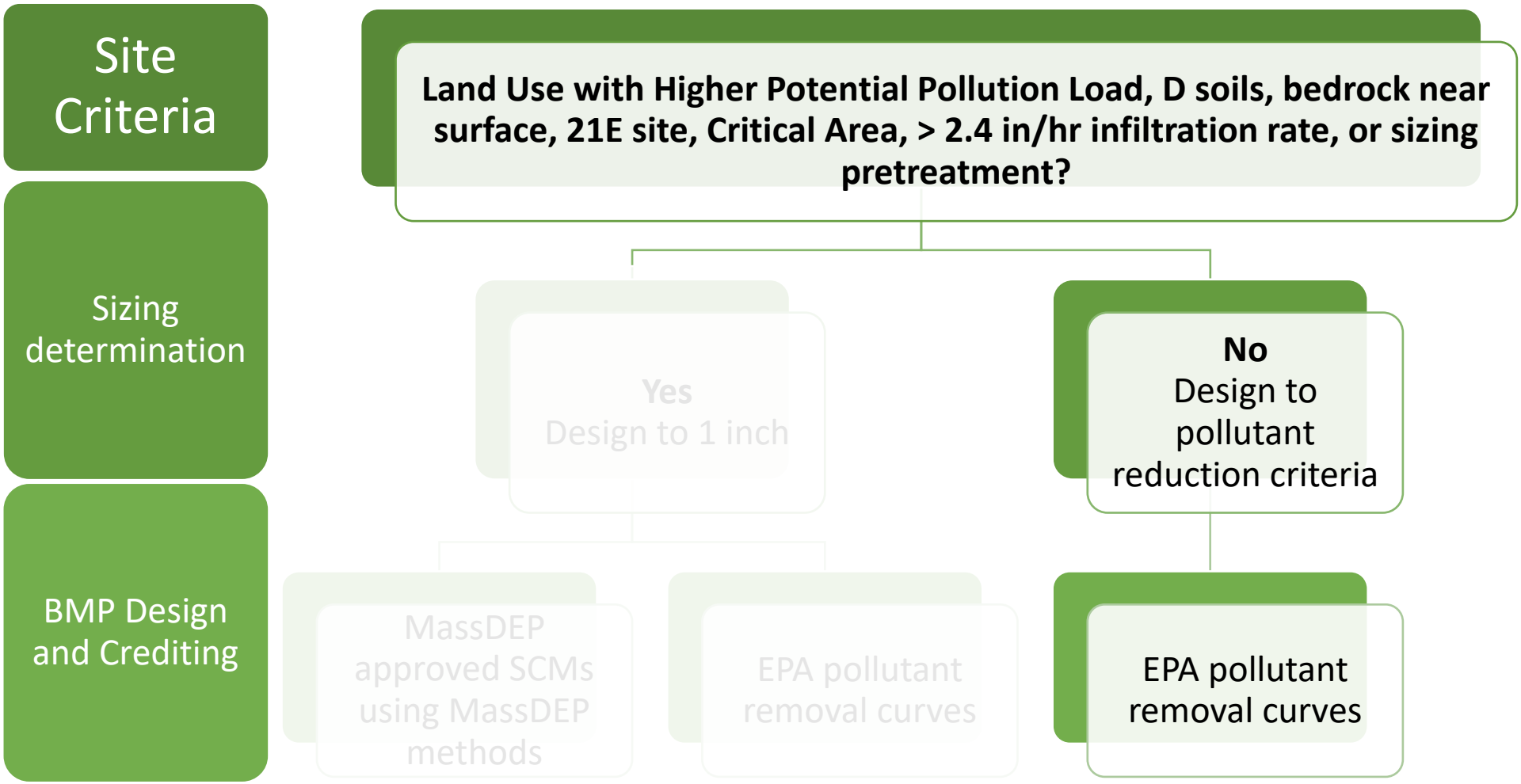
Standard 4: Steps for Sizing



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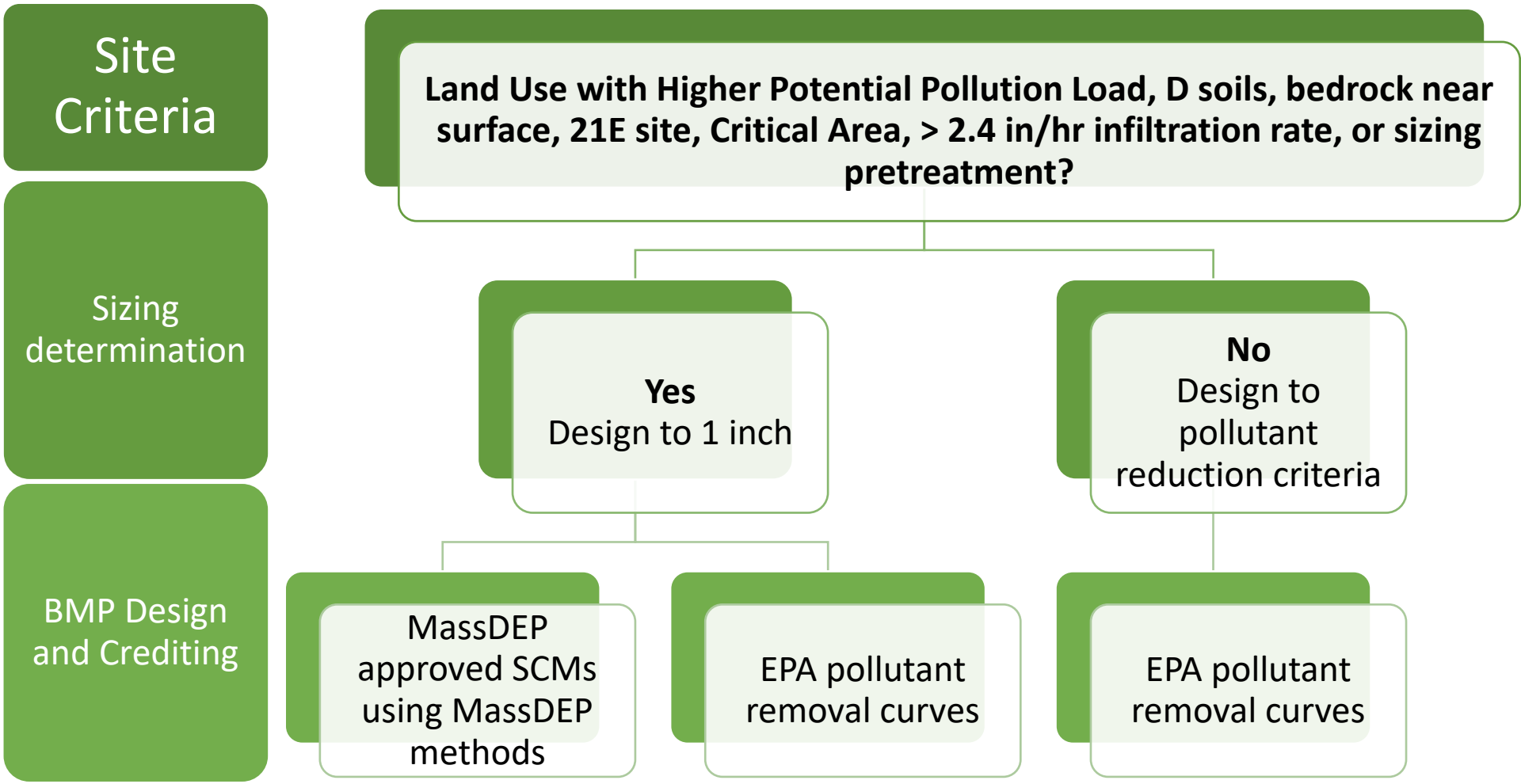


Options for Meeting Standard 4

Option 1:

- Use EPA BMP Performance Curve to size a Stormwater Control Measure (SCM) to meet