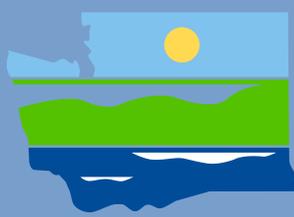


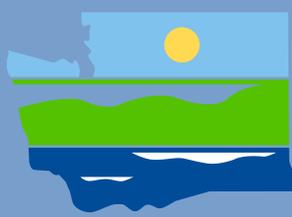
Presentation Overview

Introduction	10:00 AM
Volume I	
Lunch	11:45 AM
Volume II	12:45 AM
Volume III	1:30 PM
Break	2:10 PM
Volume IV	2:25 PM
Volume V	2:45 PM
Adjourn	3:15 PM



Volume I

Minimum Technical Requirements & Site Planning



Chapter 1 Introduction



Chapter 2 Minimum Requirements



Chapter 3 Preparation of Stormwater Site Plans



Chapter 4 BMP & Facility Selection Process



Appendices & Glossary



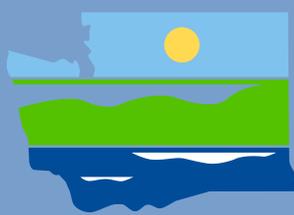
Chapter 1: Introduction

Organization

Description of
BMP Types

Relationship to
Other
Programs/
Requirements

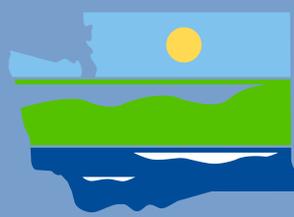
Effects of
Urbanization



Chapter 2: Minimum Requirements

For New
Development &
Redevelopment

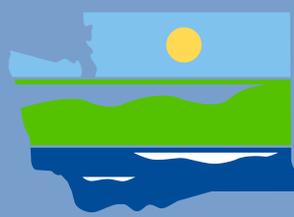




Section 2.1

Attention: Municipal Stormwater Permittees

- Please use Appendix 1 – **not** Chapter 2 – to comply with S5.C.5.a.i.



Appendix 1 Additions to Chapter 2

MR #2

- Additional statements from Vol. 2 re Const SWPPP
- Text of Elements #1 - #13 the same

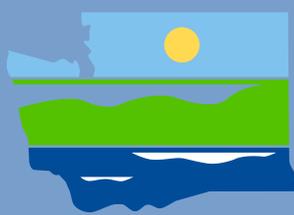
MR #6

- “Treatment-type thresholds” from Vol. V

Section 6: Exceptions/ Variances

- Keep records; Jurisdiction-wide decisions need Ecology OK

Section 7: Basin Planning



Section 2.3: Definitions

**LID:
hydrologic
focus**

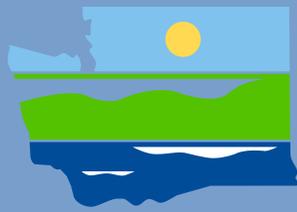
- LID BMP's
- LID Principles

Bioretention

- Engineered; Design Criteria
- Used where MR # 6 and/or MR #7 apply

**Rain
Gardens**

- Used where only MR #1 - #5 apply



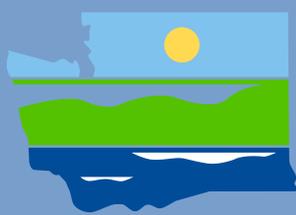
Section 2.3: Definitions

Hard Surfaces

- Impervious Surfaces
- Pervious Pavements
- Vegetated (Green) Roofs

Pollution-Generating Hard Surface (PGHS)

- PGIS, PG pervious pavements
- Vehicle use, industrial activities, material storage



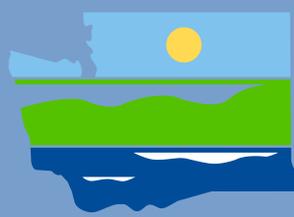
Section 2.3: Definitions

Pervious Surfaces

- Converted pervious surfaces
- Pollution-generating pervious surfaces (PGPS)

NOTE:

Permeable pavements are both hard surfaces and pervious surfaces



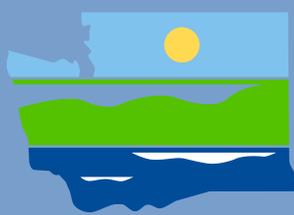
Section 2.4 Project Thresholds

When are stormwater requirements triggered?

