

1



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PRIMARY DRIVER FOR CHANGE

- TDEC's small Municipal Separate Storm Sewer System (MS4) Permit
 - MS4 = system of inlets, pipes, ditches, and outfalls that carry stormwater from public and private properties into local waterways
 - Regulates the quality of stormwater discharges from an MS4 into local waterways
 - Maryville, Alcoa, and Blount County are subject to the MS4 permit along with 85+ other local governments, universities, and federal facilities in Tennessee
- The MS4 permit (2022) included major rule changes for post-construction (permanent) stormwater quality control on new/redevelopments of 1-acre or greater
- Local gov'ts had until September 1, 2024 deadline to implement the new rules

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WHAT DO STORMWATER ORDINANCES IN ALCOA, MARYVILLE, AND BLOUNT COUNTY DO?

- Establish local authority and project applicability/exemptions for stormwater requirements
- "Adopt by reference" the TN-Construction General Permit (TN-CGP), the TN EPSC Handbook, and a local Stormwater Management Manual, which makes them enforceable
- Establish local "controls" for assessing compliance with the ordinance during the design, construction, and maintenance stages of onsite stormwater infrastructure
 - Erosion Prevention & Sediment Control (EPSC) Plan or SWPPP
 - Stormwater Management Plan (SWMP)
 - Grading Permit
 - Stormwater inspections during construction
 - As-Built Plan, professional certifications, and final inspection at construction termination
 - Post-construction stormwater inspections
- Identify the overarching stormwater requirements
- Establish enforcement authority and mechanisms

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WHAT DO LOCAL STORMWATER MANUALS DO?

- Establish and explain the design performance standards for stormwater quality, detention, and water quality buffers
- Provide (or reference) the required hydrologic and hydraulic methods for stormwater designs
- Establish design specifications for the design of stormwater control measures (SCMs)
- Identify helpful stormwater Low Impact Development (LID) practices and local incentives for their use (*coming soon*)
- Provide a checklist for the maps, narratives, and other elements required for design and as-built plans

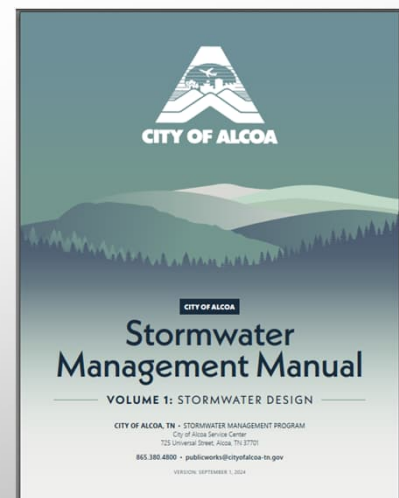
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MARYVILLE & ALCOA STORMWATER MANUALS

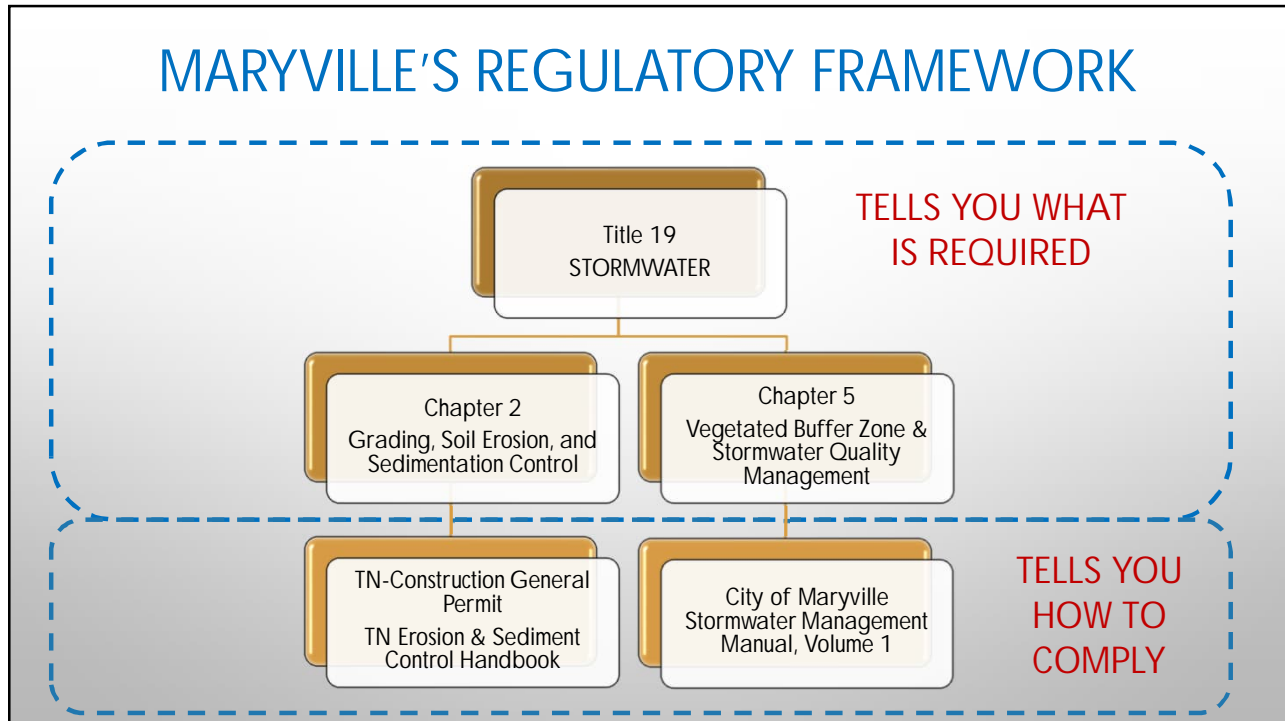
TABLE OF CONTENTS

1. INTRODUCTION
 2. THE NEED FOR SW MANAGEMENT
 3. APPLICABLE REGULATIONS AND PLANS
 4. NONSTRUCTURAL LID PRACTICES
 5. WATER QUALITY BUFFERS
 6. SCM STANDARDS, METHODS, AND SELECTION
 7. SCM DESIGN SPECIFICATIONS
- APPENDICES

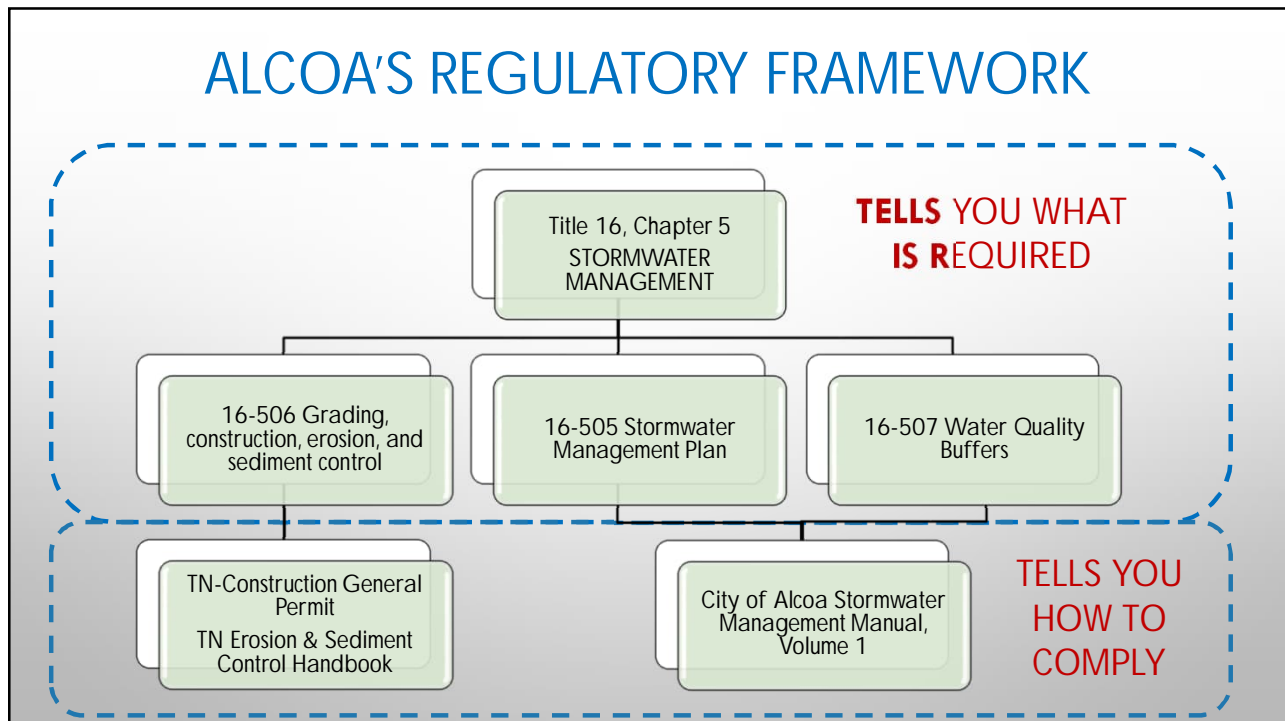
* MOST CONTENT IS THE SAME BUT USE THE MANUAL FOR THE JURISDICTION YOU ARE WORKING IN TO AVOID PLAN APPROVAL DELAYS



