The CTDOT MS4 Project Design MEP Worksheet is intended to be a living document that follows a project throughout its design. The primary intent of the Worksheet is to track the required metrics that must be reported to CT DEEP annually in order to comply with the DOT MS4 General Permit. It also serves as the required documentation to demonstrate that stormwater mitigation was pursued in a project's design to the maximum extent practical.

Section 1: Project Information

Indicate the Project Number, Title or Description, and Location.

Section 2: Existing Conditions

Before the end of Preliminary Design, fill out the requested information available regarding a project site's existing conditions. As missing or updated information (e.g., soil infiltration potential, depth to groundwater, depth to bedrock) becomes available during later design phases, edit the Existing Conditions accordingly.

EC1. Total Project Area – Total Project Area consists of all areas needed to complete the project which generally consists of the limits of disturbance with an appropriate buffer and includes any lay down areas. The project area could also include abutting DOT owned land where there are no proposed construction activities and areas that will not be impacted by the project.

> *Designer Insight - Total project area will be used in subsequent calculations for Directly Connected Impervious Area (DCIA) and determining the project's Water Quality Volume. (See instructions for EC4 and DC1, below.)*

EC2. Pre-Construction Total Impervious Area for the Project - Determine the amount of pre-construction total impervious area in acres.

EC3. Pre-Construction Disconnected Impervious Area - Determine the amount of pre-construction impervious area that is disconnected in acres.

EC4. Pre-Construction Directly Connected Impervious Area (DCIA) for the Project - Determine the amount of pre-construction DCIA in acres and as a percentage of the overall project area. DCIA is surface area within the project limits that a) is impervious, **and** b) drains to a wetland or watercourse either directly or via a storm sewer system discharge. Impervious cover includes pavement, sidewalks, roofs, exposed ledge, gravel roads/parking ($C \geq 0.7$). The pre-construction %-DCIA will typically remain consistent as the design progresses unless the total project area changes.

> *Designer Insight - The primary purpose of %-DCIA is to determine the* ***WQV retention design goal****, which will be the minimum goal for impervious area disconnections (see instructions for DC1, below.)*

EC5. Soil Infiltration Potential – Select either *Existing Report/Soils Map* or *Field Verified* as the source of the soils information. Choose from *Good/Fair, Poor* or *Mixed* as the best overall description of the project's surficial geology ability to infiltrate. Generally, soils with an infiltration rate of at least 0.3 in/hr are considered as *Good/Fair.* Retention BMPs will need to be designed to infiltrate all of the ponded water within 48 hours. Select *Mixed* if the soil conditions vary throughout a large project area.

> *Designer Insight - The soil infiltration potential will be used to inform whether infiltration Best Management Practices (BMPs) are feasible. Any existing information (such as prior soils reports) for the project area should be reviewed. If no prior, area-specific soil information is available, utilize the Soil Drainage Class map from CTECO to identify preliminary locations.* ***http://www.cteco.uconn.edu/map_catalog.asp?****.* *Areas classified as* Somewhat Poorly Drained, Poorly Drained or Very Poorly Drained Areas *can be noted as "Poor" on the Worksheet and do not warrant further consideration for infiltration BMPs. All other areas should be considered as "Good/Fair" and, unless other factors prohibit infiltration, actual infiltration rates will require field verification.*

Section 2: Existing Conditions (continued)

EC6. Depth to Groundwater – At the start of design, check the "TBD" box unless existing data from a previous project or other sources is available. As design progresses and as subsurface investigations are completed, indicate the depth to maximum groundwater as a range over the entire project area. Maximum groundwater is the level to which groundwater rises for a duration of one month or longer during the wettest season of the year. Report zero as the low end of the range if wetlands or standing water are present within the project limits. If depth to groundwater is deeper than the depth to bedrock, indicate as "BR" (below rock). If seasonal variations in depth to groundwater are known, defer to the seasonal high for this Worksheet.

EC7. Depth to Bedrock – At the start of design, check TBD unless existing data from a previous project or other sources is available. As design progresses and as subsurface investigations are completed, indicate the depth to bedrock as a range over the entire project area. Report zero as the low end of the range if bedrock outcrops are present within the project limits.

Designer Insight - The purpose of the depth to groundwater and depth to bedrock is to inform and document whether shallow groundwater or shallow bedrock will make it unfeasible to include infiltration/retention BMPs (see page 2 of DOT MS4 Worksheet) as part of the design.

EC8. Aquifer Protection Area - Indicate (Y/N) if any part of the project falls within an aquifer protection area. This information will be reported to the design unit on the PNDF provided by Office of Environmental Planning.

Designer Insight – If the project is located within an Aquifer Protection Area, then this is a limiting condition to be documented with respect to the infiltration/retention BMPs listed on page 2. Infiltration/retention BMPs should not be pursued in these areas in order to protect groundwater quality from potential contaminants associated with transportation-related spills or other releases.