Total Suspended Solids and Total Phosphorus Load Reductions

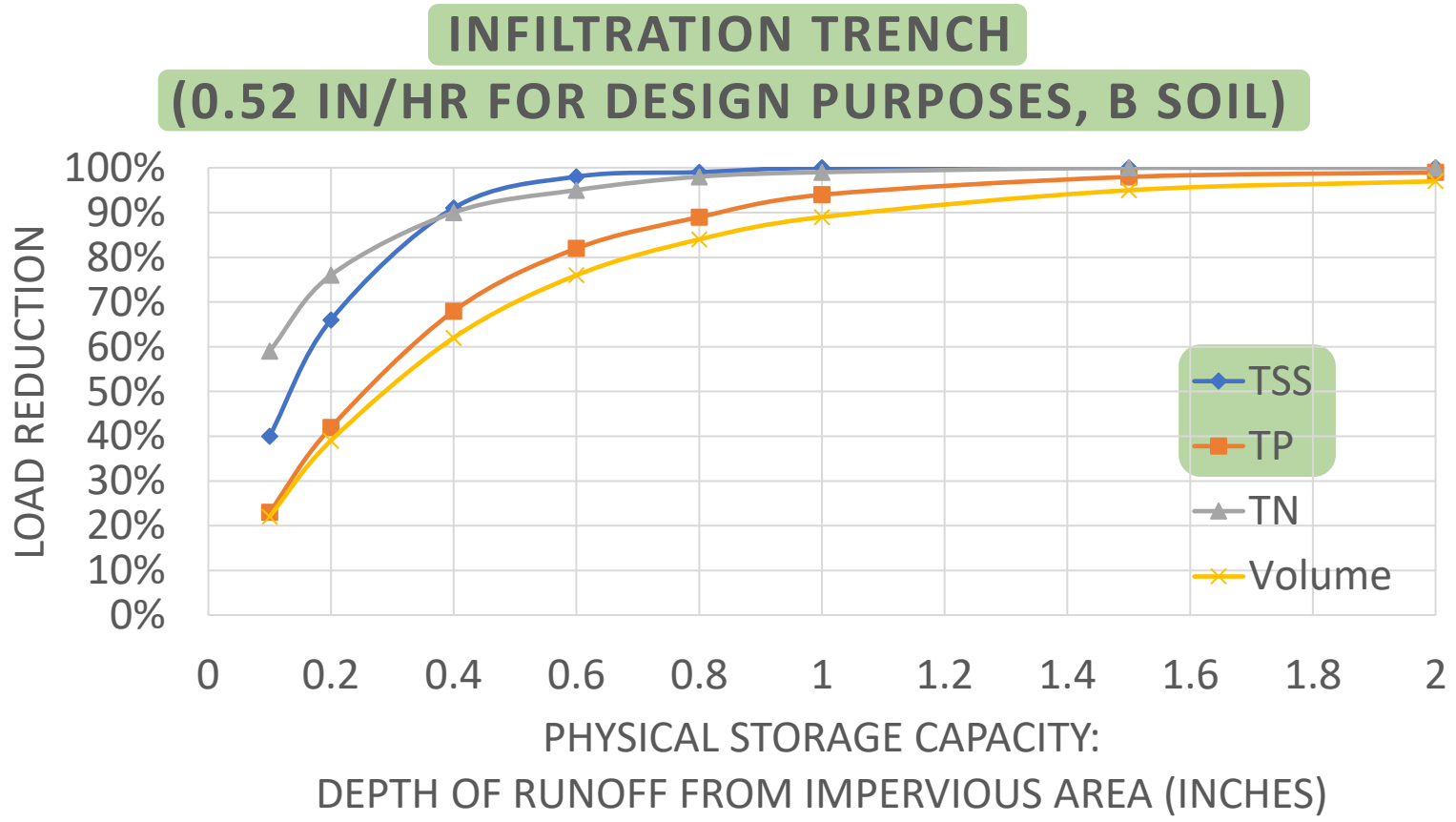
  Stormwater Control Measure Nomographs with pollutant removal and design cost estimates – UNHSC, 2018, https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ms4-permit-nomographs.pdf