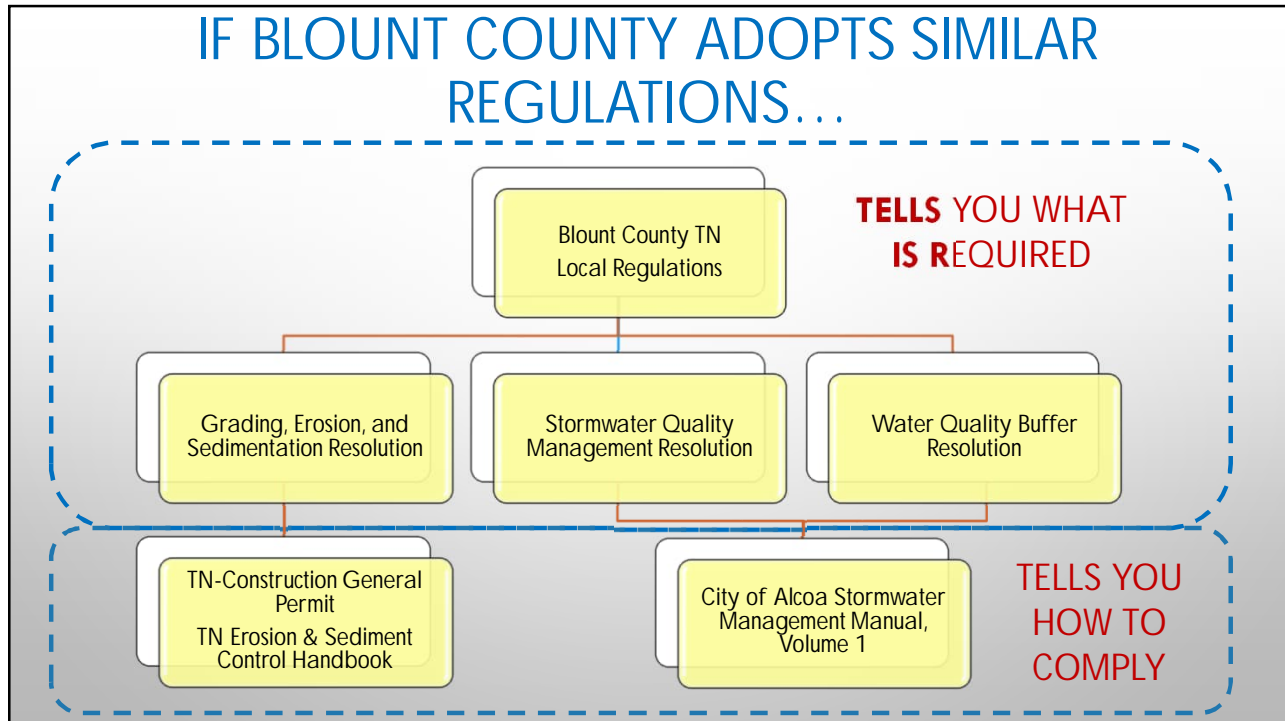
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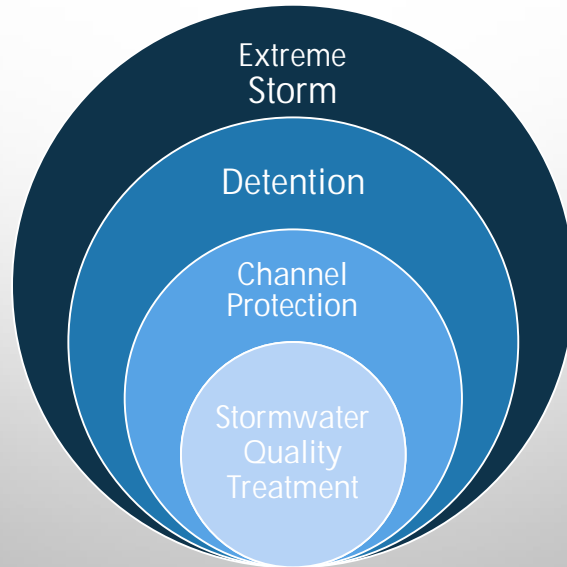
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STORMWATER DESIGN CRITERIA

Standard	Description
Stormwater Quality Treatment	SCMs must be designed to achieve 80% removal of total suspended solids from the water quality volume (WQv)
Downstream Channel Protection	The runoff volume from the 1-year, 24-hour storm event must be detained for no less than 24-hours
Detention <i>(Maryville & Alcoa only)</i>	Post-development peak discharges must be no greater than predevelopment peak discharges for the 2 through 25-year storm events
Extreme Storm Management <i>(Maryville & Alcoa only)</i>	Post-development peak discharges must be no greater than predevelopment peak discharges for the 50 and/or 100-year storm events; or, Safe management/passage of the 100-year storm event

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STORMWATER DESIGN CRITERIA



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STORMWATER QUALITY TREATMENT & CHANNEL PROTECTION STANDARDS



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TERMINOLOGY

- Post-construction/Permanent Stormwater Management: Removal of pollutants in stormwater from new developments and redevelopments
- Total Suspended Solids (TSS): The parameter used as the indicator for the reduction of pollutants in stormwater.
- Water Quality Volume (WQv): The mandatory volume of stormwater that must be treated, based on the impervious area and a prescribed rainfall amount/design storm
- Stormwater Control Measure (SCM): A permanent structural facility that is specifically designed to remove TSS (and possibly other pollutants) from post-construction stormwater.
- Best Management Practice (BMP): Measures used for erosion prevention and sediment control (e.g., silt fence); or measures used to prevent “special” pollutants from entering the MS4 (e.g., grease traps, dumpster covers, spill kits, etc.).

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STORMWATER QUALITY COMPLIANCE FROM 2008 TO SEPTEMBER 2024

The Performance Standard is 80% TSS Removal Of The WQv

$$WQv = \frac{P * Rv * A}{12}$$

P = rainfall depth (*inches*) = 1.1 inches

R_v = 0.05 + 0.009(I)

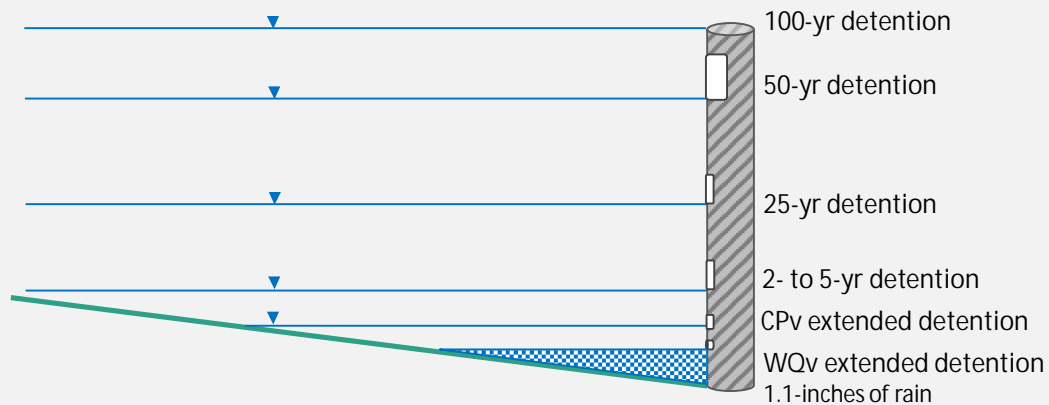
I = impervious percentage

A = drainage area to SCM (*acres*)

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STORMWATER QUALITY COMPLIANCE FROM 2008 TO SEPTEMBER 2024

The Performance Standard is 80% TSS Removal Of The WQv



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STORMWATER QUALITY RULES STARTING SEPTEMBER 2024

WHAT STAYS THE SAME?

- Performance standard of 80% TSS Removal
- Most SCMs that are currently accepted will remain
- SCM design specifications are updated from Knox County's 2008 manual (*adapted to local rules*)

WHAT IS CHANGING?

- The water quality rainfall amount
- The calculation method for WQv
- Policies for Manufactured Treatment Devices (formerly "proprietary BMPs")
- SCM Treatment Train rules

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THE SCM TREATMENT TABLE

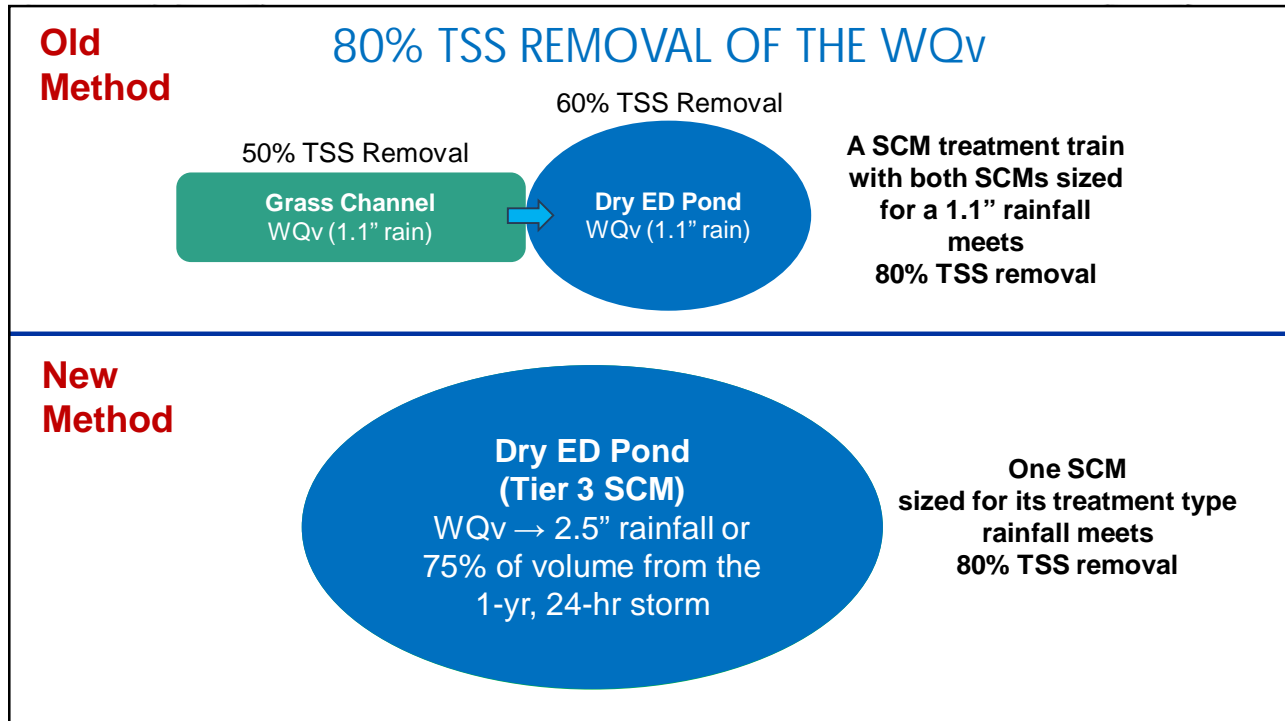
SCM Tier	SCM Treatment Mechanism(s)	Available SCMs (design configuration)	Minimum WQv (for 80% TSS Removal ¹)
Tier 1	Stormwater harvest and reuse		The runoff volume generated from the first 1-inch of the 1-yr, 24-hr storm ²
Tier 2	Biologically active filtration with an underdrain	Bioretention Area Urban Bioretention	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ²
Tier 3	Sand or gravel settling	Dry Extended Detention (ED) Basin Filtration MTDs ³ Stormwater Wetland Underground Detention Basin Wet Detention (all types)	The runoff volume generated from the first 2.5 inches of the 1-yr, 24-hr storm ² or, 75% of the total runoff volume from the 1-yr, 24-hr storm ² (whichever is less)
Tier 4	Pollutant/stormwater separation		Maximum runoff generated from the 1-yr, 24-hr storm ²