EC9. MS4 Priority Area - Indicate (Y/N) if any part of the project falls within an "MS4 Priority Area." If yes, indicate which of the three types of priorities (check all that apply). If "Impaired Waterbody" is checked, pick the impairment(s) from the list of drop-down boxes. This information will be reported to the design unit on the PNDF provided by OEP.

Designer Insight – Identifying the project's location relative to MS4 Priority Areas is a requirement of the MS4 permit. If a receiving water is impaired, identifying the specific impairment will help inform the suitability of certain BMPs.

EC10. Contamination known or suspected to be present? Indicate (Y/N) whether soil and/or groundwater contamination is known or suspected to be present. Check "Yes" if the Task 100 Environmental Hazardous Screening Form provided by DOT Environmental Compliance recommended that a Task 210 Subsurface Investigation be performed.

Designer Insight – If contaminated soil and/or groundwater is known or suspected to be present, then careful consideration must be made before deciding whether infiltration/retention BMPs are feasible. If the surrounding land use is intensely developed and public drinking water is readily available, or if existing groundwater quality is known to be unsuitable for drinking water supply without treatment, or if remediation is planned as part of the project (for reasons other than BMP implementation), then an infiltration/retention BMP may still be appropriate.

Section 2: Existing Conditions (continued)

EC11. Adjoining DOT ROW beyond project limits available for stormwater quality management. Indicate the approximate acreage of potentially suitable DOT property that is *laterally* beyond the project limit. This can include:

- Additional property in the DOT ROW that was not included in the Total Project Area;
- Adjacent parcels presently owned by DOT;
- Excess property from a parcel to be acquired for the project for reasons other than MS4.

Include only the amount of undeveloped area beyond the project limits. Attach a sketch depicting these areas.

> *Designer Insight – The available DOT-owned area surrounding a project is a general metric to help inform the possibility of locating stormwater BMPs near the project site if the area directly within the project limits is not sufficient. It is understood that the lateral distance from the project limit to the ROW limit can vary significantly, especially for linear projects that extend over a long distance. Include other relevant information related to additional area in the Notes box at the bottom of the page.*

Section 3: Designed Conditions

This portion of the Worksheet was established based on a typical 30/60/90/FDP design process. At each phase, the progression of key metrics associated with a stormwater quality design are tracked by the Worksheet. It is understood that not every project will follow this exact design process. Any information that has not changed compared to what was recorded during the previous design phase review can be indicated as such (e.g., "no change" or "same") However, the FDP column must contain the final values.

Section 3 will rely heavily on the information recorded on Section 4: Stormwater BMP Selection Summary. As such, Section 4 will also need to be completed and updated with each corresponding milestone design review. Refer to the instructions below on how to complete Section 4.

At Design Approval, complete Section 3's 30%-Design Phase column based on the best available information. If a project is using intermediate design reviews, complete the 60%-Design Phase column and/or the 90%-Design Phase column during the respective milestone reviews. These are working-versions of the Worksheet. Save the working versions of the Worksheet to the project's appropriate **310_Milestone_ Submissions** folder in COMPASS.

> *Designer Insight – Data from a project's drainage report should be used when available. Review the Worksheet to ensure the reported metrics are consistent with the drainage report.*

At the Final Design Plan milestone, complete the FDP Phase column. Upon completion of this column, this will be the record version of the project's Worksheet. Save the Worksheet to the project's COMPASS **310_Milestone_ Submissions/100%** folder.

DC1. Water Quality Volume (WQV) design goal (acre-feet) – Determine the **WQV design goal** by first calculating the Water Quality Volume (WQV) for the project. The WQV is the volume of runoff generated across a site by one and one third inch (1.3") of rainfall. The proposed impervious area ($C \geq 0.7$) must be known to determine the WQV.

WQV = (1.3-in)(R)(A)/12 WQV = water quality volume (ac-ft)
R = volumetric runoff coefficient = 0.05+0.009(I)
I = percent directly connected impervious area cover for post-construction condition as designed ($C \geq 0.7$).
A = Total DOT-Owned Project Area in acres.

> *Designer Insight - The percent impervious cover (I) in the calculation above is only the <u>directly connected impervious area</u> in the PROPOSED condition BEFORE application of any BMPs. DCIA excludes impervious surfaces that do not drain to a wetland or watercourse directly or via a storm sewer discharge.*

Section 3: Designed Conditions (continued)

Section 3A: Document WQV Retained and/or Treated

The equation above calculates a volume based on 1.3" of rainfall. It is not necessarily the WQV goal for the project. The project's **WQV design goal** is determined based on the percentage of DCIA at the pre-construction stage (EC4). If the pre-construction DCIA is greater or equal to 40% of the project area, then project's retention goal will be ½ x Water Quality Volume (WQV). If the pre-construction DCIA is less than 40%, then the retention goal will be 1.3xWQV, or simply the full WQV. For many redevelopment projects, the pre-construction DCIA percentage will be above 40% and the design goal will be equal to ½ the WQV design goal.