- DEP SCM and EPA BMP Crosswalk
  https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/bmp-crosswalk.pdf

Option 2:

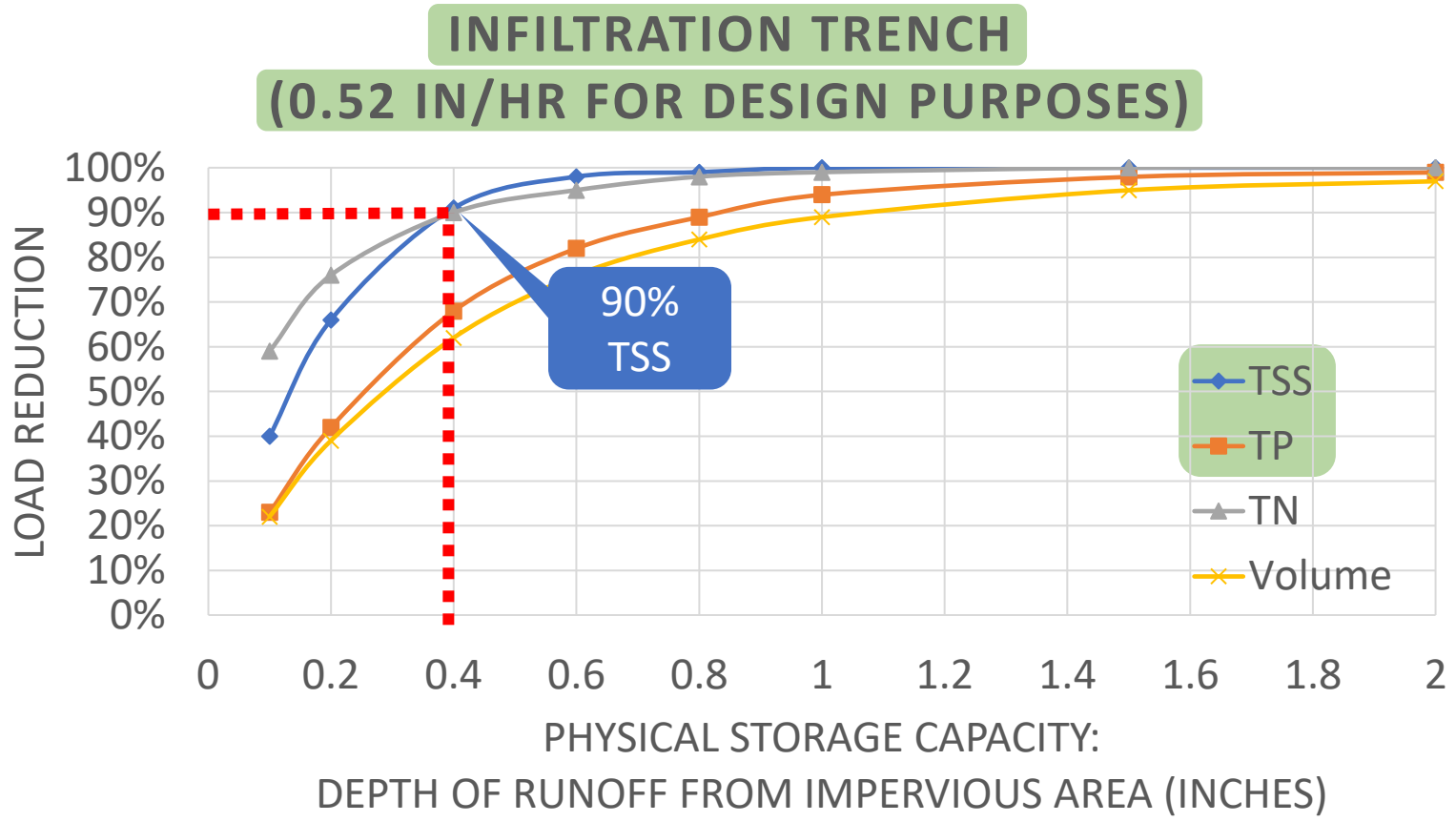
- Size SCM to 1” if:
  - When no EPA curve available, LUHPPL, D soils, bedrock near surface, 21E site, Critical Area, > 2.4 in/hr infiltration rate, or sizing pretreatment

Use EPA Pollutant Removal Curves



https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ms4-permit-nomographs.pdf