Depends upon size of project

Amount of hard surfaces

Extent of land disturbed



New Development Thresholds

Min. Requirement #2 -Erosion control

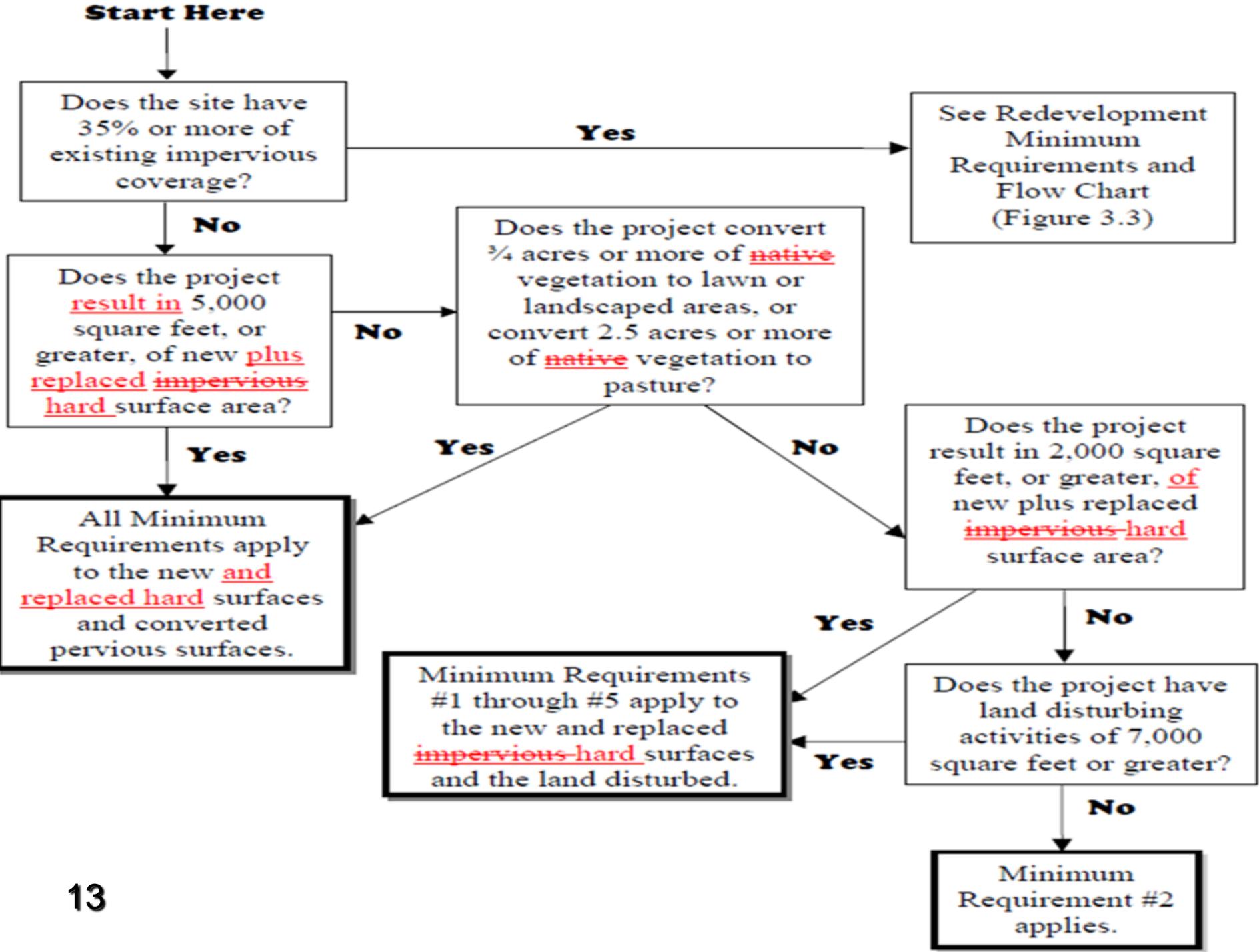
- All projects (No submittal for projects < 2,000/7,000)

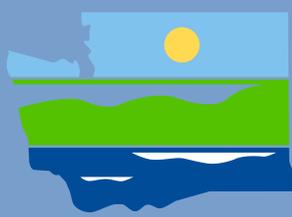
Min. Requirements #1 - #5:

- $\geq 2,000$ sq. ft. new and replaced hard surface area, or
- $\geq 7,000$ sq. ft. land disturbance

Min. Requirements #1 - # 9:

- 5,000 sq. ft. new and replaced hard surface area, or
- 3/4 acre vegetation to lawn/landscape, or
- 2.5 acres vegetation to pasture





Redevelopment Thresholds

New hard surface or converted pervious

- Same thresholds as “New Development”

Replaced hard surfaces

- MR #1 - #5 – Same as “New Development”

Replaced hard surfaces:

MR #6 - #9 (Treatment and Flow Control) only if:

- New + replaced hard surfaces \geq 5,000 sq. ft., AND proposed improvements value $>$ 50% of existing improvements value
- For roads, new hard surfaces \geq 5,000 sq. ft., and \geq 50% of existing hard surface area

Does the project result in 2,000 square feet, or more, of new plus replaced hard surface area? ~~Do the new, replaced, or new plus replaced impervious surfaces total 2,000 square feet or more?~~

OR

Does the land disturbing activity total 7,000 square feet or greater?

Yes

Minimum Requirements #1 through #5 apply to the new and replaced impervious-hard surfaces and the land disturbed.

Next Question

No

Minimum Requirements #2 applies.

Does the project add 5,000 square feet or more of new impervious-hard surfaces?
OR
Convert $\frac{3}{4}$ acres or more of native-vegetation lawn or landscaped areas?
OR
Convert 2.5 acres or more of native-vegetation to pasture?

Yes

All Minimum Requirements #1 through #9 apply to the new hard surfaces and the converted pervious surfaces.

Next Question

No

Is this a road related project?

Yes

Does the project add 5,000 square feet or more of new impervious-hard surfaces?

Yes

Do new impervious-hard surfaces add 50% or more to the existing impervious-hard surfaces within the project limits?

No

No additional requirements

Yes

All Minimum Requirements #1 through #9 apply to the new and replaced impervious-hard surfaces.