If possible, an estimate of the WQV design goal should be calculated during preliminary design in order to approximate the extent of best management practices that will be needed. If the extent of impervious cover is not fully known by Design Approval, then the WQV cannot be calculated, and the TBD box should be checked. Provide the information during a later design phase. An accurate value must always be provided for the FDP milestone.

DC2. WQV Goal *retained* – Copy the total ***WQV retained*** value column in Section 4: Stormwater BMP Selection Summary. Refer to Section 4 of these instructions.

DC3. WQV Goal *Treated* – Copy the total ***WQV Treated*** value column in Section 4: Stormwater BMP Selection Summary. Refer to Section 4 of these instructions.

*Designer insight – Incorporate run-off retention BMPs to the maximum extent practical as site conditions allow documenting site constraints in Section 4 that are consistent with the Existing Condition information provided on page 1. If the amount of run-off retained in the design condition fails to meet the **WQV design goal** (DC1), determine the shortfall, and evaluate the use of treatment BMPs to make up the difference. Treatment without infiltration should only be incorporated into the design when runoff retention can be demonstrated to be infeasible.*

Designer insight - It is acceptable to take credit for disconnecting off site DCIA areas that drain to on-site BMPs.

To document how the project did meeting the WQV design goal, add DC2 and DC3 and compare to DC1. If the DC2 plus DC3 is equal to or greater then DC1 the goal has been met. If DC2 plus DC3 is less then DC1, then the goal has not been met.

*Designer insight – For projects that do not fully **retain** the WQV design goal, treatment BMPs shall be selected to meet (or at least maximize) specific TP, TN, and TSS pollutant reduction targets. Refer to Section 4 of these instructions.*

Section 3B: Document Changes in DCIA Pre to Post Construction

DC4. Post-construction Total Impervious Area (acres) – Determine Post-construction Total Impervious Area. Determine the total amount of post construction impervious area including both directly connected impervious areas (DCIA) and disconnected impervious area.

DC5. Post-construction DCIA before new BMPs (acres) Determine the amount of post-construction DCIA before application of any proposed structural stormwater quality BMPs. Here, DCIA is surface area within the project limits that a) is impervious **and** b) drains to a wetland or watercourse either directly or via a storm sewer system discharge. Impervious cover includes pavement, sidewalks, roofs (Facilities projects), exposed ledge, gravel roads/parking ($C \geq 0.7$). Do not include turf, temporary pavement areas or temporary access roads. If the post-construction DCIA is unknown during the Preliminary Design phase, check TBD and provide the information at a later design phase.

*Designer insight – For the Post-Construction DCIA value, do not count impervious areas that will drain to BMPs designed to retain enough runoff for the area to have met the **WQV design goal**. Directly connected impervious areas not directed to a qualifying BMP must be counted as DCIA. The goal is to reduce the amount of DCIA (see DC9, below.)*

DC6. DCIA Disconnected by new BMPs (acres) – Determine DCIA disconnected by proposed BMPs from Section 4.

Section 3: Designed Conditions (continued)

DC7. Final Post- Construction DCIA (acres) – Subtract the DCIA Disconnected by new BMPs from the Post-construction DCIA before new BMPs.

DC8. Pre-construction DCIA (acres) – Copy the Pre-Construction DOT-Owned Directly Connected Impervious Area (DCIA) from line EC4.

DC9. Change in DCIA from pre- to post-construction (acres) - Subtract the **Pre-construction *DCIA*** (DC8) from the Post-construction DCIA (DC7).

A negative value indicates that the amount of DCIA will decrease.

A positive value indicates that the project will cause DCIA to increase. Review the limiting site constraints in Section 4 with the recorded existing conditions in Section 1 for accuracy and consistency.

Designer insight – The DOT MS4 General Permit that became effective on July 1, 2019 has a statewide compliance metric to reduce DOT statewide DCIA by 2% by June 30, 2024. In December of 2023, a Consent Order was signed between CTDOT and EPA that requires CTDOT to reduce DCIA by 40 acres by June 30, 2027 and 80 acres by June 30, 2030. While a project will not be in violation if the maximum extent practical falls short of the permit requirements for DCIA and runoff reductions, any additional DCIA added by projects will make meeting these targets that much harder.

Designer insight – Since BMPs may have drainage areas that extend beyond the chosen project area, it is acceptable to take credit for disconnecting off site DCIA areas that drain to on-site BMPs and compensate for DCIA remaining on-site. In rare cases it will be possible to disconnect more DCIA than exists within the project area.