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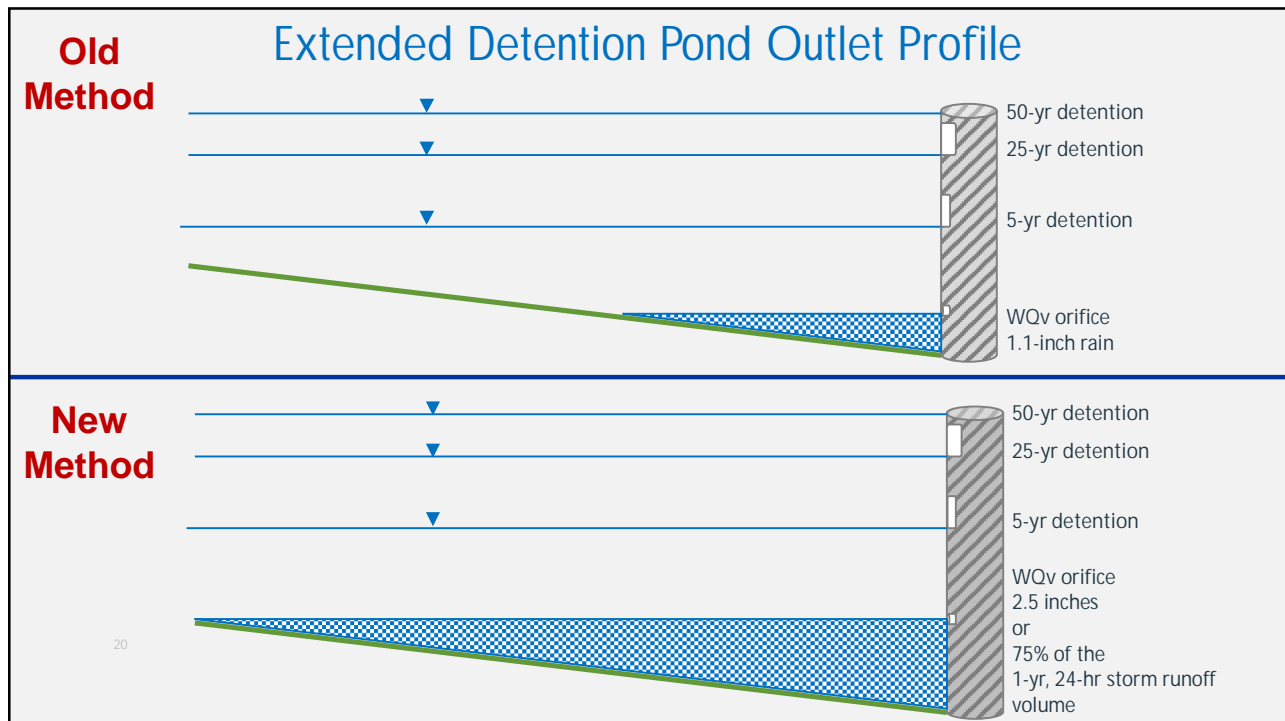
FLOOD CONTROL (DETENTION) SCMS

SCM Tier	SCM Treatment Mechanism(s)	Available SCMs (design configuration)	Minimum WQv (for 80% TSS Removal ¹)
Tier 1	Stormwater harvest and reuse	Green Roof	The runoff volume generated from the first 1-inch of the 1-yr, 24-hr storm ²
Tier 2	Biologically active filtration with an underdrain	Bioretention Area Biofiltration MTDs ³ Dry Enhanced Swale Urban Bioretention	<div style="border: 2px solid blue; padding: 5px; text-align: center;"> <p>Important! The Channel Protection Standard requires extended detention of the 1-year, 24-hour storm.</p> <p>↓</p> </div>
Tier 3	Sand or gravel filtration, settling	Dry Extended Detention (ED) Basin Filtration MTDs ³ Permeable Pavement System Sand Filter (all types) Stormwater Wetland Underground Detention Basin Wet Detention (all types)	
Tier 4	Pollutant/stormwater separation	Hydrodynamic Separation MTDs ³	Maximum runoff generated from the 1-yr, 24-hr storm ²

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CALCULATING THE WQv: THE SIMPLE METHOD

$$WQv = \frac{P * 0.95 * A}{12}$$

P = rainfall depth (*inches*)

$R_v = 0.05 + 0.009(I) = 0.95$

I = 100%

A = **impervious** drainage area to SCM (*acres*)

Note: This "impervious only" calculation will likely not be possible for residential subdivisions

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EXAMPLE OF THE SIMPLE METHOD



A = 2 acres

$R_v = 0.05 + 0.009(I) = 0.95$

I = 100%

Site designer selects a bioretention area to treat stormwater quality

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USE THE SCM TABLE FOR RAINFALL

SCM Tier	SCM Treatment Mechanism(s)	Available SCMs (design configuration)	Minimum WQv (for 80% TSS Removal ¹)
Tier 1	Stormwater harvest and reuse	Green Roof	The runoff volume generated from the first 1-inch of the 1-yr, 24-hr storm ²
Tier 2	Biologically active filtration with an underdrain	Bioretention Area Biomaturation MTDs ³ Dry Enhanced Swale Urban Bioretention	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ²
Tier 3	Sand or gravel filtration, settling	Dry Extended Detention (ED) Basin Filtration MTDs ³ Permeable Pavement System Sand Filter (all types) Stormwater Wetland Underground Detention Basin Wet Detention (all types)	The runoff volume generated from the first 2.5 inches of the 1-yr, 24-hr storm ² or, 75% of the total runoff volume from the 1-yr, 24-hr storm ² (whichever is less)
Tier 4	Pollutant/stormwater separation	Hydrodynamic Separation MTDs ³	Maximum runoff generated from the 1-yr, 24-hr storm ²

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EXAMPLE OF THE SIMPLE METHOD



$$WQv = \frac{P * 0.95 * A}{12}$$

$$WQv = \frac{1.25 * 0.95 * 2}{12}$$

$$WQv = 0.20 \text{ acre} - ft$$

$$A = 2 \text{ acres}$$

$$R_v = 0.05 + 0.009(I) = 0.95$$

$$I = 100\%$$

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CALCULATING THE WATER QUALITY PEAK DISCHARGE (Q_{wq})

Used to size flow diverters, overflow outlets, inlets, etc.



$$Q_{wq} = q_u A Q_{wv}$$

Q_{wq} = water quality peak discharge (cfs)
 q_u = unit peak discharge (csm/in)
 A = SCM drainage area
 Q_{wv} = water quality volume (inches)

The full calculation method
is provided in Chapter 6 of
the manuals

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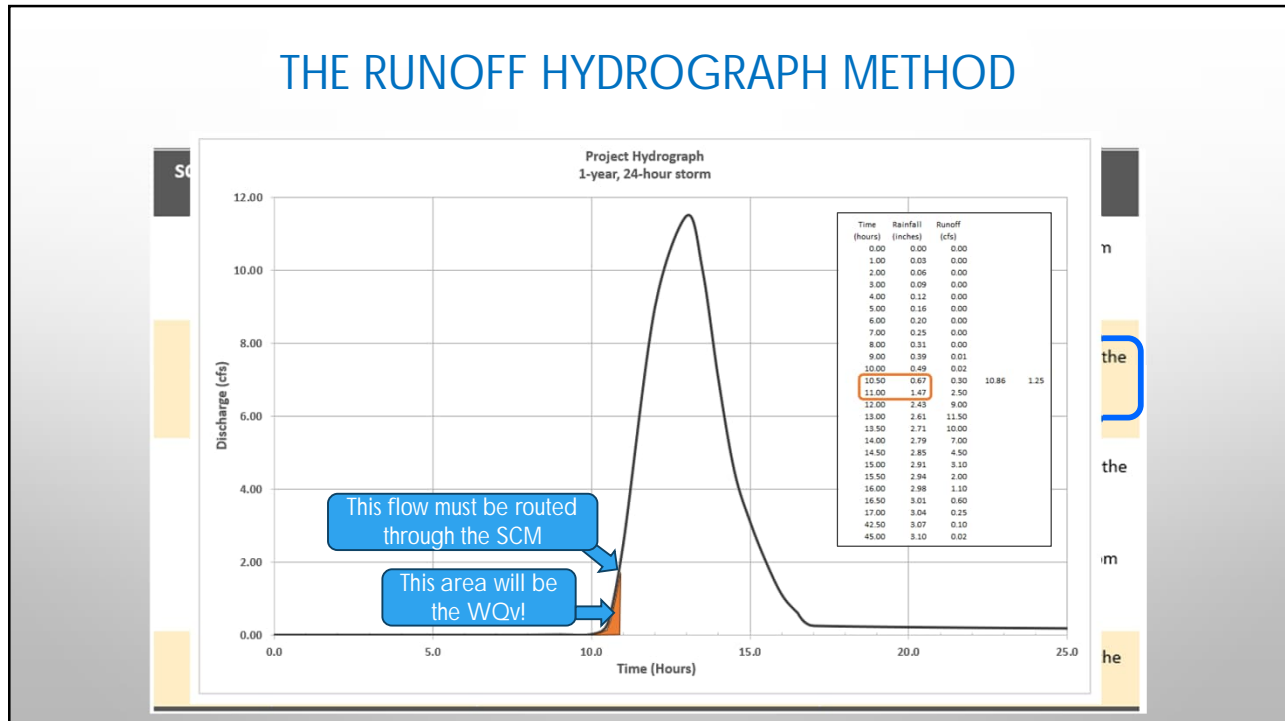
A SECOND METHOD TO DETERMINE WQv and Q_{wq}

RUNOFF HYDROGRAPH METHOD

- Typical NRCS hydrology (CN, Tc, etc.)
- Design Storm = 1-year, 24-hour storm
 - at the location of the development
 - use the latest NOAA Precipitation-Frequency Atlas
- Rainfall depth from the SCM Treatment Table for the selected SCM
- Use the hydrograph to determine WQv and Q_{wq}