No

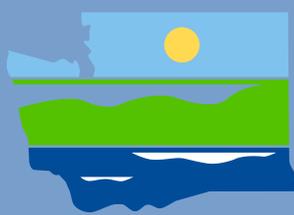
Is the total of new plus replaced impervious-hard surfaces 5,000 square feet or more, AND does the value of the proposed improvements – including interior improvements – exceed 50% of the assessed value (or replacement value) of the existing site improvements?

Yes

No

No additional requirements

No



Section 2.5: Minimum Requirements

1. Stormwater Site Plans

2. Construction Stormwater Pollution Prevention

3. Source Control

4. Preservation of Natural Drainage Systems and Outfalls

5. Onsite Stormwater Management



Section 2.5: Minimum Requirements

6. Runoff Treatment

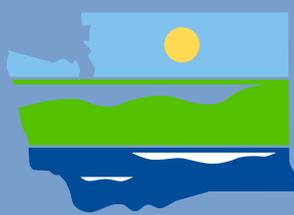
7. Flow Control

8. Wetlands Protection

9. Operation and Maintenance

~~10. Basin Planning~~

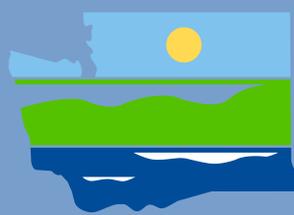
- Basin Planning removed from list of Minimum requirements



Minimum Requirement #1 Stormwater Site Plan Preparation

Use site-appropriate development principles to retain native vegetation and minimize impervious surfaces to the extent feasible.

Local codes should change to incorporate certain principles, and may give discretion on others.



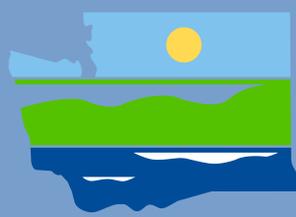
Minimum Requirement #2

Updated consistent with NPDES Construction Stormwater General Permit

- Details in Volume II presentation

Added Element #13: Protect LID BMPs

- Protect Rain Gardens/Bioretenion from sediment & compaction. Remove sediments.
- Protect permeable pavements & base course from sediments and muddy construction equipment



Minimum Requirement # 3: Source Control

No substantive Changes!

Minimum Requirement # 4:
Natural Drainage & Outfalls

No substantive Changes!

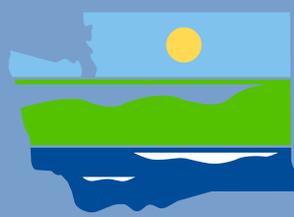


Minimum Requirement #5 On-site Stormwater Management

Intent:

Reduce hydrologic change – especially changes in surface and shallow sub-surface flows

Apply on-site BMPs to infiltrate, disperse, and retain runoff

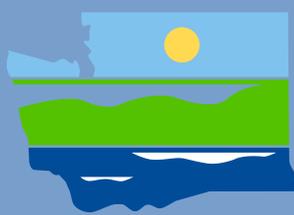


Projects subject Only to MR #1- #5

Use Mandatory List #1, or

Meet LID Performance Standard

- Cannot use Rain Gardens; can use Bioretention
- Demonstrate compliance with approved models and methods



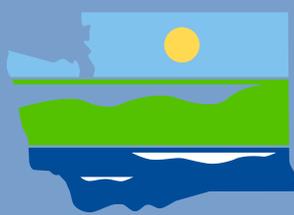
Mandatory List #1

Lawn and landscaped areas:

1. BMP T5.13

Roofs: consider in order listed; use first feasible option

1. Full Dispersion per BMP T5.30
2. Downspout Infiltration Systems per Volume III
3. Rain Gardens per WSU Handbook
4. Downspout Dispersion Systems per BMP T5.10



Glacial till: high in runoff
and poor turf quality



Same soil with 30%
compost added. Up to
50% less runoff. Turf
still healthy 4 years later