Designer insight – Use the notes area at the end of section 3 to explain how the numbers in sub-sections 3A and 3B were determined. For example, the project is adding 2.1 acres of new impervious area compared to the pre-construction condition but 2.6 acres are being disconnected via two proposed BMPs resulting in a net decrease of DCIA of 0.5 acres.

<u>Section 4: Stormwater BMP Selection Summary</u>

This section of the Worksheet should be used to document the specific BMP types used to meet MS4 requirements. Refer to CTDEEP's 2023 Connecticut Stormwater Quality Manual (SWQM) and the New England Retrofit Manual that the SWQM references, for design and crediting information. The EPA retrofit curves (aka, BMP crediting curves) included in the New England Stormwater Retrofit Manual should be used to determine the disconnection and pollutant removal credit that each proposed BMP should claim. <u>These curves have been consolidated by CTDOT MS4 into tables which are attached at the end of this document for easier designer reference.</u> Innovative BMPs not listed in the Connecticut Stormwater Quality Manual are also encouraged so long as good engineering judgement is used when assigning retention and treatment capacities.

Designer insight – Designers should generally refer to the 2023 CT DEEP Water Quality Manual for BMP design / sizing guidance and the attached tables which consolidate the New England Retrofit Curves for Disconnection and Pollutant Removal Crediting.

Complete the Stormwater BMP Selection Summary at each milestone design review. Indicate the current design review phase by checking off the appropriate box in the upper left corner.

Designer insight – While Section 3 (Design Conditions) and Section 4 (Stormwater BMP Selection Summary) were established based on a typical 30/60/90/FDP design process, it is understood that not every project will follow this exact design process and that a project's metrics may not change from one phase to the next.

At the project's Design Approval, potential opportunities to improve water quality with stormwater BMPs should be identified with preliminary locations shown on project plans.

Design phases after Design Approval will need to verify any preliminary assumptions used in siting and sizing BMPs.

Section 4: Stormwater BMP Selection Summary (continued)

Examine all limiting factors for each BMP being considered. These factors may include but are not limited to:

- Permeability/percolation information
- Depth to maximum groundwater
- Depth to bedrock

Update Section 1 as needed based on the field investigations.

Designer insight – A best management practice that does not meet every design requirement listed in the Stormwater Quality Manual will still provide a benefit, albeit not the full possible extent. Document the assumptions used in determining the proportional amount of runoff retainage and/or treatment that the BMP will provide given its site constraints.

BMP Category – In this column, list the BMP Category from the drop-down list. The BMPs listed are grouped into four categories:

1. **Natural Dispersion** promotes flow dispersion and reduce flow velocities in order to allow the downstream terrain to absorb and/or filter the runoff. This BMP is also referred to as a Qualified Pervious Area. Consider the following factors of the downstream terrain when determining its capacity to retain or treat: slope, soil type, and distance to the nearest surface water or wetland. Consider augmenting the downstream terrain to retain or treat a greater volume of runoff. For example, soil amendments can be used to increase infiltration capacity or certain seed mixes could be specified to promote beneficial vegetation.
2. **Open Conveyance BMPs** remove pollutants from the runoff as it is collected and conveyed. The slope, soil type, and length of the conveyance will generally dictate its capacity to retain and/or treat. Also consider the downstream terrain, if any, between the conveyance's outfall and the nearest surface water or wetland.

*Designer insight – For a Disconnection BMPs and Conveyance & Disconnection BMPs to meet the **WQV retention design goal**, they may need to be coupled with one or more other BMPs designed per the criteria in the 2023 CT DEEP Stormwater Quality Manual.*

3. **Infiltration/Retention BMPs** are practices that retain the WQV or a portion of the WQV, temporarily holding it before it infiltrates into the native soil. Any BMP that does not allow the WQV to enter a storm system or adjacent surface water body would qualify for infiltration/retention credit.
4. **Treatment BMPs** are practices that improve the water quality but do not reduce or retain the volume.

BMP Type – In this column, list the type of BMP being proposed, aka, infiltration trench, detention basin, qualified pervious area, water quality swale.

WQV Retained – In this column, list the amount of the WQV retained (if any) by each BMP used in the design. For example, if a project uses three separate infiltration trenches, then each trench should be individually listed and the WQV retained by each recorded in the cell where the "infiltration trench" row and the "WQV Retained" column intersect.

WQV Treated – In this column, list the amount of the WQV treated by each BMP used in the design. For example, if a project has incorporated two separate wet detention basins, then each basin should be individually listed, and the volume treated by each basin should be recorded in the cell where the "wet basin" row and the "WQV Treated" column intersect.

Designer insight – The amount of water that a BMP can infiltrate might be limited to only a portion of the WQV design goal. In additional to the volume retained, consider the volume of treatment the BMP provides to the portion of the WQV that cannot be retained. Include that amount of treatment under the WQV Treated column.