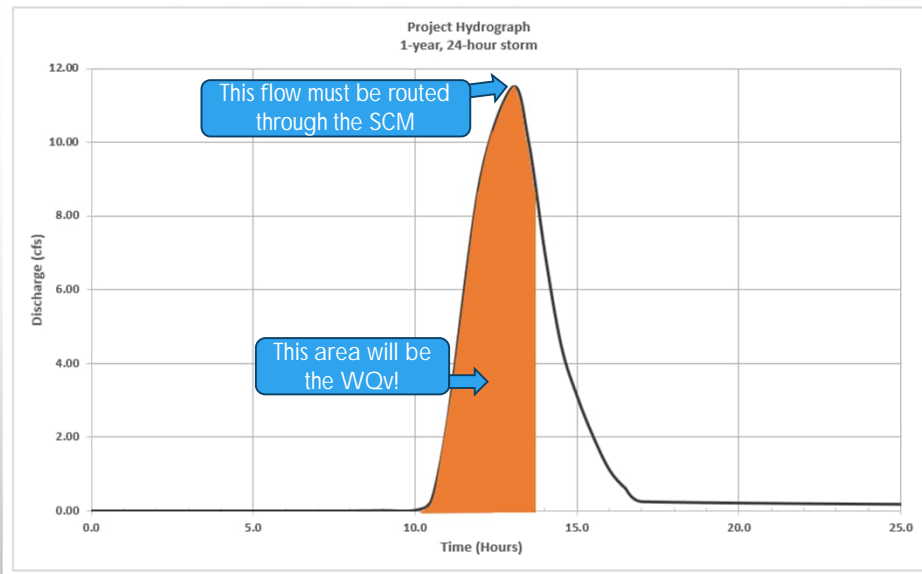
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THE RUNOFF HYDROGRAPH METHOD



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When the WQv includes the hydrograph's peak discharge...



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Tier 3 SCMs have two rainfall options for WQv

SCM Tier	SCM Treatment Mechanism(s)	Available SCMs (design configuration)	Minimum WQv (for 80% TSS Removal ¹)
Tier 1	Stormwater harvest and reuse	Green Roof	The runoff volume generated from the first 1-inch of the 1-yr, 24-hr storm ²
Tier 2	Biologically active filtration with an underdrain	Bioretention Area Biofiltration MTDs ³ Dry Enhanced Swale Urban Bioretention	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ²
Tier 3	Sand or gravel filtration, settling	Dry Extended Detention (ED) Basin Filtration MTDs ³ Permeable Pavement System Sand Filter (all types) Stormwater Wetland Underground Detention Basin Wet Detention (all types)	The runoff volume generated from the first 2.5 inches of the 1-yr, 24-hr storm ² or, 75% of the total runoff volume from the 1-yr, 24-hr storm ² (whichever is less)
Tier 4	Pollutant/stormwater separation	Hydrodynamic Separation MTDs ³	Maximum runoff generated from the 1-yr, 24-hr storm ²

$$WQv_{Tier3} = 0.75 * V$$

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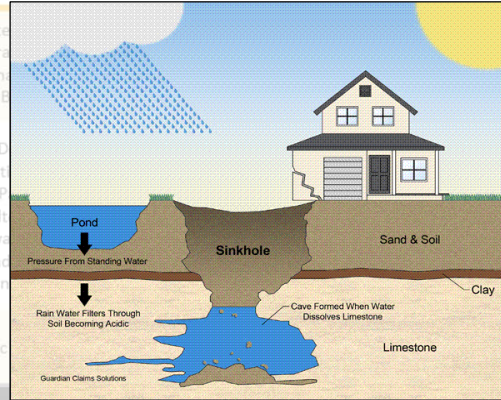
OTHER DESIGN POLICIES OF INTEREST

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LIMITATIONS ON TIER 1 SCMs

SCM Tier	SCM Treatment Mechanism(s)	Available SCMs (design configuration)	Minimum WQv (for 80% TSS Removal ¹)
Tier 1	Stormwater harvest and reuse	Green Roof	The runoff volume generated from the first 1-inch of the 1-yr, 24-hr storm ²
Tier 2	Biologically active filtration with an underdrain	Bioretention Area Biofiltration MTDs ³ Dry Enhanced Swale Urban Bioretention	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ²
Tier 3	Sand or gravel filtration	Extended Detention (ED) Basin Permeable Pavement System Sand Filter (all types) Stormwater Wetland	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ² or, 75% of the total runoff volume from the 1-yr, 24-hr storm ²
Tier 4	Pollutant/stormwater separation	Hydrodynamic Separator	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ²

Infiltration SCMs are prohibited due to high potential for sinkhole formation



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AN UNDERDRAIN, LINER, & INTERNAL WATER STORAGE ARE REQUIRED FOR TIER 2 SCMs

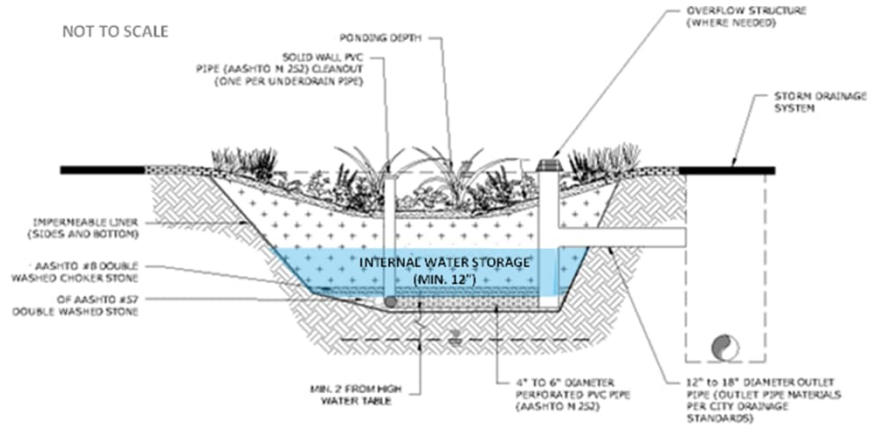
SCM Tier	SCM Treatment Mechanism(s)	Available SCMs (design configuration)	Minimum WQv (for 80% TSS Removal ¹)
Tier 1	Stormwater harvest and reuse	Green Roof	The runoff volume generated from the first 1-inch of the 1-yr, 24-hr storm ²
Tier 2	Biologically active filtration with an underdrain	Bioretention Area Biofiltration MTDs ³ Dry Enhanced Swale Urban Bioretention	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ²

- An underdrain and impermeable liner prevent sinkhole formation
- TDEC requires at least 12" of internal water storage
- A grass channel is no longer considered an SCM

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TWO UNDERDRAIN CONFIGURATION OPTIONS

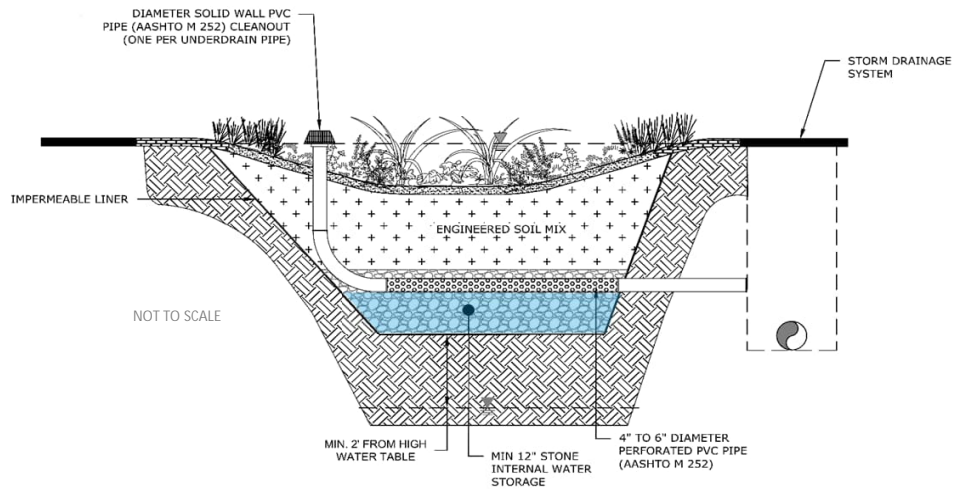
1. Upturned Elbow Configuration



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TWO UNDERDRAIN CONFIGURATION OPTIONS

2. Elevated Underdrain Configuration



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UNDERGROUND DETENTION BASINS



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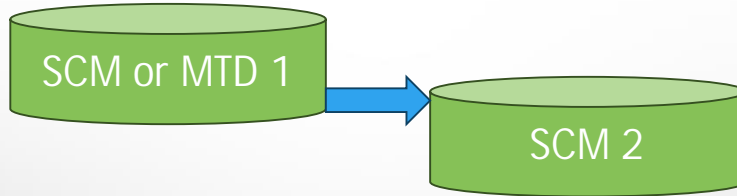
UNDERGROUND DETENTION DESIGN POLICIES

- Fully enclosed structures are preferred, otherwise a liner is required
- If the structure will provide WQv treatment:
 - extended detention is the required mechanism
 - a rock/gravel bed is required to reduce sediment resuspension from inflows
- Other SCMs are preferred for WQv treatment



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SCM TREATMENT TRAINS



- A treatment train is two or more SCMs placed in series
- Used when a single SCM does not have the capacity or % TSS removal to meet achieve 80% TSS Removal from the WQv
- Treatment train policies now depend on whether an MTD is present
- See Chapter 6 in the manuals for more details.