Use EPA Pollutant Removal Curves



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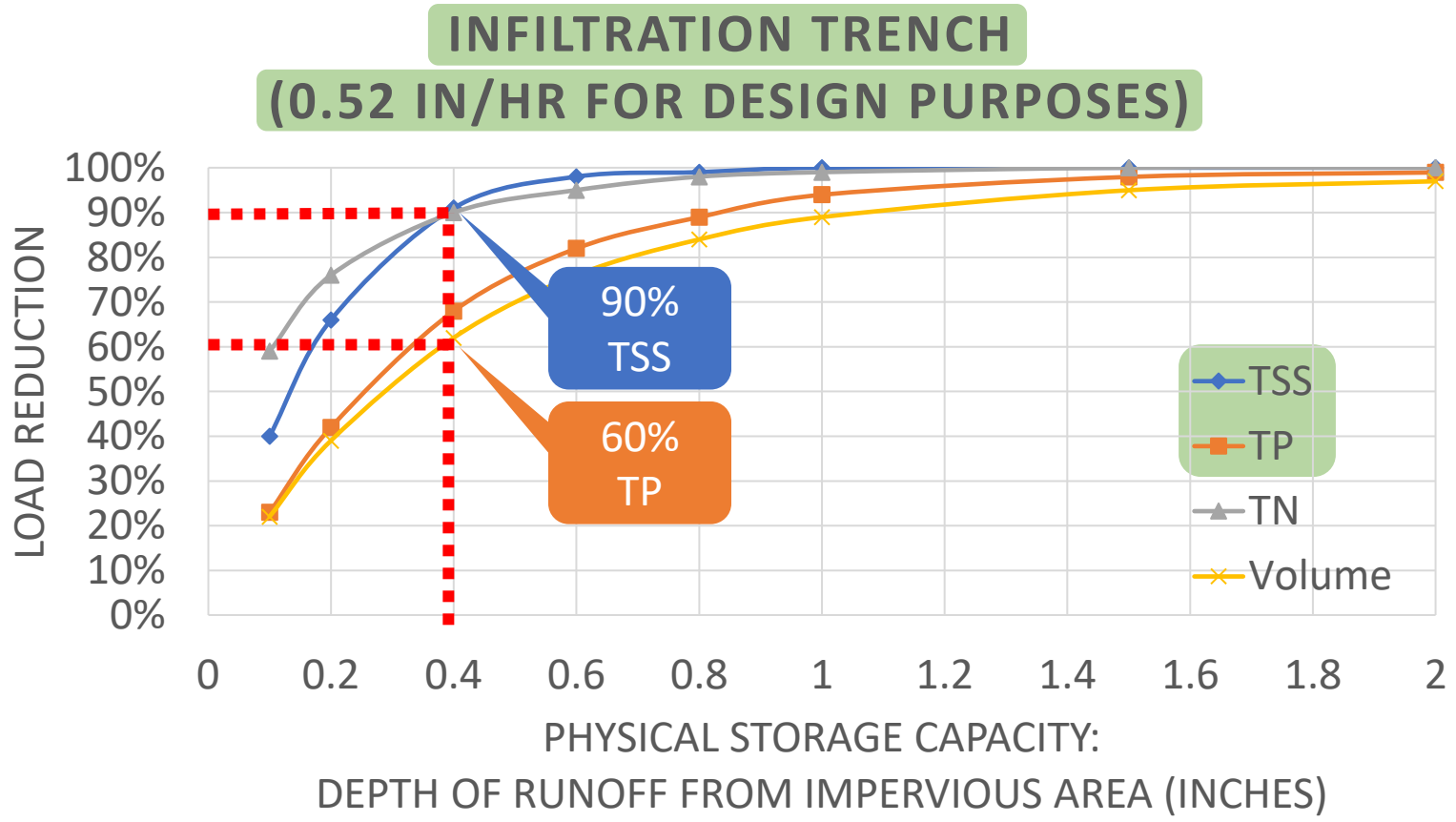