Section 4: Stormwater BMP Selection Summary (continued)

DCIA Captured (acres) – In this column, list the amount of directly connected impervious area (DCIA) that is captured by the BMP being proposed. DCIA Captured is the amount of surface area within the project limits that a) is impervious **and** b) drains to a BMP for retention and/or treatment that would otherwise have drained to a wetland or watercourse either directly or via a storm sewer system discharge.

Runoff Depth from DCIA Captured by BMP (inches) – Document the runoff depth from the DCIA captured by the BMP based on the BMP sizing / capacity.

HSG Soil Type – Based on preliminary soils information from row EC5 above or final field soil investigation results, list the Hydraulic Soil Group (Choices are A, B, C or D).

DCIA Disconnection Credit (Percentage) – In this column, record the DCIA Disconnection Credit for the proposed BMP. DCIA Disconnection Credit is the percentage of DCIA directed to a BMP that can be considered disconnected. Refer to the BMP Crediting Tables attached to these instructions which were adopted from the EPA retrofit curves in the appendix of the New England Stormwater Retrofit Manual.

DCIA Disconnection Credit (Acres) – DCIA Disconnection Credit is the area directed to a BMP that can be considered disconnected. To find this number multiply the total amount of DCIA Captured (acres) by the BMP by the appropriate DCIA Disconnection Credit percentage based on soil type and depth of runoff captured.

Total Phosphorus (TP) Reduction Percentage – List the percentage of total phosphorus being removed by the BMP based on the appropriate Retrofit Crediting Curve attached to these instructions. The removal percentage is based on the depth of runoff captured and the soil type.

> *Designer Insight – If a project cannot **retain** all of the project's water quality volume design goal, then BMPs should be selected that meet or strive to meet the following Pollutant Reduction Targets: New Development - TP 60%, TN 40%, and TSS 90%. Redevelopment- TP 50%, TN,30%, and TSS 80%.*

Total Suspended Solids (TSS) Reduction Percentage – List the percentage of total suspended solids being removed by the BMP based on the appropriate Retrofit Crediting Curve attached to these instructions. The removal percentage is based on the depth of runoff captured and the soil type.

Total Nitrogen (TN) Reduction Percentage – List the percentage of total nitrogen being removed by the BMP based on the appropriate Retrofit Crediting Curve attached to these instructions. The removal percentage is based on the depth of runoff captured and the soil type.

Describe Site Constraints Limiting BMP Implementation (if applicable): Describe the site constraints for the project that prevented the selection of preferred retainage BMPs or even treatment BMPs. Examples include but may not be limited to insufficient space, shallow groundwater, shallow bedrock and utility conflicts.

*Every project that affects drainage shall at least have completed the Worksheet with its FDP. The FDP-version will be considered the final version of the worksheet. All metrics extracted for the annual DEEP reports will come from the final FDP Worksheet. Save the FDP version of the Worksheet to the project's appropriate Compass **310_Milestone_ Submissions/100%** folder.*

BMP Crediting Tables for:

- Pollutant Reduction Percentages
- Directly Connected Impervious Area Reduction Percentages

Adopted by CTDOT MS4 from the EPA Retrofit Curves included in the New England Stormwater Retrofit Manual

Natural Dispersion / Simple Disconnection for <u>Low</u> Slopes

Pollutant Reduction

Slope Requirements: (Grass ≤ 12 to 1 (8%), Meadow/Forest ≤ 8 to 1 (13%))

HSG	**Impervious Area to Pervious Area Ratio**										
	8:1	6:1	4:1	2:1	1:1	1:2	1:4	1:10	1:30	1:50	1:70
HSG A	45%	52%	63%	78%	88%	93%	95%	99%	99%	100%	100%
HSG B	26%	31%	39%	54%	66%	74%	78%	88%	89%	90%	100%
HSG C	16%	20%	26%	37%	48%	57%	62%	73%	79%	82%	94%
HSG D	10%	12%	16%	24%	32%	39%	44%	62%	68%	71%	75%

Natural Dispersion / Simple Disconnection for <u>Medium</u> Slopes

Pollutant Reduction

Slope Requirements: (Grass ≤ 6 to 1 (16%), Meadow/Forest ≤ 4 to 1 (25%))

HSG	**Impervious Area to Pervious Area Ratio**										
	1:1	1:2	1:4	1:10	1:30	1:50	1:70				
All Groups	16%	18%	22%	31%	34%	35%	37%				

Natural Dispersion / Simple Disconnection for <u>High</u> Slopes

Pollutant Reduction

Slope Requirements: (Grass ≤ 4 to 1 (25%), Meadow/Forest ≤ 3 to 1 (33%))

HSG	**Impervious Area to Pervious Area Ratio**										
	1:1	1:2	1:4	1:10	1:30	1:50	1:70				
All Groups	10%	13%	14%	20%	22%	23%	25%				