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WQv PRETREATMENT

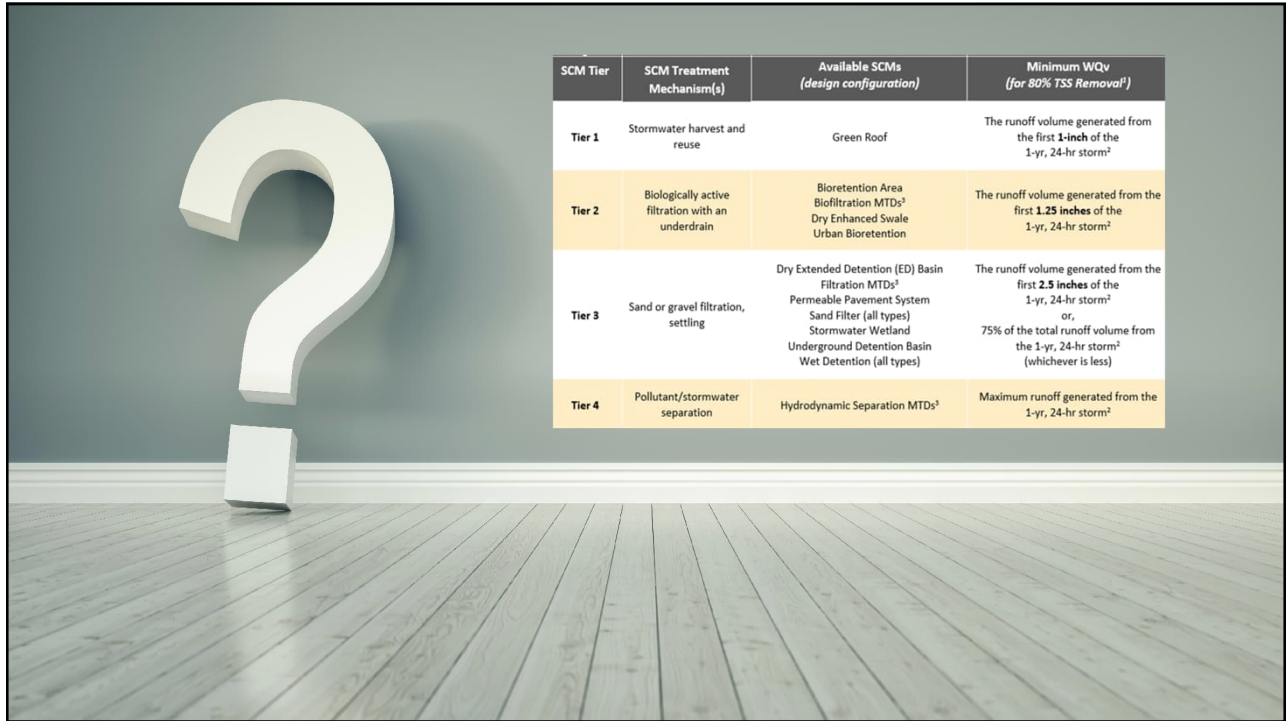
- Sediment pretreatment is required for most SCMs
- Forebays are required for storage facilities that are designed for stormwater quality
- Exception may be underground detention

Table 7.14.8 Pretreatment Measure Applicability

SCM Type	Applicability by Pretreatment Device				
	Forebay (Sec. 7.14.8)	Vegetated Filter Strip (Sec. 7.14.9)	Proprietary Pretreatment Device ¹ (Sec. 7.14.10)	MTD ¹ (Sec. 7.7)	Other (rock apron, baffles, sumas, etc.) (Sec. 7.14.4)
7.1 Bioretention Area	Yes	Yes	Yes	Yes	Yes
7.2 Dry Detention Basins	Required	No	No	No	Used for energy dissipation only
7.3 Dry Enhanced Swales	Yes	Yes	Yes	Yes	Yes
7.4 Gravity (Oil-Grit) Separators	Gravity separators are used as pretreatment devices for other SCMs.				
7.5 Green Roof	Green roofs do not typically require pretreatment devices.				
7.6 MTDs	A pretreatment measure is usually included within the MTD unit				
7.7 Permeable Pavement Systems	Permeable pavement systems do not typically require pretreatment devices.				
7.8 Sand Filters	Yes	Yes	Yes	Yes	Yes
7.9 Stormwater Wetlands	Required	No	No	No	Used for energy dissipation only
7.10 Underground Detention Basins	Yes	No	Yes	Yes	Yes
7.11 Urban Bioretention Areas	Yes	Yes	Yes	Yes	Yes
7.12 Wet Detention Basins	Required	No	No	No	Used for energy dissipation only
7.13 Wet Enhanced Swales	Yes	Yes	No	No	Used for energy dissipation only

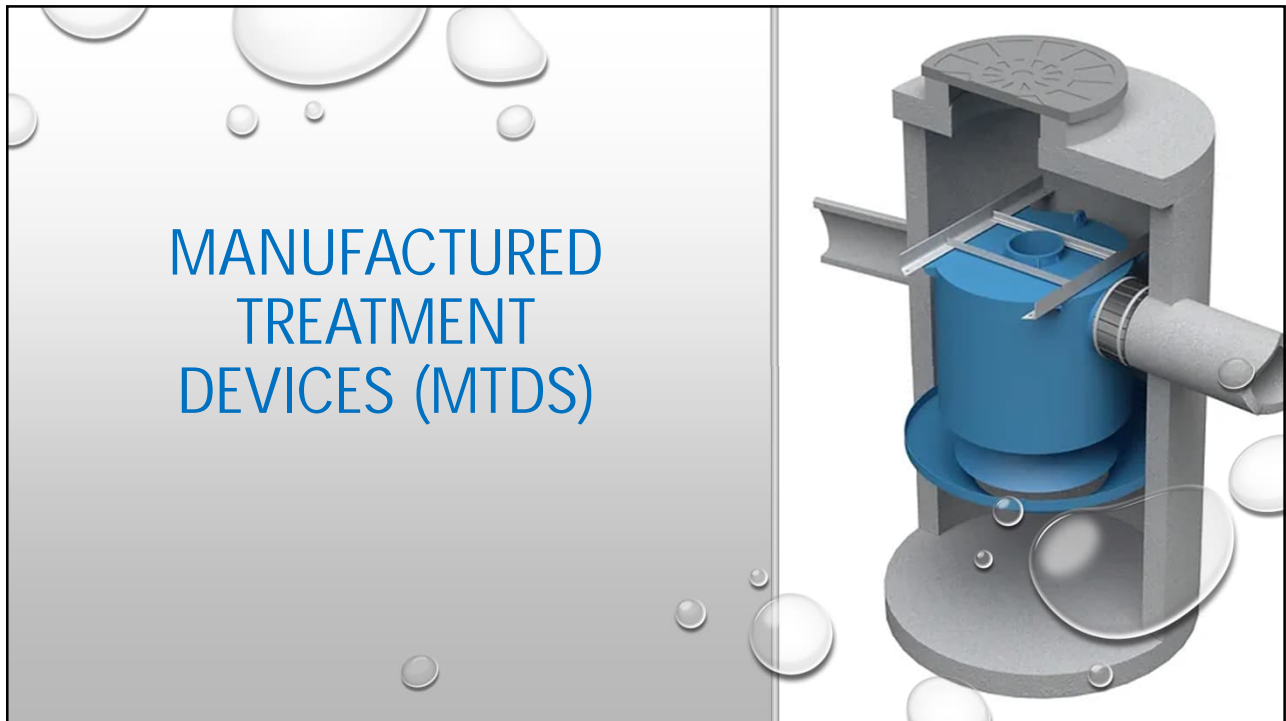
¹ PPDs are different from manufactured treatment devices (MTDs). MTDs are structural SCMs that can be used, alone, to meet the city's requirements for stormwater treatment or can be used as pretreatment. PPDs cannot be used to meet stormwater quality treatment standards by themselves.

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SCM Tier	SCM Treatment Mechanism(s)	Available SCMs (design configuration)	Minimum WQv (for 80% TSS Removal ²)
Tier 1	Stormwater harvest and reuse	Green Roof	The runoff volume generated from the first 1-inch of the 1-yr, 24-hr storm ²
Tier 2	Biologically active filtration with an underdrain	Bioretention Area Biofiltration MTDs ³ Dry Enhanced Swale Urban Bioretention	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ²
Tier 3	Sand or gravel filtration, settling	Dry Extended Detention (ED) Basin Filtration MTDs ³ Permeable Pavement System Sand Filter (all types) Stormwater Wetland Underground Detention Basin Wet Detention (all types)	The runoff volume generated from the first 2.5 inches of the 1-yr, 24-hr storm ² or, 75% of the total runoff volume from the 1-yr, 24-hr storm ² (whichever is less)
Tier 4	Pollutant/stormwater separation	Hydrodynamic Separation MTDs ³	Maximum runoff generated from the 1-yr, 24-hr storm ²

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MANUFACTURED TREATMENT DEVICES

SCM Tier	SCM Treatment Mechanism(s)	Available SCMs (design configuration)	Minimum WQv (for 80% TSS Removal ¹)
Tier 1	Stormwater harvest and reuse	Green Roof	The runoff volume generated from the first 1-inch of the 1-yr, 24-hr storm ²
Tier 2	Biologically active filtration with an underdrain	Bioretention Area Biofiltration MTDs ³ Dry Enhanced Swale Urban Bioretention	The runoff volume generated from the first 1.25 inches of the 1-yr, 24-hr storm ²
Tier 3	Sand or gravel filtration, settling	Dry Extended Detention (ED) Basin Filtration MTDs ³ Permeable Pavement System Sand Filter (all types) Stormwater Wetland Underground Detention Basin Wet Detention (all types)	The runoff volume generated from the first 2.5 inches of the 1-yr, 24-hr storm ² or, 75% of the total runoff volume from the 1-yr, 24-hr storm ² (whichever is less)
Tier 4	Pollutant/stormwater separation	Hydrodynamic Separation MTDs ³	Maximum runoff generated from the 1-yr, 24-hr storm ²

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TIER 2 MTDs

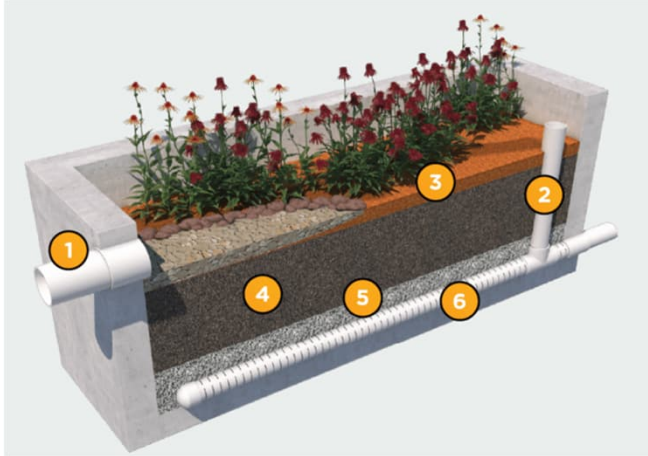


BioPod™ Tree by Oldcastle Infrastructure

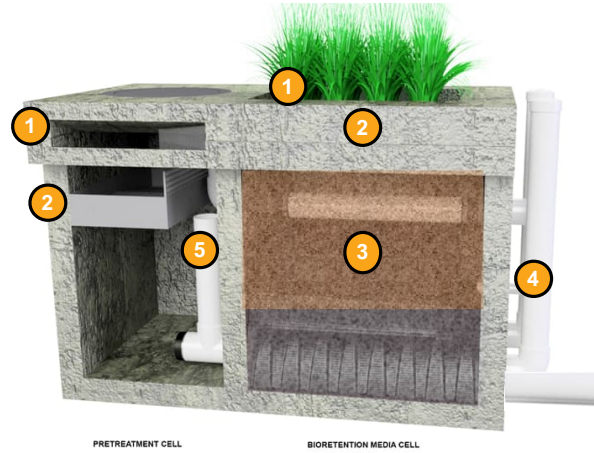
- Biologically-active filtration
 - Plant uptake
 - Engineered media sorption
 - Anoxic denitrification
- An underdrain is required
- A minimum of 12-inches of internal water storage (IWS) is required

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TIER 2 MTDs



Jensen Precast Biofiltration System



ADS EcoPure™ BioFilter

NOTE: GRAPHICS DO NOT SHOW THE REQUIRED MINIMUM OF 12-INCHES OF INTERNAL WATER STORAGE

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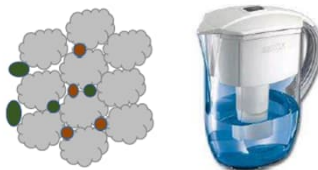
TIER 3 MTDs

Provide physical removal of pollutants in at least one of 3 ways...