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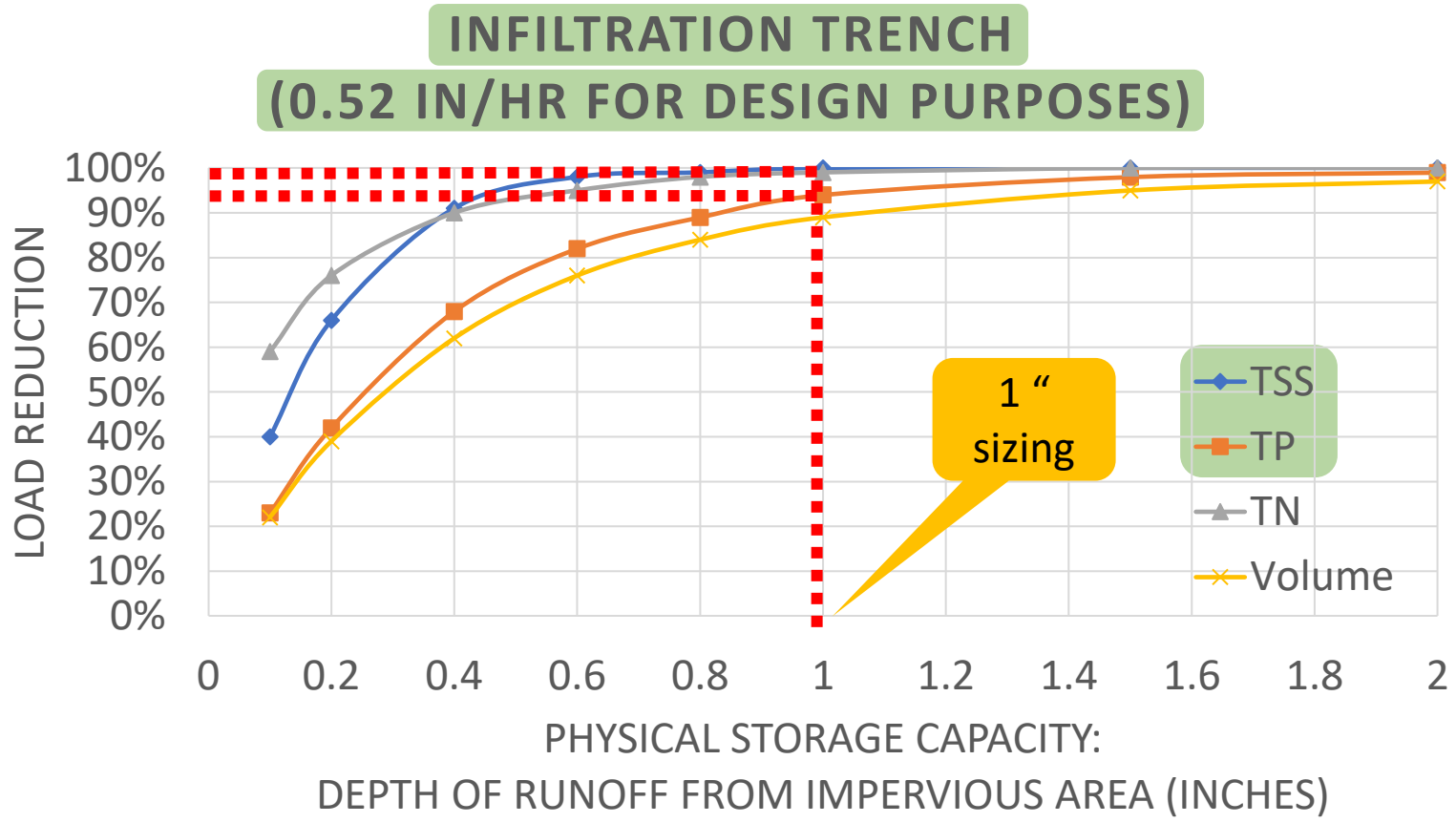

https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ms4-permit-nomographs.pdf

Small Scale Measures Treat Runoff

- Small Scale control = SCM smaller than current MassDEP Water Quality Volume
- Distributed small scale SCMs can fit in right-of-ways, other space constrained areas
- Weighted average by sub-watershed to meet pollutant removal requirement

Meeting 90% TSS and 60% TP Removal

Option 1:

- Use EPA BMP Performance Curve Size SCM to meet Total Suspended Solids and Total Phosphorus Load Reductions

  Stormwater Control Measure Nomographs with pollutant removal and design cost estimates – UNHSC, 2018, https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ms4-permit-nomographs.pdf

- DEP SCM and EPA BMP Crosswalk

  https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/bmp-crosswalk.pdf

Option 2:

- Size SCM to 1” using current DEP method when:
  - No EPA curve available, LUHPPL, D soils, bedrock near surface, 21E site, Critical Area, > 2.4 in/hr infiltration rate, or sizing pretreatment

Summary of DEP SCM Sizing Methods

- Handbook Volume 3, Chapter 1: Documenting Compliance with the Massachusetts Stormwater Standards
- Standard 3, Recharge – Sizing storage volume:
  - "Static" Method;
  - "Simple Dynamic" Method; or the
  - "Dynamic Field" Method
- Example: Static Method

MassDEP Static Method for Sizing BMPs

- Assumes entire recharge /treatment volume is based on:
- $Vol_{Recharge} = Depth_{Runoff} * Area_{Impervious}$

- Runoff Depth = 1 inch
- Impervious area definition
  - Existing: Roofs; paved roads, driveways, parking lots and sidewalks
  - Proposed addition: gravel roads, driveways and parking areas, artificial turf, compacted soils

Clarifying Questions and 10 Minute Break

Standard 7: Redevelopment

Laura Schifman, Stormwater Coordinator

Purpose: Encourage redevelopment to minimize alterations to sites that contain unaltered wetland resources

Existing Regulation:
Meet the following Stormwater Management Standards to the maximum extent practicable:

- Standard 2
- Standard 3
- Pretreatment and structural best management practice requirements of Standards 4, 5, and 6.
- Standard 1 (only for existing discharges)

Comply with all other Stormwater Management requirements and Improve existing conditions

Proposal for Redevelopment Standard 7

Current MassDEP Rule	MS4 Requirement
▪ Standards 2, 3, and 4: Maximum Extent Practicable (MEP) and improve existing conditions	▪ Remove 80% Total Suspended Solids ▪ Remove 50% Total Phosphorus ▪ Off-site mitigation allowed within HUC 12

Proposal: Require 80% TSS and 50% TP* (instead of MEP)

MEP for Std 2, 3, partially for 5 and 6.

Off-site mitigation permitted to meet Std 3 and 4^ within HUC 12, same or adjacent municipality, and same wetland system if on-site mitigation is not practicable.

* or as required by TMDL, see Standard 11

^ in sites that do not discharge to Critical Areas or TMDL waters or are designated as LUHPPL

Standard 4 applies to total post-construction impervious area on site.
Definition of Redevelopment site does not change.

Proposal for Redevelopment Standard 7

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MEP for Std 2, 3, partially for 5 and 6.

Off-site mitigation permitted to meet Std 3 and 4^ for redevelopment within HUC 12, same or adjacent municipality, and same wetland system, if on-site mitigation is not practicable.

*** or as required by TMDL, see Standard 11**
^ in sites that do not discharge to Critical Areas or TMDL waters or are designated as LUHPPL

Standard 4 applies to <u>total</u> post-construction impervious area on site.
Definition of site designation does not change.