Natural Dispersion / Simple Disconnection for <u>Low</u> Slopes

DCIA Reduction

Slope Requirements: (Grass $\leq$ 12 to 1 (8%), Meadow/Forest $\leq$ 8 to 1 (13%))

HSG	Impervious Area to Pervious Area Ratio										
	8:1	6:1	4:1	2:1	1:1	1:2	1:4	1:10	1:30	1:50	1:70
HSG A	50%	58%	70%	87%	98%	100%	100%	100%	100%	100%	100%
HSG B	28%	34%	44%	60%	74%	82%	87%	97%	99%	100%	100%
HSG C	18%	22%	29%	41%	53%	63%	69%	81%	88%	91%	100%
HSG D	11%	14%	18%	27%	36%	43%	48%	69%	76%	78%	84%

Natural Dispersion / Simple Disconnection for <u>Medium</u> Slopes

DCIA Reduction

Slope Requirements: (Grass $\leq$ 6 to 1 (16%), Meadow/Forest $\leq$ 4 to 1 (25%))

HSG	Impervious Area to Pervious Area Ratio										
	1:1	1:2	1:4	1:10	1:30	1:50	1:70				
All Groups	18%	21%	24%	34%	38%	39%	42%				

Natural Dispersion / Simple Disconnection for <u>High</u> Slopes

DCIA Reduction

Slope Requirements: (Grass $\leq$ 4 to 1 (25%), Meadow/Forest $\leq$ 3 to 1 (33%))

HSG	Impervious Area to Pervious Area Ratio										
	1:1	1:2	1:4	1:10	1:30	1:50	1:70				
All Groups	12%	14%	16%	23%	25%	25%	28%				

Infiltration Basin (HSG A-D)

Pollutant Reduction

HSG A	Design Storage Volume: Runoff Depth from Impervious Area (in)													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	59%	81%	89%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%
TN	0%	75%	92%	96%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Bacteria	0%	60%	87%	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
TSS	0%	79%	95%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Metals	0%	91%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

HSG B	Design Storage Volume: Runoff Depth from Impervious Area (in)													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	41%	60%	71%	81%	86%	90%	92%	94%	96%	97%	98%	99%	99%
TN	0%	59%	77%	85%	92%	94%	96%	97%	98%	99%	100%	100%	100%	100%
Bacteria	0%	34%	55%	68%	80%	86%	92%	95%	97%	98%	99%	100%	100%	100%
TSS	0%	67%	94%	95%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%
Metals	0%	78%	92%	96%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%

HSG C	Design Storage Volume: Runoff Depth from Impervious Area (in)													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	35%	52%	62%	72%	77%	82%	85%	88%	90%	92%	93%	94%	95%
TN	0%	52%	69%	77%	85%	89%	92%	94%	96%	97%	98%	98%	98%	99%
Bacteria	0%	24%	40%	52%	63%	71%	79%	84%	88%	91%	93%	94%	95%	96%
TSS	0%	64%	80%	87%	93%	96%	98%	99%	99%	100%	100%	100%	100%	100%
Metals	0%	71%	86%	91%	96%	97%	98%	99%	99%	100%	100%	100%	100%	100%

HSG D	Design Storage Volume: Runoff Depth from Impervious Area (in)													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	28%	43%	54%	64%	71%	77%	82%	86%	89%	91%	92%	93%	95%
TN	0%	52%	67%	75%	83%	87%	90%	92%	94%	96%	97%	97%	97%	98%
Bacteria	0%	22%	36%	47%	58%	66%	73%	78%	83%	86%	89%	91%	93%	95%
TSS	0%	63%	80%	86%	92%	94%	95%	96%	97%	98%	98%	98%	98%	99%
Metals	0%	61%	78%	84%	90%	92%	94%	95%	96%	97%	98%	98%	98%	99%

Infiltration Basin (HSG A-D)

DCIA Reduction

HSG A	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	66%	88%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Runoff	0%	61%	84%	91%	97%	98%	99%	100%	100%	100%	100%	100%	100%	100%

HSG B	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	41%	62%	71%	80%	86%	91%	94%	97%	98%	99%	100%	100%	100%
Runoff	0%	25%	45%	58%	70%	77%	83%	87%	90%	92%	94%	95%	96%	97%

HSG C	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	33%	48%	57%	65%	71%	76%	81%	86%	90%	93%	94%	96%	98%
Runoff	0%	13%	25%	35%	45%	53%	61%	68%	75%	80%	85%	87%	89%	92%

HSG D	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	28%	41%	49%	57%	62%	67%	72%	76%	80%	83%	85%	87%	89%
Runoff	0%	9%	17%	25%	33%	40%	47%	53%	59%	64%	69%	72%	75%	78%