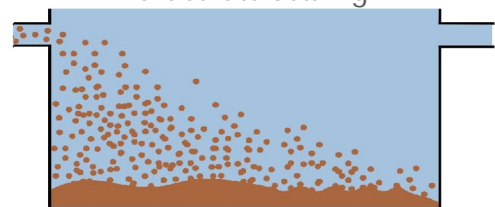
Surface/Membrane Filtration



Depth/Bed Filtration



Particulate Settling



Slide concepts provided by Jacob Dorman, Contech Engineered Solutions LLC

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TIER 3 MTDs

Contech StormFilter®

Stormwater360
Jellyfish®

Underground Detention Systems

CONTECH
ENGINEERED SOLUTIONS

Dissolved Phosphorus

PhosphoSorb Media

Slide concepts provided by Jacob Dorman, Contech Engineered Solutions LLC

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TIER 4 MTDs

Hydrodynamic devices that operate via swirling, baffles, flow controls, etc.

Hydro International First Defense

Hydro International Hydro DryScreen™

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KEY POLICIES FOR MTDs

- NJDEP certification of % TSS removal is required for MTDs used for primary treatment, whether installed alone or in a treatment train
 - NJDEP = New Jersey Department of Environmental Protection
 - Certifies MTDs for either 80% TSS removal or 50% TSS removal
 - Currently, all Tier 4 MTDs (hydrodynamic separators) are certified for 50% TSS removal
 - Design flow must be no greater than the maximum treatment flow rate (MTR) cited in the NJDEP certification

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NJDEP MTD CERTIFICATION WEBSITE

Green Infrastructure (GI) MTDs


Devices Certified by NJDEP	MTD Laboratory Test Certifications	Superseded Certifications	Certified TSS Removal Rate	Maintenance Plan
Aqua-Ponic™ Stormwater Biofiltration System	Certification		80%	Plan
Bio Clean Modular Wetlands Linear Stormwater Treatment Device by Bio Clean Environmental Services, Inc.	Certification		80%	Plan
Biopod™ Biofilter with StormMix Media by Oldcastle Infrastructure	Certification	Superseded	80%	Plan
EcoPure BioFilter by Advanced Drainage Systems, Inc.	Certification	Superseded	80%	Plan
Filtrerra Bioretention System by Contech Engineered Solutions	Certification	Superseded	80%	Plan
Filtrerra® HC Bioretention System by Contech Engineered Solutions	Certification		80%	Plan
FocalPoint® High Performance Modular Biofiltration System by Convergent Water Technologies	Certification		80%	Plan
StormScape™ Filter by Hydro International	Certification		80%	Plan
StormVault BioFiltration with Sierra Blend by Jensen Water Resources	Certification	Superseded	80%	Plan

MTDs NOT Considered GI

Devices Certified by NJDEP	MTD Laboratory Test Certifications	Superseded Certifications	Certified TSS Removal Rate	Maintenance Plan	Expiration Date
Aqua-Filter™ Stormwater Filtration System Model AF-3.48 Round with Perlite Media by AquaShield, Inc.	Certification		80%	Plan	
Aqua-Filter™ Stormwater Filtration System with Perlite Media by AquaShield, Inc.	Certification	Superseded	80%	Plan	
Aqua-Swirl Xcelerator Stormwater Treatment System by AquaShield, Inc.	Certification	Superseded	50%	Plan	7/23/2024
Barracuda™ MAX Hydrodynamic Separator by Advanced Drainage Systems, Inc.	Certification		50%	Plan	12/31/2024
BayFilter™ Enhanced Media Cartridge by BaySaver Technologies, LLC	Certification	Superseded	80%	Plan	
Cascade Separator™ by CONTECH Engineering Solutions LLC	Certification	Superseded	50%	Plan	10/01/2024
Debris Separating Baffle Box by BioClean Environmental Services, Inc.	Certification		50%	Plan	6/11/2024
First Defense® Optimum Vortex Separator by Hydro International	Certification		50%	Plan	12/31/2024
HydroChain™ Vortex Filter by Shawcor	Certification		80%	Plan	
Hydroworks® HydroDome (HD) Stormwater Separator by Hydroworks® LLC.	Certification		50%	Plan	12/31/2024
Hydroworks® HydroFilter by Hydroworks® LLC.	Certification		80%	Plan	
HydroStorm Hydrodynamic Separator by Hydroworks® LLC.	Certification		50%	Plan	3/27/2023
Jensen Deflective Separator (JDS) by Jensen Water Resources	Certification	Superseded	50%	Plan	2/28/2024

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EXAMPLE NJDEP CERTIFICATION LETTER


State of New Jersey
Division of Water Quality
Bureau of Stormwater Permitting
401 East State Street
P.O. Box 620 Mail Code 491-02B
Trenton, New Jersey 08625-0420
Phone: 609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnrc_home.htm

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Acting Commissioner

January 21, 2021

Mark B. Miller
Research Scientist
AquaShield™, Inc.
2733 Kanasita Drive, Suite 111
Chattanooga, TN 37343

Re: MTD Lab Certification
Aqua-Ponic™ Stormwater Biofiltration System
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Miller:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). AquaShield™, Inc. has requested a Laboratory Certification for the Aqua-Ponic™ Stormwater Biofiltration System.

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated November 2020) for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

The NJDEP certifies the use of the Aqua-Ponic™ stormwater treatment unit by AquaShield™ at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

- The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 7.0 gpm/ft² of effective filtration treatment area.
- The Aqua-Ponic™ stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.
- This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
- Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.
- The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Aqua-Ponic™. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at maintenance_manual_aqua-ponic_6-20.pdf (aquashieldinc.com) for any changes to the maintenance requirements.
- For an MTD to be considered "green infrastructure" (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD shall meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat runoff by infiltration into subsoli; and/or (2) treat stormwater runoff through filtration by vegetation or soil; and/or (3) store stormwater for reuse.


In order for an Aqua-Ponic™ system to meet the definition of GI, the Aqua-Ponic™ system must treat stormwater runoff through filtration by vegetation. To this end, consistent with the vegetative cover requirement for bioretention systems, the minimum vegetative cover in an Aqua-Ponic™ system is 85% in order to qualify as GI under the Stormwater Management rules at N.J.A.C. 7:8. The vegetative cover should be determined based on the expected coverage of the proposed plantings when matured. Plant death or damage shall require replanting to maintain this 85% coverage requirement if the system is installed as GI.

- Sizing Requirement:**
The example below demonstrates the sizing procedure for the Aqua-Ponic™.

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MTD Maintenance Manuals are also on the NJDEP website

INSPECTION & MAINTENANCE MANUAL



Aqua-Ponic™ Stormwater Biofiltration System

Manufactured by



AquaShield™, Inc.
2733 Kanasita Drive
Suite 111
Chattanooga, TN 37343
(888) 344-9044
www.aquashieldinc.com

June 2020

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...ing movement toward the
...es as the preferred means to
(GI) stormwater management
...ed by AquaShield™, Inc. no
...s in an urban environment.

...etter assist stakeholders with
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...etic™ system are described in

...struction biofiltration system
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...qua-Ponic™ is its combination
...or growing plants without soil
...qua-Ponic™ uses stormwater
...with only their roots exposed
...bilization filter medium. The
...during those periods of time

...such as native grasses, shrub
...ype or multiple types of plants
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...etic™ serves three operational
...nutrient uptake. Figure 1 is an
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...area. The filtered water then
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...to the top pea gravel layer which

ANCE LOG

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Postal Code: _____

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				X

Time Frame

	9	10	11	12
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				X
				X

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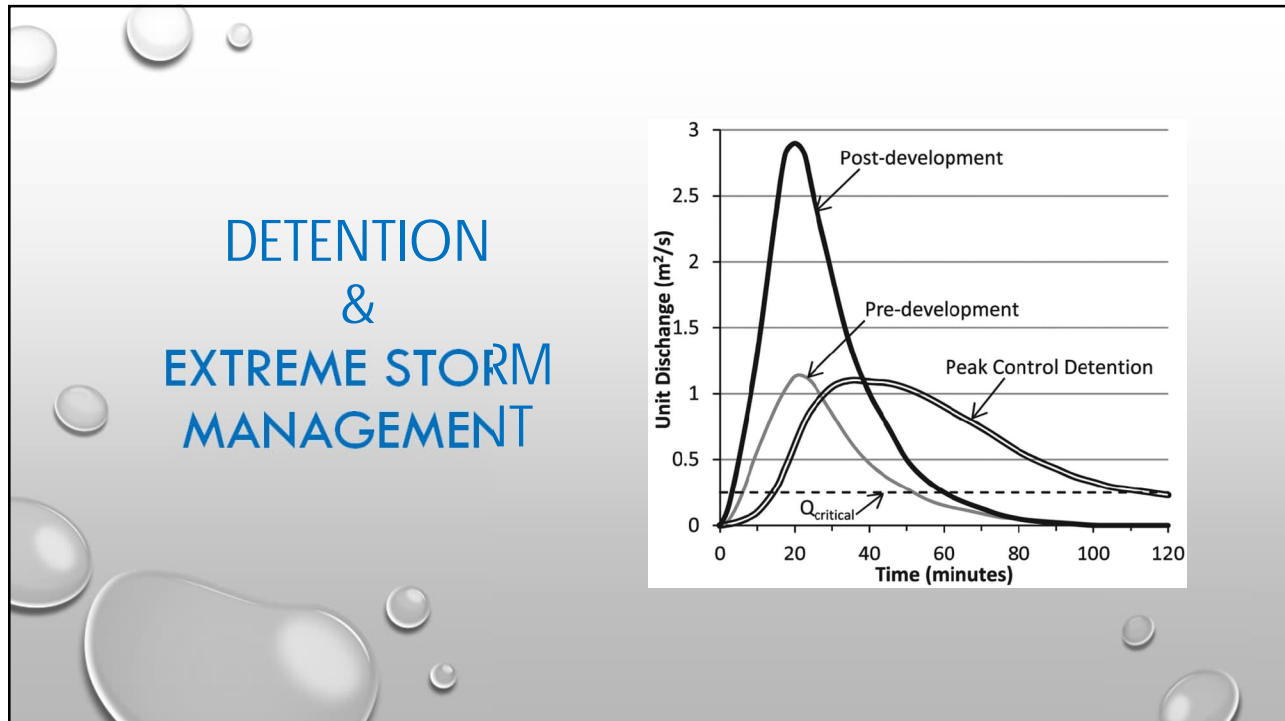
KEY POLICIES FOR MTDs