Comparison of Proposed WPA Redevelopment Standard and MS4 Redevelopment

- Example: Total Suspended Solids

	Current Stormwater Handbook	2016 MS4	Proposed Stormwater Handbook
New Development	80% TSS	90% TSS 60% TP	90% TSS 60% TP
Redevelopment	80% TSS to Maximum Extent Practicable	80% TSS 50% TP	80% TSS 50% TP

Applying TSS Removal to Redevelopment under MS4 and WPA

MassDEP:
100% New Development

EPA:
New Development

MassDEP:
85% New Development
15% Redevelopment

EPA:
Redevelopment

MassDEP:
34% New Development
66% Redevelopment

EPA:
Redevelopment

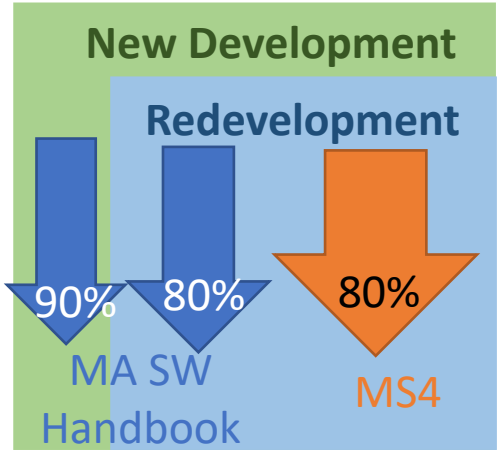
TSS Load Reductions under MS4 and WPA

MassDEP:
90% TSS removal

EPA:
90% TSS removal

MassDEP:
88.5% TSS removal

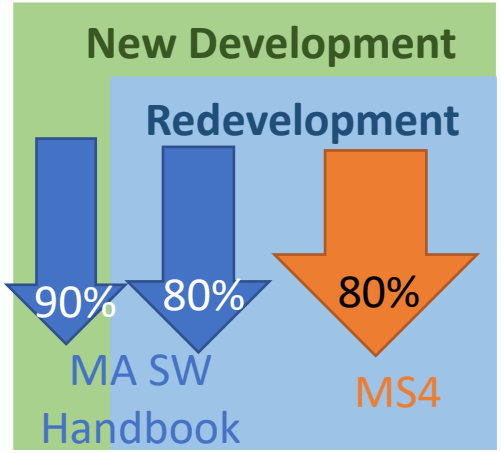
EPA:
80% TSS removal

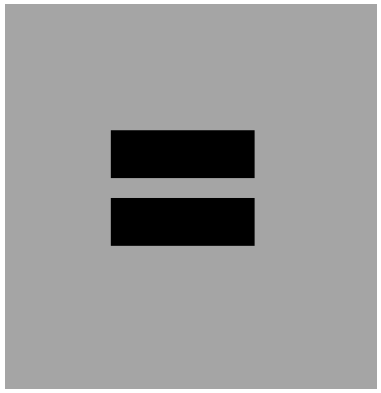


MassDEP:
83.4% TSS removal

EPA:
80% TSS removal

TSS Load Reductions under MS4 and WPA





MassDEP:
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EPA:
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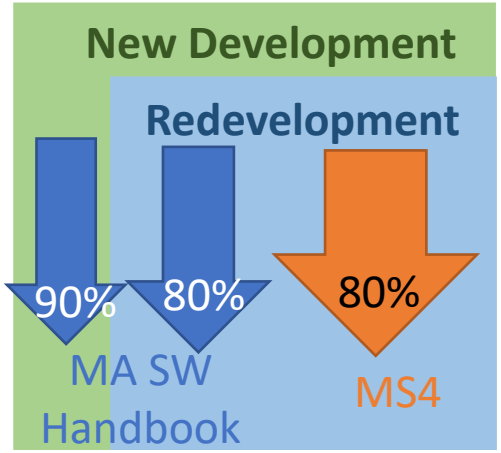

