DESIGNING SCMs FOR WQTV

Proprietary Post-Construction Practices

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TENNESSEE STORMWATER ASSOC.

Developed by Members of the TNSA SCM Committee

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A guidance document for sizing proprietary SCMs and effectively using the WQTV found in the 2022 NPDES Small MS4 Permit and Tennessee MS4 Rules.

Images for illustrative purposes only. TNSA SCM Committee does not endorse specific proprietary SCMs or assist with selection.

Compliance Toolbox

Proprietary post-construction stormwater control measures (SCMs) improve the quality of runoff through basic separation treatment processes (mechanical separation) or advanced treatment processes (filtration).

In the 2022 NPDES Small MS4 Permit, TDEC defined SCMs by their **dominant treatment process**. Designers should use good engineering practices and consider the latest innovations in stormwater management when selecting the appropriate WQTV design depth corresponding to the SCM's dominant treatment process.

For example, proprietary SCMs deploying biologically active filtration are only required to treat the first 1.25 inches of the design storm. Basic separation treatment practices, such as hydrodynamic separators (HDS), are required to treat the maximum runoff generated from the entire design storm.

Hydrodynamic separator (HDS) systems do not meet permitting requirements as stand-alone treatment and should not be placed downstream of detention ponds. Multiple HDSs in a row within a treatment train are ineffective and inconsistent with good engineering practice.

COMPLIANCE BASICS

DESIGN STORM

The design storm is 1-yr, 24-hr storm defined by NOAA Atlas 14.

WQTV

The depth of runoff for the WQTV depends on the SCM's dominant treatment process.

TSS REMOVAL

TDEC requires new and redevelopment projects utilize SCMs to remove at a minimum 80% TSS from the WQTV.

TREATMENT TRAIN

Progressive treatment and distinct removal processes are required.

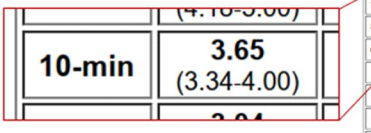
Important Design Factors

SCMs must be sized correctly to meet performance expectations and protect water quality.

1. Proprietary SCMs must have the WQTV converted to a flow rate not to exceed the system's maximum treatment flow rate (MTFR). This ensures the system provides enough surface area for the treatment process. MTFR is calculated by multiplying the effective treatment area (ETA) or effective filter treatment area (EFTA) by the certified hydraulic loading rate (HLR). The HLR is identified in certification letters from NJDEP or TAPE.

$$(ETA\ or\ EFTA) \times (HLR) = MTFR$$

2. Properly select precipitation depth and intensity using NOAA's Atlas 14. Depth will correspond to the 1-yr, 24-hr design storm at the project's geographic location. Intensity will correspond to the site-specific **time of concentration** associated with the 1-year storm event recurrence interval.



PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

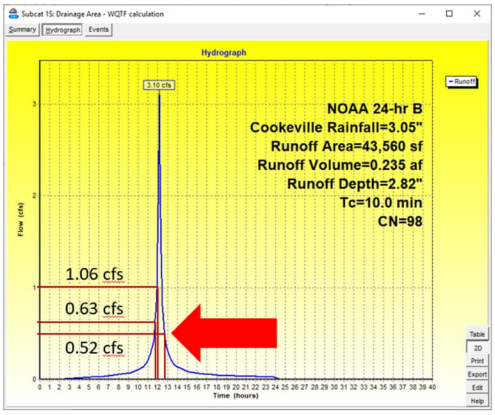
Duration	Average recurrence interval (years)								
	1	2	5	10	25	50	100	200	500	1000
5-min	4.57 (4.18-5.00)	5.39 (4.94-5.90)	6.32 (5.80-6.92)	7.12 (6.49-7.78)	8.16 (7.39-8.90)	9.00 (8.10-9.80)	9.88 (8.83-10.8)	10.8 (9.55-11.7)	12.0 (10.5-13.1)	13.0 (11.3-14.2)
10-min	3.65 (3.34-4.00)	4.31 (3.95-4.73)	5.07 (4.64-5.54)	5.69 (5.20-6.22)	6.50 (5.89-7.09)	7.16 (6.45-7.81)	7.85 (7.02-8.55)	8.54 (7.57-9.31)	9.50 (8.30-10.4)	10.3 (8.86-11.2)
15-min	3.04 (2.78-3.33)	3.61 (3.32-3.96)	4.27 (3.92-4.67)	4.80 (4.38-5.24)	5.50 (4.98-6.00)	6.05 (5.45-6.59)	6.61 (5.91-7.21)	7.19 (6.37-7.83)	7.97 (6.97-8.69)	8.58 (7.42-9.37)
30-min	2.08 (1.91-2.28)	2.49 (2.29-2.74)	3.04 (2.78-3.32)	3.48 (3.17-3.80)	4.07 (3.69-4.44)	4.55 (4.10-4.96)	5.06 (4.53-5.52)	5.59 (4.96-6.10)	6.34 (5.54-6.91)	6.95 (6.01-7.59)
60-min	1.30 (1.19-1.42)	1.57 (1.44-1.72)	1.95 (1.78-2.13)	2.26 (2.07-2.47)	2.71 (2.46-2.96)	3.09 (2.78-3.36)	3.49 (3.12-3.80)	3.92 (3.48-4.28)	4.55 (3.98-4.96)	5.07 (4.38-5.54)
2-hr	0.762 (0.696-0.840)	0.916 (0.836-1.01)	1.14 (1.04-1.25)	1.32 (1.20-1.45)	1.58 (1.43-1.74)	1.81 (1.62-1.98)	2.04 (1.82-2.24)	2.30 (2.03-2.52)	2.68 (2.33-2.93)	2.99 (2.57-3.28)
3-hr	0.553 (0.507-0.609)	0.664 (0.607-0.732)	0.819 (0.748-0.901)	0.950 (0.865-1.04)	1.14 (1.03-1.25)	1.29 (1.16-1.42)	1.46 (1.30-1.60)	1.64 (1.45-1.80)	1.91 (1.66-2.09)	2.12 (1.83-2.33)
6-hr	0.340 (0.311-0.375)	0.405 (0.370-0.448)	0.495 (0.451-0.546)	0.571 (0.519-0.630)	0.681 (0.614-0.749)	0.772 (0.692-0.849)	0.869 (0.773-0.955)	0.973 (0.858-1.07)	1.12 (0.976-1.23)	1.25 (1.07-1.37)
12-hr	0.205 (0.189-0.223)	0.244 (0.225-0.267)	0.297 (0.274-0.325)	0.342 (0.314-0.373)	0.405 (0.369-0.442)	0.457 (0.415-0.498)	0.512 (0.462-0.558)	0.571 (0.510-0.622)	0.654 (0.577-0.713)	0.722 (0.629-0.789)
24-hr	0.127 (0.119-0.136)	0.152 (0.142-0.163)	0.185 (0.173-0.198)	0.211 (0.198-0.226)	0.248 (0.231-0.264)	0.277 (0.258-0.295)	0.307 (0.284-0.327)	0.337 (0.311-0.360)	0.380 (0.348-0.404)	0.413 (0.376-0.440)
2-day	0.077 (0.072-0.082)	0.092 (0.087-0.098)	0.112 (0.106-0.120)	0.129 (0.121-0.137)	0.151 (0.141-0.161)	0.169 (0.157-0.180)	0.187 (0.174-0.200)	0.207 (0.191-0.220)	0.233 (0.214-0.249)	0.254 (0.232-0.272)
3-day	0.055 (0.051-0.058)	0.065 (0.062-0.070)	0.080 (0.075-0.085)	0.091 (0.085-0.097)	0.106 (0.099-0.113)	0.118 (0.110-0.126)	0.130 (0.121-0.139)	0.143 (0.132-0.152)	0.160 (0.147-0.170)	0.173 (0.158-0.185)
4-day	0.044 (0.041-0.047)	0.052 (0.049-0.056)	0.063 (0.059-0.067)	0.072 (0.067-0.076)	0.083 (0.078-0.089)	0.092 (0.086-0.098)	0.102 (0.094-0.108)	0.111 (0.103-0.118)	0.123 (0.113-0.131)	0.133 (0.122-0.142)
7-day	0.030 (0.028-0.032)	0.036 (0.034-0.038)	0.043 (0.041-0.046)	0.049 (0.046-0.052)	0.056 (0.053-0.060)	0.062 (0.058-0.066)	0.068 (0.064-0.073)	0.075 (0.069-0.079)	0.083 (0.076-0.088)	0.089 (0.082-0.095)

Preventing Premature Bypass

Proprietary SCMs with filtration as the dominant treatment process can treat runoff from the first 2.5 inches of the design storm or 75% of the design storm, whichever is less.

Premature bypass of the SCM is a concern when designing for the lesser volume allowance because the first 75% of the design storm occurs after the peak flow rate.

Proprietary filters must be designed to treat the **maximum peak flow rate**.



Peak Runoff = 3.10 cfs

Peak Runoff depth = 2.82"

Total volume = 0.235 af (10,236.6 cf)

Hydrograph Results		
Precip (in)	Runoff Depth (in)	Runoff Rate (cfs)
1.00	0.79	0.63
1.25	1.04	1.06
2.29	2.06	0.52
3.05	2.82	3.10

Accepted Performance Verification Programs

TSS removal rates for HDS, baffle box, and similar systems must be evaluated using the following TDEC accepted industry-wide standards: **NJDEP Certification**[1] or **TAPE GULD for Basic Treatment (TSS)**[2]. TDEC allows for all other proprietary SCMs to be evaluated using these industry-wide standards.

These protocols utilize a minimum 50% TSS removal for HDS and 80% TSS removal for Filtration as the performance standard.

[1] NJDEP| Stormwater | Stormwater Manufactured Treatment Devices

[2] Emerging stormwater treatment technologies (TAPE) - Washington State Department of Ecology