- NJDEP certification of % TSS removal is required for MTDs used for primary treatment, whether installed alone or in a treatment train
- NJDEP certification is not required for MTDs used for pretreatment except when installed upstream of an underground detention basin
- MTDs shown in the approved design plan **MUST** be the same MTDs installed at the development (make, model, size)
 - Seek prior local gov't approval for MTD substitutions after SWMP approval
 - The as-built plan **MUST** show the exact MTDs that are installed
- (*Maryville & Alcoa only*) MTDs with a minimum of 60 gallons of internal volume dedicated to storage are required for:
 - Parking lots with more than 100 parking spaces
 - Gas stations, auto repair centers, and petroleum storage facilities

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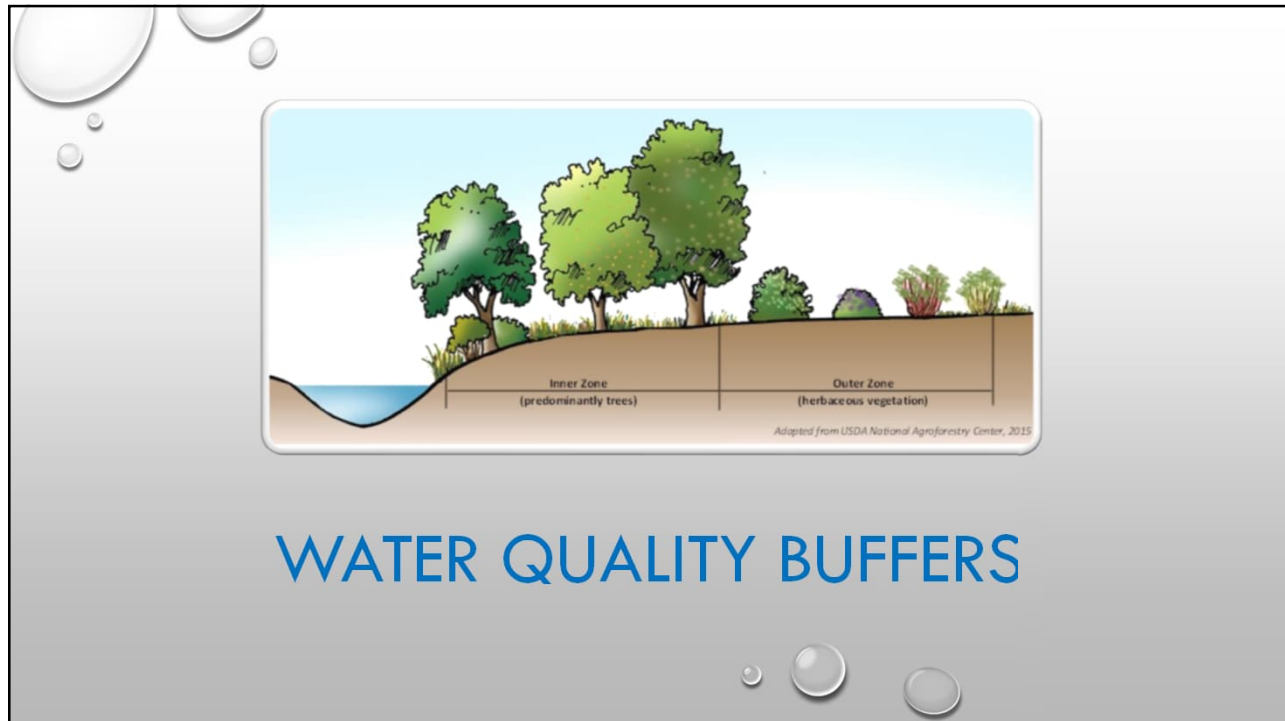


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DETENTION STANDARDS BY CITY

CITY OF MARYVILLE	Detention Standard	<ul style="list-style-type: none"> • Post-development peak discharges 1, 2, 5, 10, 25, and 50-year, 24-hour design storms no greater than pre-development peak discharges • Safely pass the 100-year, 24-hour storm without damage downstream; or, the City may require detention of the 100-year storm
	Freeboard	<ul style="list-style-type: none"> • At least 1 foot of freeboard above the WSEL
	Method	<ul style="list-style-type: none"> • NRCS hydrologic methods
CITY OF ALCOA	Detention Standard	<ul style="list-style-type: none"> • Post-development peak discharges 2, 5, 10, and 100-year, 24-hour design storms no greater than pre-development peak discharges
	Spillway & Freeboard	<ul style="list-style-type: none"> • Emergency spillway 0.1 foot above the 100-year WSEL • At least 1 foot of freeboard above the WSEL
	Method	<ul style="list-style-type: none"> • NRCS hydrologic methods

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OVERVIEW OF CHANGES TO BUFFER RULES

What stays the same?

- Required for streams, wetlands, lakes, and ponds
- Width measured from top of bank
- Buffer averaging rules
- Sheet flow required for overland discharges to buffer
- Restrictions on use and activities in the buffer

What will change?

- Width increase for most streams
- Revised rules for:
 - buffer vegetation
 - allowed entry/uses

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WATER QUALITY BUFFER WIDTH

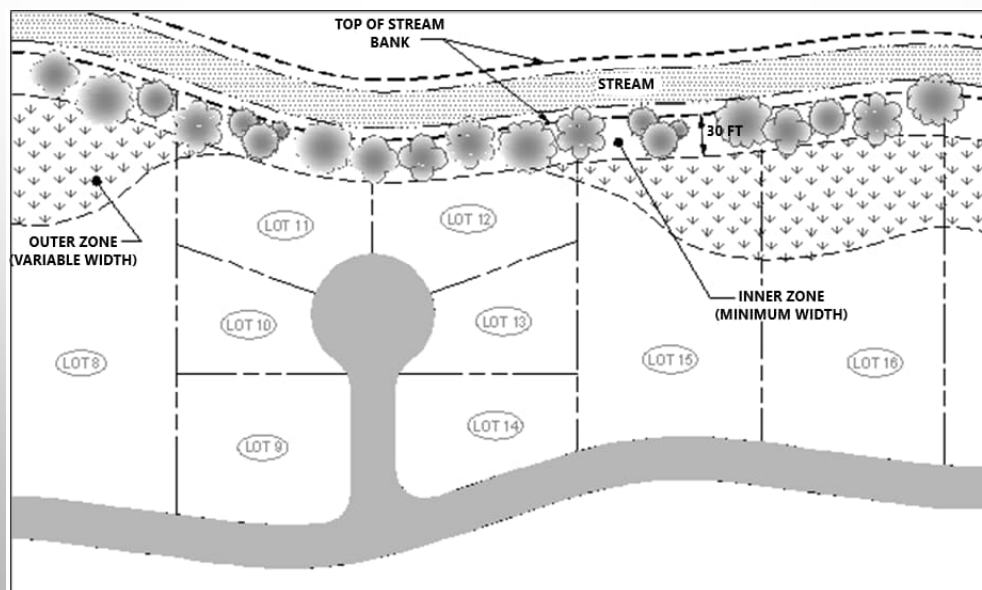
- Same width rules apply to streams, wetlands, ponds, and lakes
- Purpose: additional water quality protection, streambank/shoreline stabilization and canopy protection (shading)

Waterbody Characterization	Minimum Width (feet)	Minimum Average Width (feet)
Waters with available parameters for siltation and habitat alteration or unassessed waters.	15	30
Waters with unavailable parameters for siltation and habitat alteration or Exceptional Tennessee Waters	30	60

- Width averaging allowed in the outer zone only

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EXAMPLES OF BUFFER AVERAGING



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WATER QUALITY BUFFER USES

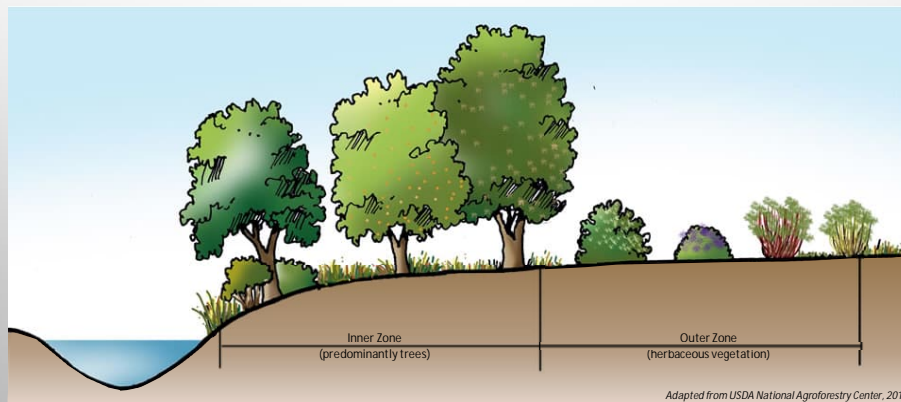
Waterbody Characterization	Minimum Width (feet)	Minimum Average Width (feet)
Waters with available parameters for siltation and habitat alteration or unassessed waters.	15	30
Waters with unavailable parameters for siltation and habitat alteration or Exceptional Tennessee Waters	30	60