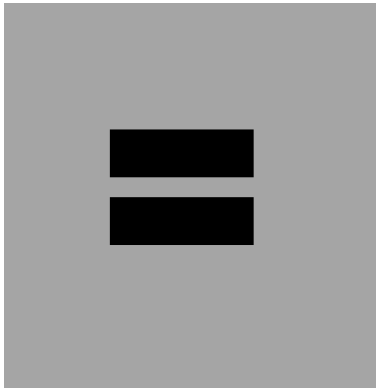

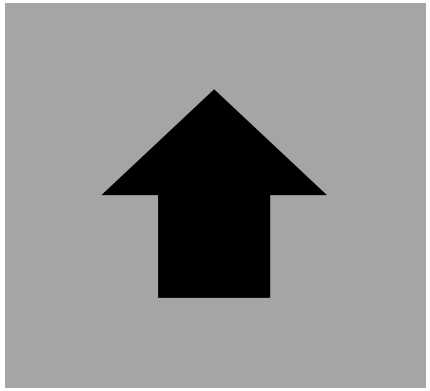

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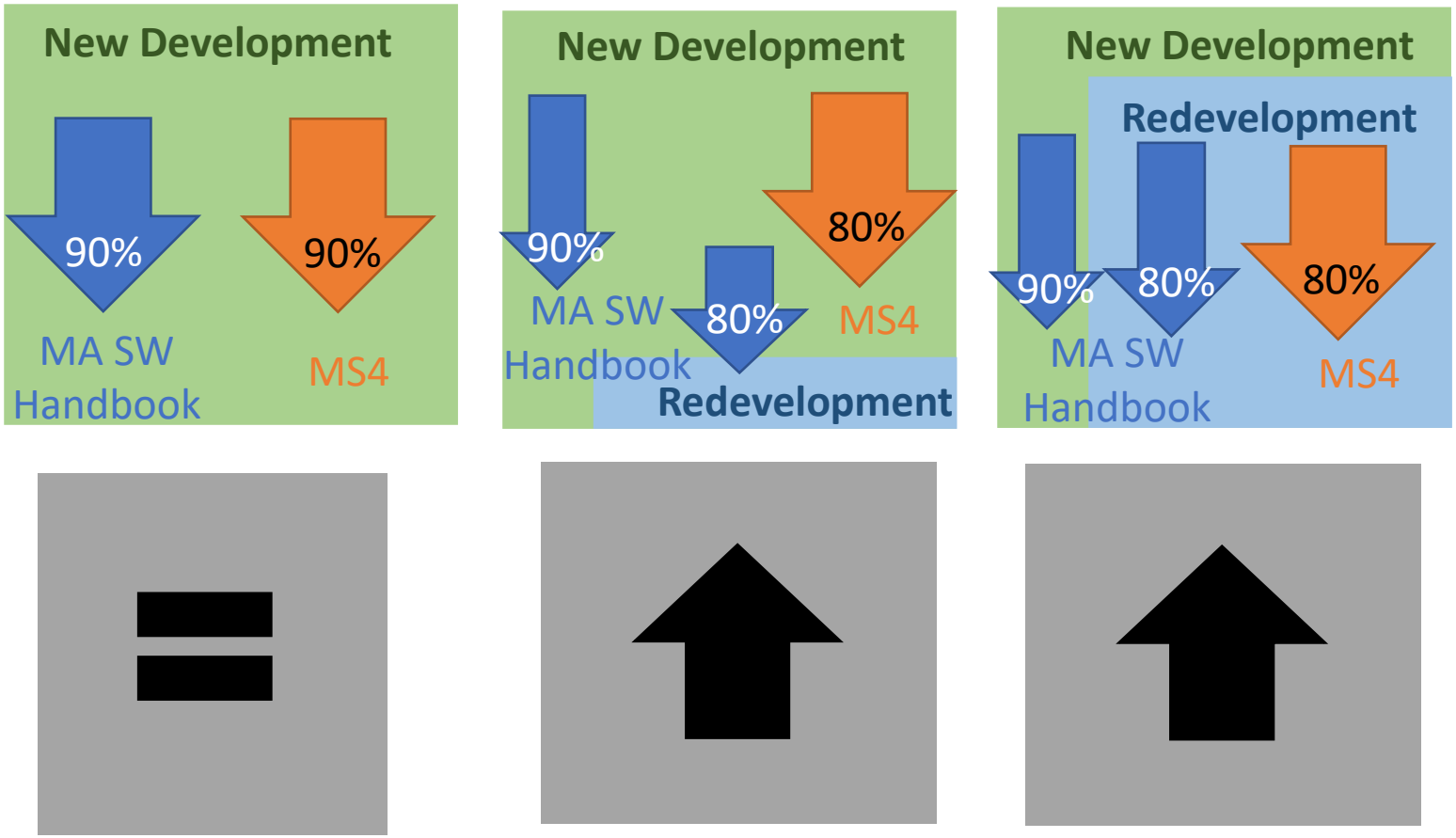
TSS Load Reductions under MS4 and WPA



Numeric Load Reduction Standards provide Higher Water Quality Protection

https://neiwpcc.org/our-programs/wetlands-aquatic-species/habs/

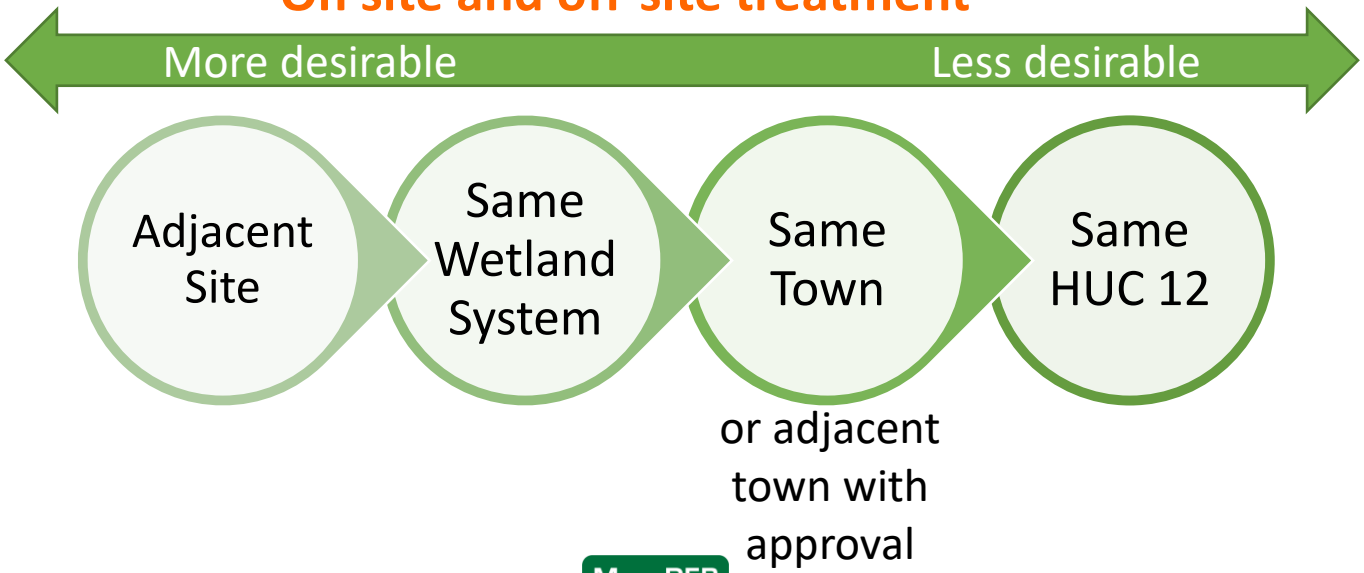
- Development results in degradation of wetland resource areas
- Numeric standards provide higher water quality protection than Maximum Extent Practicable
- Historically, only limited treatment provided on many redevelopments
- Many urban areas are required to meet high pollutant load reductions to comply with Total Maximum Daily Load (TMDL) wasteload and load allocations