COOPERATIVE EXTENSION
WASHINGTON STATE
UNIVERSITY



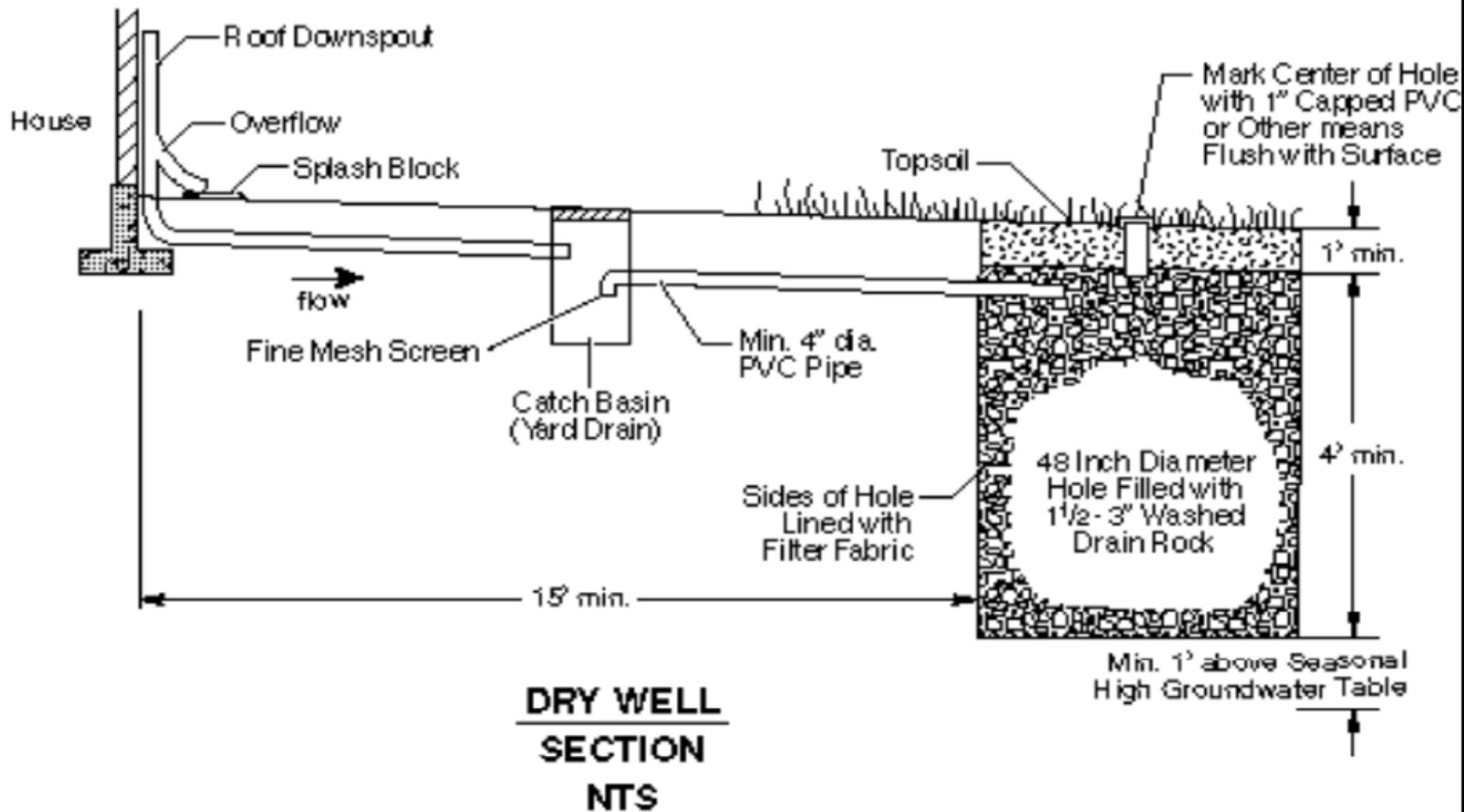


Figure 3.4 Typical Downspout Infiltration Drywell

Rain Garden

Handbook for Western Washington Homeowners

**Designing your landscape
to protect our streams,
lakes, bays, and
wetlands**



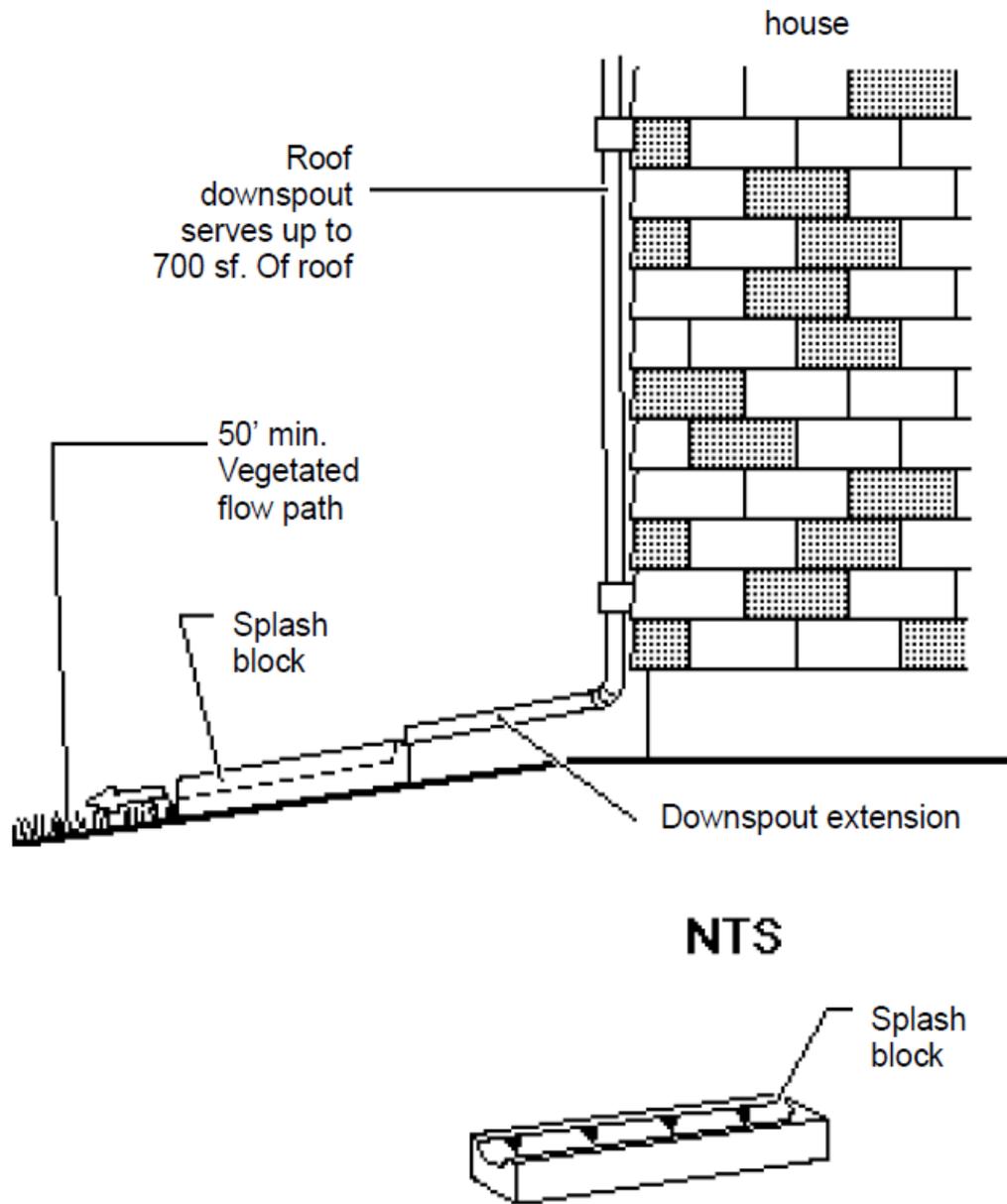
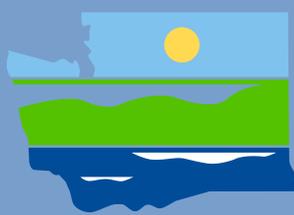