- Minimal impervious surfaces
- Trails allowed – for paved sidewalks or trails, the total width must be increased by the width of the trail
- Prohibitions:
 - Concentrated animal lots, kennels, etc.
 - Vehicle/equipment parking, repair, storage, use
 - Materials storage and transfer
 - Waste dumping, handling and storage
 - Other potential polluting activities

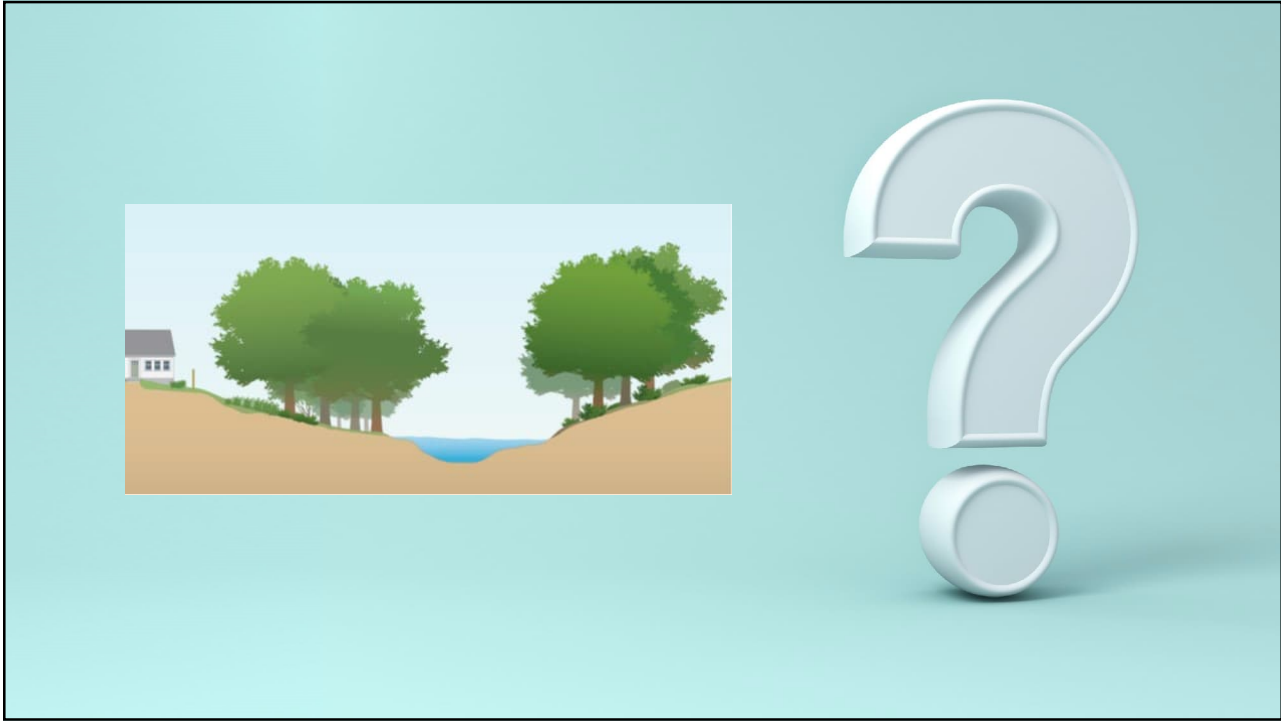
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WATER QUALITY BUFFER VEGETATION

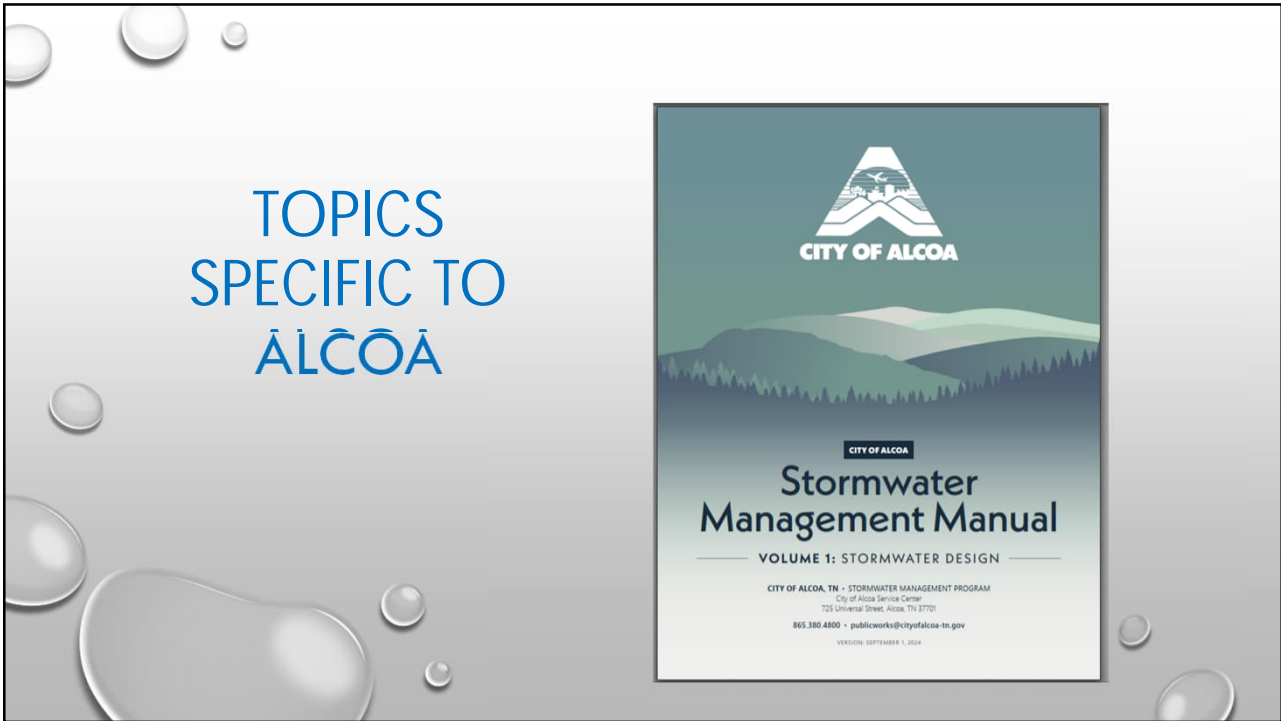
- Inner zone: predominantly trees
- Outer zone: predominantly herbaceous vegetation (grass, but shrubs and trees allowed)



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CITY OF ALCOA UPDATES

- 80% TSS removal achieved by following TDEC's tiered table
- MTD treatment as certified by NJDEP
- Underground ED requirements
 - Open bottom basins only
 - Requires pretreatment
- Developments & Redevelopments
 - Any redevelopment greater than 0.1 acre of impervious added
 - Protecting downstream properties

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SCM INSPECTION REQUIREMENTS

- TDEC permit requires inspection within 90 days of installation
- The Engineer of Record will be responsible for completing this inspection
- This will be noted on all plans
- This will aide the engineer when completing the Stormwater Certifications at the end of a project

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SWMP DELIVERABLES

- SWPPP
- Detailed drainage calculations
- Hydrology map
- All outfalls on the site – pre vs post runoff numbers for the 2, 10, 25, 100-year storms. Post must be less than or equal to pre runoff.
- Show how 80% TSS is achieved for each outfall.
- Site plan
- Grading plan
- EPSC plan
- Submittals on manufactured SCM's

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TOPICS SPECIFIC TO MARYVILLE



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STORMWATER MANAGEMENT PLAN THRESHOLD

- WQMP = SWMP
- Previously, the threshold for requiring a WQMP was triggered by one of the following:
 - 10,000 sq. Ft. Of new impervious area
 - ≥1 acre disturbed, or less if part of a larger common plan of development
- Now, threshold aligns with MS4 permit:
 - ≥1 acre disturbed, or less if part of a larger common plan of development

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SUBMITTAL REQUIREMENTS

- SCM Maintenance Report
 - Describes the inspection and maintenance requirements for each proposed SCM
 - Will be used by the property owner to guide SCM management after construction
 - A map that accurately identifies each SCM and its location on the property relative to property boundaries, buildings, driveways and parking areas, etc., Such that persons responsible for SCM inspection and maintenance can visually locate it. For each SCM, include also the locations of each inlet and outlet, and its associated easements. SCMs shall be identified by proper name as established in Chapter 7 of Stormwater Management Manual.
 - SCM Maintenance Guidance and Inspection checklist(s) for each proposed SCM:
 - For SCMs constructed onsite, this information may be sourced from Knox County or other jurisdiction manuals. City of Maryville and City of Alcoa SCM maintenance manuals are planned and can be used as the source of this information in the future.
 - For MTDs and manufacturer/vendor supplied SCMs (e.g., cisterns, green roofs), the maintenance and inspection information developed by the manufacturer must be provided.
 - Design professionals may provide additional SCM maintenance and inspection information as appropriate for the expected conditions of the proposed development.

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PROJECT CLOSEOUT

- A maintenance easement shall be provided to the SCM from a driveway, public or private road. It shall be designed as follows:
 - A minimum width of 20 feet
 - A maximum slope of no more than 15%
 - The access route in the easement shall be free of permanently affixed obstructions (e.g., trees, pools, fences without gates, permanent signs, etc.) And appropriately stabilized to withstand maintenance equipment and vehicles
 - To the extent feasible, allow vehicles to turn around
 - The entire SCM (including inlets, pretreatment devices, the storage area embankments, outlet structure, and emergency spillway, etc.) Shall be included in the easement and shall be accessible from the easement's drive path.
- For all projects (residential and commercial) these easements must be recorded with the Blount County Register of Deeds on a plat with applicable notes regarding operation, maintenance and modifications, prior to final project closeout
- As-built plans and professional certifications in accordance with Appendix D of the manual

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THANK YOU!

FOR MORE INFORMATION:

City of Maryville, TN
 Stormwater Management
 Municipal Building
 400 W. Broadway Avenue, TN 37801
 (865) 273-3500
 Email: stormwater@maryville-tn.gov

City of Alcoa, TN
 Stormwater Management Program
 City of Alcoa Service Center
 725 Universal Street, Alcoa, TN 37701
 (865) 380-4800
 Email: publicworks@cityofalcoa-tn.gov

Blount County, TN
 Stormwater Department
 Blount County Development Services
 1221 McArthur Rd, Maryville TN 37804
 (865) 681-9301
 Email: development@blounttn.org

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