Infiltration Trench (HSG A-D)

Pollutant Reduction

HSG A	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	50%	75%	85%	94%	96%	98%	99%	99%	100%	100%	100%	100%	100%
TN	0%	76%	92%	95%	98%	99%	100%	100%	100%	96%	100%	100%	100%	100%
Bacteria	0%	50%	75%	85%	94%	96%	98%	99%	99%	100%	100%	100%	100%	100%
TSS	0%	92%	98%	99%	100%	100%	100%	100%	100%	98%	100%	100%	100%	100%
Metals	0%	93%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

HSG B	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	27%	47%	60%	73%	80%	86%	89%	92%	94%	96%	97%	97%	98%
TN	0%	61%	78%	95%	92%	99%	97%	100%	98%	96%	99%	99%	99%	99%
Bacteria	0%	27%	45%	56%	67%	74%	80%	85%	89%	92%	94%	95%	96%	97%
TSS	0%	44%	70%	82%	93%	96%	99%	100%	100%	100%	100%	100%	100%	100%
Metals	0%	72%	94%	97%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%

HSG C	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	18%	33%	45%	57%	65%	73%	78%	83%	87%	90%	92%	93%	95%
TN	0%	56%	72%	80%	87%	90%	93%	95%	96%	97%	98%	98%	98%	99%
Bacteria	0%	22%	35%	45%	54%	61%	68%	73%	78%	82%	85%	87%	89%	91%
TSS	0%	32%	56%	70%	84%	90%	95%	97%	98%	99%	99%	100%	100%	100%
Metals	0%	51%	77%	86%	94%	96%	98%	99%	99%	99%	99%	100%	100%	100%

HSG D	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	24%	38%	48%	57%	63%	69%	74%	78%	81%	84%	86%	88%	90%
TN	0%	54%	68%	75%	82%	86%	89%	91%	93%	94%	95%	96%	96%	97%
Bacteria	0%	25%	38%	48%	58%	65%	71%	76%	80%	83%	85%	87%	89%	91%
TSS	0%	49%	64%	71%	77%	81%	84%	87%	89%	91%	92%	92%	93%	93%
Metals	0%	39%	53%	61%	68%	73%	77%	80%	83%	86%	88%	89%	91%	92%

Infiltration Trench (HSG A-D)

DCIA Reduction

HSG A	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	61%	80%	89%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Runoff	0%	49%	73%	83%	93%	96%	98%	99%	99%	100%	100%	100%	100%	100%

HSG B	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	29%	49%	61%	73%	80%	86%	90%	93%	96%	98%	98%	99%	99%
Runoff	0%	21%	38%	50%	62%	70%	77%	82%	86%	89%	91%	92%	93%	94%

HSG C	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	18%	33%	44%	55%	63%	70%	74%	78%	82%	86%	88%	90%	92%
Runoff	0%	9%	19%	28%	37%	45%	52%	58%	64%	69%	74%	77%	80%	83%

HSG D	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Pollutant	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	22%	33%	41%	47%	53%	58%	63%	67%	71%	74%	76%	79%	82%
Runoff	0%	6%	12%	18%	23%	29%	34%	39%	44%	49%	53%	57%	61%	65%

Bio-Filtration

Pollutant Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	24%	38%	48%	57%	63%	69%	74%	78%	81%	84%	86%	88%	90%
TN	0%	54%	68%	75%	82%	86%	89%	91%	93%	94%	95%	96%	96%	97%
Bacteria	0%	25%	38%	48%	58%	65%	71%	76%	80%	83%	85%	87%	89%	91%
TSS	0%	49%	64%	71%	77%	81%	84%	87%	89%	91%	92%	92%	93%	93%
Metals	0%	39%	53%	61%	68%	73%	77%	80%	83%	86%	88%	89%	91%	92%

Bio-Filtration

DCIA Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	18%	31%	37%	43%	46%	48%	50%	51%	53%	55%	57%	59%	61%
Runoff	0%	0%	3%	4%	5%	7%	8%	9%	10%	12%	13%	15%	17%	18%

Sand Filter

Pollutant Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	14%	25%	31%	37%	41%	44%	46%	48%	51%	53%	54%	55%	56%
TN	0%	9%	16%	20%	23%	26%	28%	30%	31%	32%	32%	33%	34%	35%
Bacteria	0%	11%	19%	25%	30%	35%	40%	44%	48%	52%	55%	57%	60%	62%
TSS	0%	44%	69%	80%	91%	94%	97%	98%	98%	99%	99%	99%	99%	99%
Metals	0%	68%	88%	92%	95%	96%	96%	96%	96%	97%	97%	97%	97%	97%

Sand Filter

DCIA Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	18%	31%	37%	43%	46%	48%	50%	51%	53%	55%	57%	59%	61%
Runoff	0%	0%	3%	4%	5%	7%	8%	9%	10%	12%	13%	15%	17%	18%