Figure 3.7 Typical Downspout Splashblock Dispersion



Mandatory List #1 (continued)

Other Hard Surfaces (driveways, patios, walks, parking lots):
consider in order listed; use first feasible option

1. Full Dispersion per BMP T5.30



2. Permeable pavement per design criteria in
Appendix III-C



3. Rain Gardens per WSU Handbook



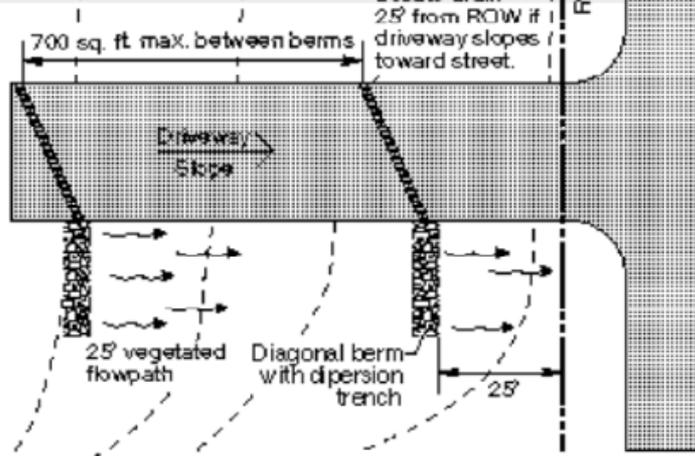
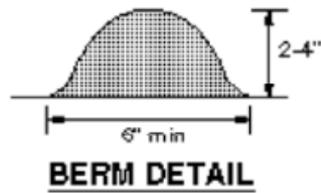
4. Sheet Flow Dispersion per BMP T5.12, or
Concentrated Flow Dispersion per BMP T5.11



Walks

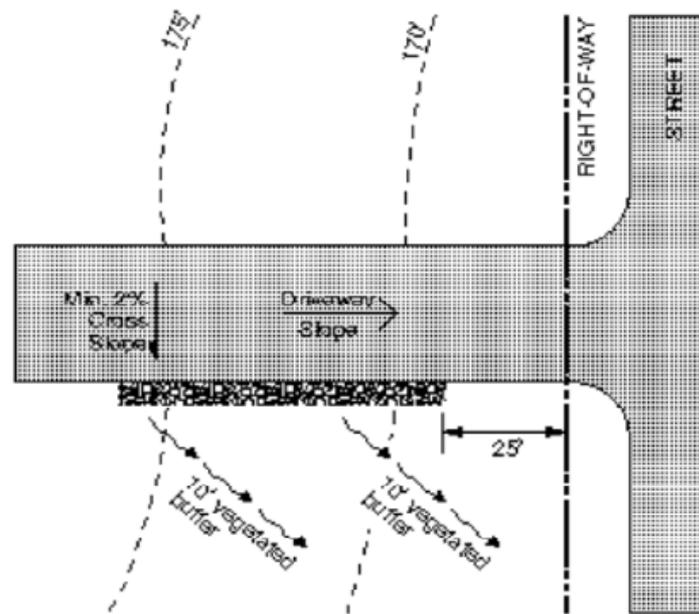


Driveways & Parking Areas



PLAN

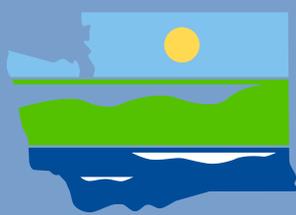
Driveway Dispersion Trench
Driveway Slope Varies and Slopes Toward Street



PLAN

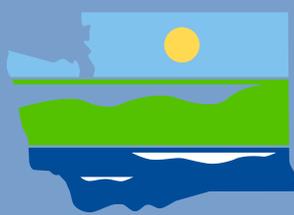
Sheet Flow Dispersion from a Driveway
Flat to Moderately Sloping Driveways

**Figure 5.5 –
Sheet Flow
Dispersion for
Driveways**



Project Triggering MR #1-9

Project Type & Location	Requirement
Development (new or redevelopment) on any parcel inside the UGA, or development outside the UGA on a parcel less than 5 acres	LID Performance Standard and BMP T5.13 OR Mandatory List #2 (applicant option)
Development (new or re-development) outside the UGA on a parcel of 5 acres or larger	LID Performance Standard and BMP T5.13