Redevelopment:
When on-site mitigation is not possible

Only Standards 3 (recharge) and 4 (water quality) eligible for off-site mitigation if on-site mitigation is not practicable.

Potential for combination approach:

On site and off-site treatment



Additional Changes Proposed

Parameter	Existing Regulations	Proposed Regulations
5-9 lots/units	Maximum Extent Practicable	Fully Meet Stormwater Standards
Impervious Area definition	Roofs; paved roads, driveways, parking lots and sidewalks	Add gravel roads, driveways and parking areas, artificial turf, and compacted soils
ESSD/LID	For new development: Must be considered to meet Stormwater Standard 3 (recharge). For Redevelopment: Must be considered	For new development and redevelopment: Must be incorporated unless not feasible.

New Standard 11: Supporting Total Maximum Daily Loads

Lealdon Langley, Director, Division of Watershed Management

New Standard 11 – Supporting TMDLs

Standard 4 already requires compliance with TMDLs, however we want to make this clearer. MassDEP has made great progress on developing TMDLs in the last few years.

If the Order covers a stormwater discharge to a resource area including a water of the United States for which a TMDL has been approved, all stormwater best management practices must be designed to comply with the TMDL.

Inclusion of this specification as a standard will improve success in meeting TMDL goals and ultimately removal of impaired waters from the 303(d) list.

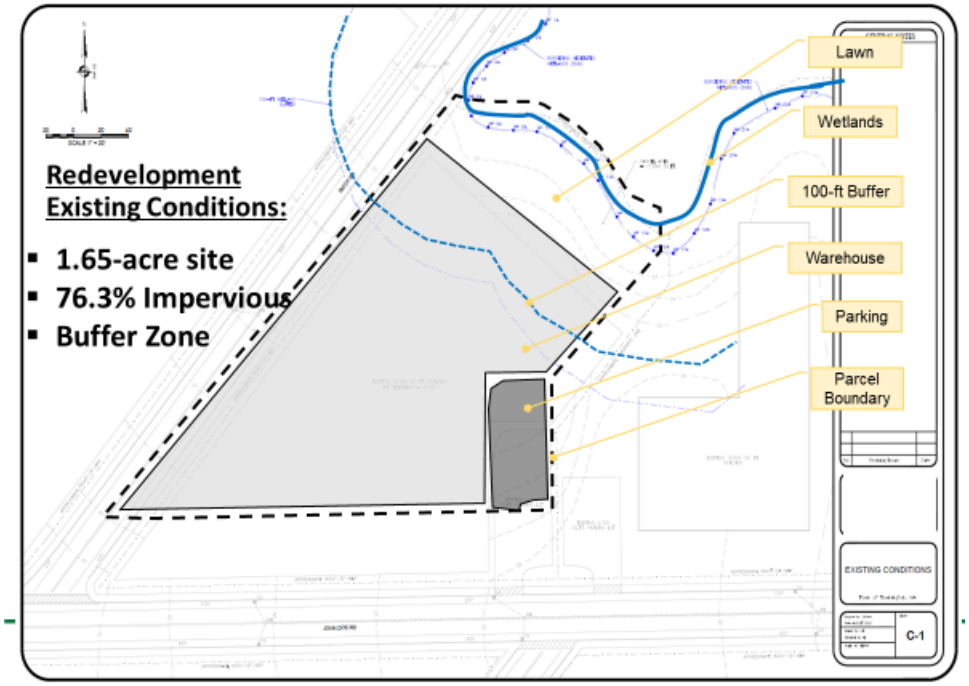
Summary of Major Changes To Be Proposed

1. No new untreated stormwater conveyances
2. Post-development peak discharge rates
3. **Groundwater recharge – 1” recharge for all soils**
4. **Pollutant removal for Post-Development – 90% TSS, 60% TP**
5. Lands Uses with Higher Potential Pollutant Loads
6. Critical area protection, including public drinking waters
7. **Redevelopments – Require 80% TSS, 50% TP (eliminate MEP for STD 4)**
8. Implement Erosion and sedimentation control during construction
9. Implement long-term operation and maintenance of stormwater controls
10. Prohibit Illicit discharges to stormwater controls and wetlands
11. **Supporting TMDL**

MEETING TO DISCUSS SCENARIOS?

Name of Scenario
Scenario 1 (NEW DEVELOPMENT) 26 half-acre lot subdivision with roadway, 26 single-family houses
Scenario 2 (REDEVELOPMENT) Roadway reconstruction with added sidewalk and bike lane on one side
Scenario 3 (REDEVELOPMENT) Residential tight urban lot, multi-family housing, existing structure to be demolished

EXAMPLE:



Questions & Answers

- Advisory Committee Q&A
- Public Q&A