Gravel Wetland

Pollutant Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	19%	26%	31%	41%	41%	51%	46%	57%	51%	61%	62%	62%	63%
TN	0%	22%	33%	41%	48%	53%	57%	61%	64%	66%	68%	69%	71%	72%
Bacteria	0%	30%	47%	57%%	66%	70%	73%	74%	75%	76%	76%	76%	77%	77%
TSS	0%	48%	61%	72%%	82%	87%	91%	93%	95%	96%	97%	97%	98%	98%
Metals	0%	57%	68%	76%	83%	86%	88%	89%	90%	90%	90%	90%	90%	97%

Gravel Wetland

DCIA Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	20%	27%	33%%	39%	42%	45%	46%	47%	48%	49%	50%	50%	51%
Runoff	0%	0%	0%	0%	0	1%	1%	2%	2%	2%	2%	2%	3%	3%

Wet Pond

Pollutant Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	14%	25%	31%	37%	41%	44%	46%	48%	51%	53%	54%	55%	56%
TN	0%	9%	16%	20%	23%	26%	28%	30%	31%	32%	32%	31%	31%	32%
Bacteria	0%	15%	24%	32%	39%	45%	50%	54%	58%	61%	64%	66%	68%	70%
TSS	0%	30%	44%	52%	60%	64%	68%	71%	74%	76%	77%	78%	80%	81%
Metals	0%	59%	71%	76%	80%	83%	85%	86%	87%	88%	89%	90%	90%	91%

Wet Pond

DCIA Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	14%	23%	29%	35%	40%	44%	48%	52%	56%	59%	62%	65%	68%
Runoff	0%	4%	9%	14%	19%	24%	29%	34%	39%	44%	48%	52%	56%	60%

Extended Dry Detention

Pollutant Reduction

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	3%	6%	7%	8%	9%	9%	10%	11%	12%	12%	12%	12%	13%
TN	0%	1%	3%	5%	6%	8%	9%	10%	11%	12%	13%	14%	15%	17%
Bacteria	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	2%
TSS	0%	18%	31%	35%	38%	39%	40%	42%	44%	45%	46%	46%	46%	46%
Metals	0%	53%	67%	68%	68%	69%	69%	71%	72%	73%	73%	73%	73%	73%

Extended Dry Detention

DCIA Reduction

Pollutant	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	11%	20%	24%	29%	32%	35%	37%	39%	41%	43%	44%	45%	45%
Runoff	0%	10%	19%	25%	31%	34%	37%	38%	39%	39%	39%	39%	38%	38%

Impervious Area Disconnection through Storage (HSG A-D)

Impervious to Pervious Ratio 4:1

HSG A	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Release Rate	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
1-day	0%	24%	40%	52%	61%	67%	70%	71%	71%	71%	71%	71%	71%	71%
2-day	0%	23%	38%	50%	59%	66%	71%	75%	78%	79%	80%	80%	80%	80%
3-day	0%	22%	37%	49%	58%	64%	70%	74%	77%	79%	80%	81%	83%	84%

HSG B	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Release Rate	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
1-day	0%	24%	40%	52%	59%	62%	62%	62%	62%	62%	62%	62%	62%	62%
2-day	0%	23%	38%	50%	59%	66%	70%	72%	73%	73%	73%	73%	73%	73%
3-day	0%	22%	37%	49%	58%	64%	70%	74%	77%	78%	79%	79%	80%	80%

HSG C	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Release Rate	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
1-day	0%	24%	37%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
2-day	0%	23%	38%	46%	48%	48%	48%	48%	48%	48%	48%	48%	48%	48%
3-day	0%	22%	37%	49%	54%	56%	56%	56%	56%	56%	56%	56%	56%	56%

HSG D	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
Release Rate	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
1-day	0%	22%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%
2-day	0%	22%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%	26%
3-day	0%	21%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%

Grass Swale (HSG A-D)

Design Criteria:

- ≤ 2% Slope or ≤ 6% with Check Dams
- Bottom Width 2ft Min / 8 ft Max
- 12 inches max ponding depth for water quality storm
- Max 1.5 feet per second velocity for water quality storm
- See CTDEEP SWQM (Page 223) for more detailed design guidance

Pollutant Reduction

Pollutant	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
TP	0%	2%	5%	7%	9%	11%	13%	15%	17%	19%	21%	22%	23%	25%
TN	0%	1%	3%	5%	6%	7%	9%	10%	11%	12%	13%	14%	15%	17%

DCIA Reduction

(Credit Amount from CTDOT MS4)

Pollutant	**Design Storage Volume: Runoff Depth from Impervious Area (in)**													
	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30
Effective IA	0%	1%	3%	5%	6%	7%	9%	10%	11%	12%	13%	14%	15%	17%