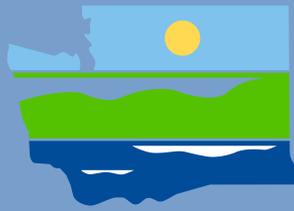


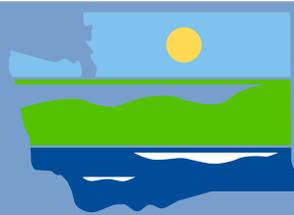
Mandatory List #2

Same as Mandatory List # 1, except

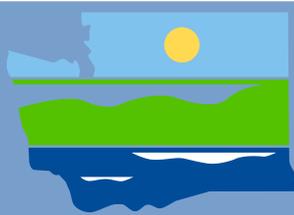
Roofs: *in order listed; if feasible*

1. Full Dispersion
2. Downspout Infiltration Systems
3. Bioretention BMPs at least 5% of drainage area
4. Downspout Dispersion Systems
5. Commercial buildings: Vegetated roof, or impervious roof to permeable pavement. If the latter option not used, cost analysis for infeasibility of a vegetated roof



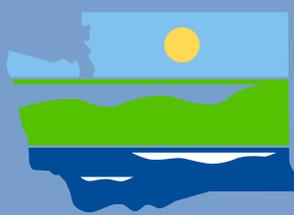


*Seattle Cancer Care Alliance roof.
Photo: Annika McIntosh, 2009, from City of Seattle survey of green roofs*



DEPARTMENT OF
ECOLOGY
State of Washington





Mandatory List #2 (Continued)

Same as Mandatory List #1, except:

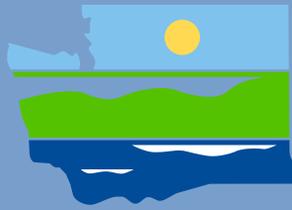
**Other Hard Surfaces (walks, driveways, parking lots, roads):
*in order listed; if feasible***

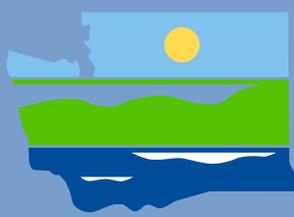
1. Full Dispersion

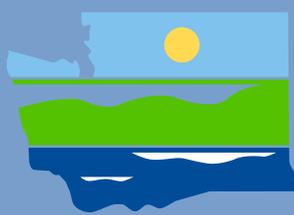
2. Permeable pavement

3. Bioretention BMPs at least 5% of drainage area

4. Flow Dispersion

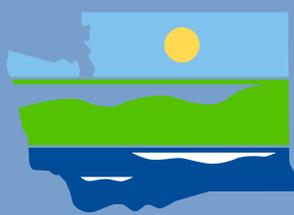






Project Triggering MR #1-9

Project Type & Location	Requirement
Development (new or redevelopment) on any parcel inside the UGA, or development outside the UGA on a parcel less than 5 acres	LID Performance Standard and BMP T5.13 OR Mandatory List #2 (applicant option)
Development (new or re-development) outside the UGA on a parcel of 5 acres or larger	LID Performance Standard and BMP T5.13

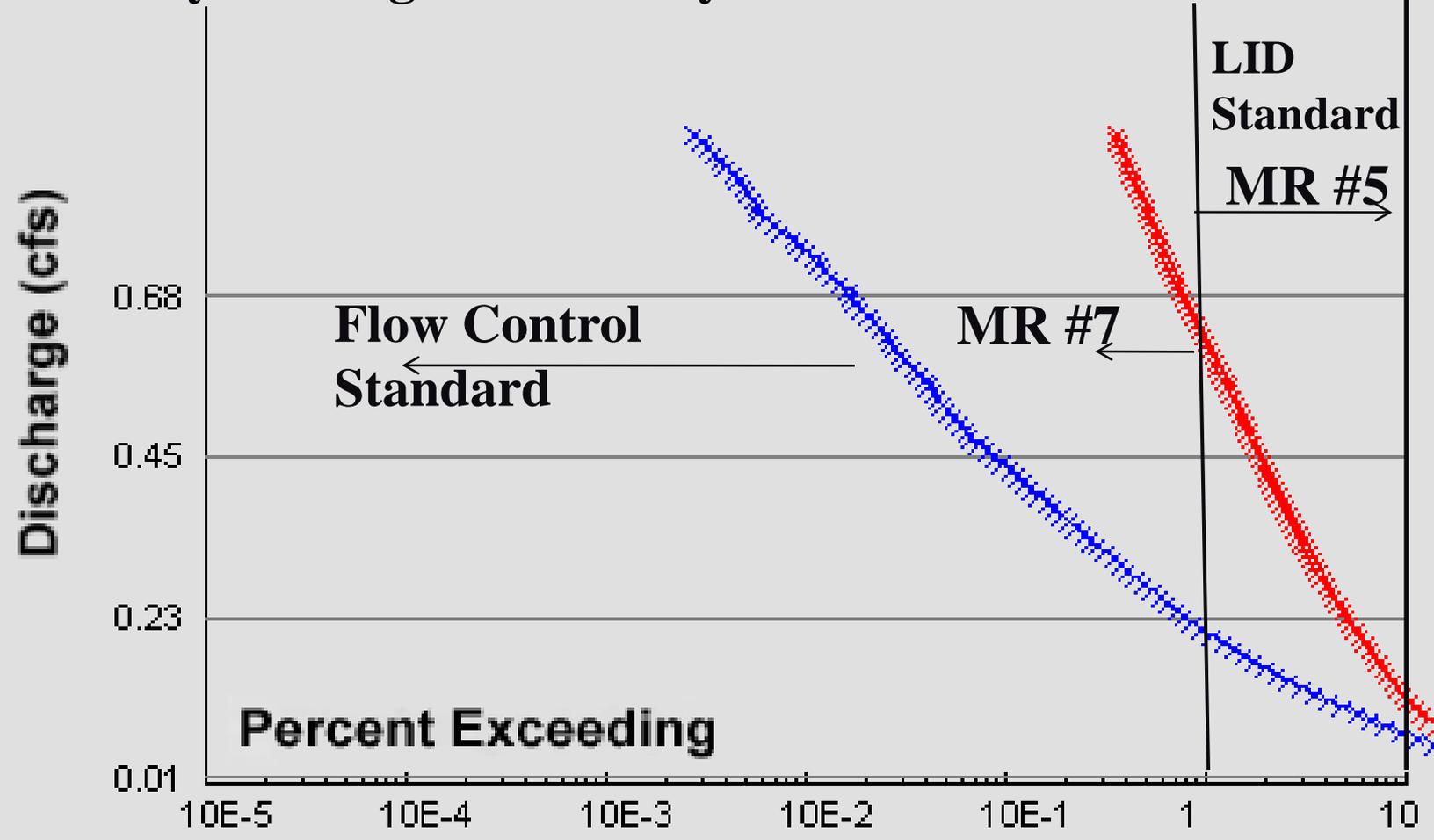


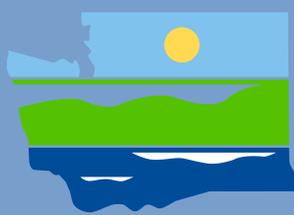
LID Performance Standard

Match discharge durations to pre-developed (pre-European) durations from 8% of the 2-year flow to 50% of the 2-year flow

LID Std: Control durations from 8% of 2-yr through 50% of 2-year

x Predeveloped
x Developed





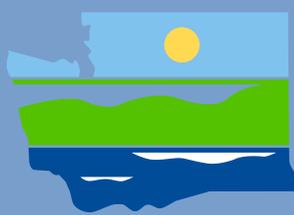
Performance Standard Criteria

Useful indicator of progress toward LID goal attainment
(mimic natural hydrology)

Should be related to the goal of protecting beneficial uses –
scientifically sound

Compliance easily demonstrated and determined (Simple to
use and to check)

Use existing runoff modeling tools



LID Performance Standard

Easiest option to implement

1 hydrologic analysis for MR#5 & #7

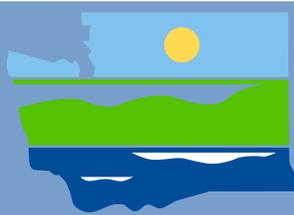
Increases protection of streams from erosion

- $\frac{1}{2}$ 2 yr is bedload threshold for most streams

Basin-scale analyses indicate healthy B-IBI score

Duration std is harder to meet than volume std

Provides implementation flexibility



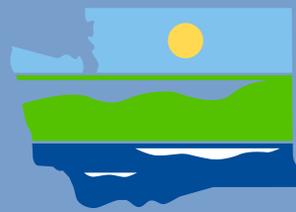
LID Feasibility Criteria: Appendix I-F

Criteria for Bioretention/Rain Gardens, Permeable Pavement, Vegetated Roofs

- Site/Engineering-based
- Competing Needs

Local governments

- Required to use these & BMP design criteria
- Intended as comprehensive list



Bioretention Infeasibility Site/Engineering-Based

Site-specific Geotech evaluation recommendation

- Erosion, slope failure, or flooding

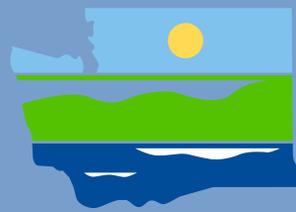
Distance to groundwater

- < 1' for small drainages; < 3' for larger drainages

Field testing: < 0.3 in/hr

Incompatible with surrounding drainage

Lack of space in redevelopment



Permeable Pavement Infeasibility Site/Engineering-Based

Geotech evaluation

Field testing < 0.3 in/hr

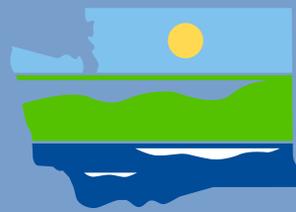
Arterial or Collector

$< 1'$ to base course bottom

Soils don't provide adequate treatment

- Local gov option for inserting a treatment layer

Soil ability to support loads; CBR > 5 is OK



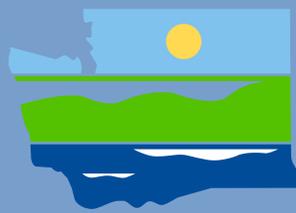
Competing Needs Infeasibility

Conflict with **listed** federal or state laws, rules, standards

Conflict with special zoning district criteria adopted thru community planning process

Public health and safety standards

Transportation regulations to maintain options



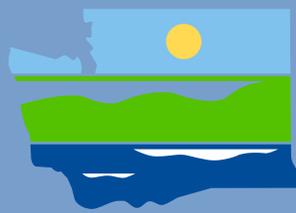
M.R. #6 – Treatment Threshold

The following require construction of stormwater treatment facilities (~~see Table 2.1~~):

- Projects in which the total of ~~effective~~, pollution-generating ~~impervious-hard~~ surface (PGIS) is 5,000 square feet or more in a threshold discharge area of the project, or
- Projects in which the total of pollution-generating pervious surfaces (PGPS) ~~– with the exception of permeable pavements –~~ is three-quarters (3/4) of an acre or more in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site.

Table 2.1 Treatment Requirements by Threshold Discharge Area				
	< 3/4 acres of PGPS	> 3/4 acres PGPS	< 5,000-sf PGIS	> 5,000-sf PGIS
Treatment Facilities		✓		✓
Onsite Stormwater BMPs	✓	✓	✓	✓

~~PGPS – pollution-generating pervious surfaces~~

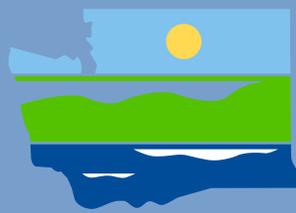


MR #6 – Treatment Threshold

Pollution-generating permeable pavement > 5,000 sq ft in a “Threshold Discharge Area” must comply thru:

- Infiltrating into soils that meet “suitability criteria,” or
- Infiltrating through a treatment layer
- Demo compliance w/ runoff model
 - WWHM/MGS Flood

Ecology does **not** want mini-treatment facilities

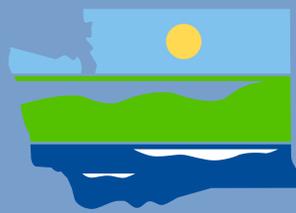


MR 6 – Treatment

Other Changes

- Treatment-type thresholds text reworded for clarity. Intent unchanged.
- WQ Design Flow Rate further defined.
- WQ Design Storm Volume re-described to match intent and WWHM model output.*

*Change not identified in public release draft.



MR #7 – Flow Control

Thresholds

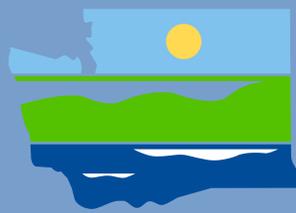
0.1 cfs increase to consider all effective hard and pervious surfaces.

Add 0.15 cfs increase threshold for 15-minute time steps.

Reference Appendix I-G

Map identifies basins eligible to use “existing land cover”

Basins > 40% TIA since 1985



MR #8 – Wetlands Protection

Use New Guidesheets #1 - #3 in Appendix I-D

#1

Criteria for excluding wetlands from serving as a treatment/flow control facility

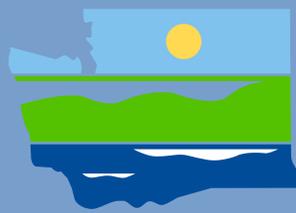
#2

Criteria for including wetlands as a treatment/flow control facility

#3

Wetland Protection

3A – General guidelines
3B – Hydrology guidelines



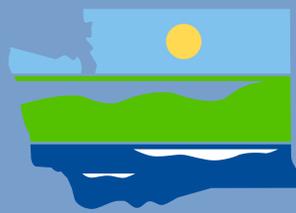
MR #8 – Wetlands Protection

Guidesheet 3B: Hydrology guidelines

Daily influent volume not more than 20% higher or lower than the pre-development volumes.

Monthly influent volume not more than 15% higher or lower than the pre-development volumes

WWHM Upgrade to perform analyses



Exceptions/Variations

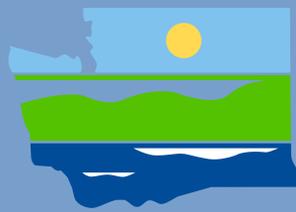
Consistent
with
Municipal
Stormwater
Permits

Severe and
unexpected
economic
hardship

- Criteria
listed

Not
increase
risk to
public, not
injurious to
other
properties
and water
quality

Least
possible
exception to
comply
w/intent



Chapter 3 – Preparation of Stormwater Site Plans

1. Analyze Existing Site Conditions

2. Preliminary Site Layout

3. Off-site Analysis

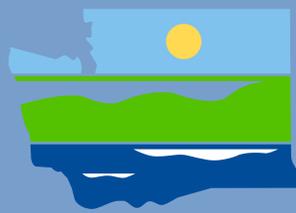
4. Determine applicable Min. Requirements

5. Prepare Permanent SW Plan

6. Prepare Construction SWPPP

7. Complete Plan

8. Check for Compliance



Chapter 4 – BMP & Facility Selection

I. Determine Applicable Min Requirements

II. Select Source Control BMPs

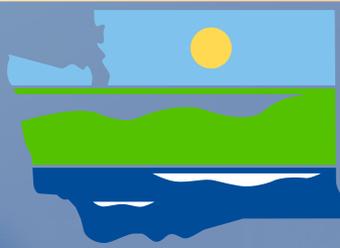
III. Determine TDA's & Applicable Min R'qments

IV. Select Flow Control BMPs and Facilities

V. Select Treatment Facilities (*Reference Volume V*)

VI. Review Selections

VII. Complete Permanent SW Control Plan



DEPARTMENT OF
ECOLOGY
State of Washington

Questions?

