Prince George's County
Department of Permitting, Inspections and Enforcement
SITE/ROAD PLAN REVIEW DIVISION
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BIO-TYPE DEVICE DESIGN REVIEW CHECKLIST

This checklist serves as a guide for the consultant in the preparation and for the County the review of

- M-2 Submerged Gravel Wetland,
- M-3 Landscape Infiltration,
- M-6 Micro-Bioretention,
- F-6 Bioretention,
- M-7 Rain Gardens, and
- M-8 Swales

Any questions regarding items contained herein should refer to Prince George's County DPIE for clarification. Applicable page number or section in the Stormwater Management Design Manual, County Code, PGSCD Reference Manual, or Maryland Design Manual for specific design criteria are included for reference.

NOTE: PLANS SUBMITTED WITHOUT A COMPLETED CHECKLIST MAY BE RETURNED WITHOUT REVIEW

Site/Project Name: _____ Date: _____

Applicant: _____ Consultant: _____

Phone Number: _____ Phone Number: _____

Email Address: _____ Email Address: _____

Site Development Concept Plan No.:_____ DPIE Permit Case No. _____

Consultant: Please complete the checklist below by indicating the following:
C or ✓ = Complete or checked; X = Not Applicable; O = Outstanding, need to address
Please place the appropriate symbol in the CONSULT column.

Item #	Design Checklist Item	Reference	CONSULT	DPIE
A	**DRAINAGE AREA MAP & COMPUTATIONS**			
1.	A drainage area map provided as part of the plan design set. Drainage area to each device provided in a table on the DA map	10.5.4.2		
2.	Determination of embankment for dam safety meets PGSCD requirements and MD-378 embankment freeboard criteria.	PGSCD II-11 to 14		
3.	Flow splitter computations provided, if applicable.	10.5.4		
4.	Maximum treated area, exclusive of device area and supporting slopes does not exceed the device sizing criteria.	10.5.3		

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5.	A description of the goals and a summary table of the several types of devices used with required and provided ESD volumes for each POI, etc. (SWM BMP Summary Tabulation). Each POI addresses ESD volume for each individual drainage area.			
6.	Cumulatively, the ESD devices must provide 100% of the target ESDv; however, each individual device may be undersized to **a** minimum of 1 inch, or oversized to ESDmax of 2.7 inches. See design manual for limitations regarding point of interest or other constraints.	10.8.6.3		
7.	Horizontal bends for PVC or HDPE pipe are 22.5 degrees, 45 degrees, or two 45 degree bends for a 90 degree bend for pipes less than 12". Intercepting lines should use a 45 degree bend.			
8.	Supporting computations for the design are included such as: Weir analysis, inlet or curb cut efficiency, HGL, trench drain sizing, etc. Any equations or references are cited.			
9.	Rip rap outfall protection design computations included. Rip rap sized for maximum barrel release and channel or pipe depth and velocity (at least the 10-year storm event) using MDE Figures D.2 and D.3).			
10.	Data input or output files are formatted or text size adjusted so each line is not wrapped to the next line.			
11.	Professional consultants seal, signature, date, and Professional Certification required by COMAR provided on all sheets.			
12.	It is preferred that all pipes and structures are be located at least 5 feet horizontal from edge of ESD device dry storage bottom from all other utilities.			
B	**GEOTECHNICAL INVESTIGATION**			
1.	Geotechnical report identifying soil type identified by Unified Soil Classification, boring logs with soils descriptions, and blow counts included. Report discusses design recommendations. Uploaded as separate document not as part of design report.	10.5.6 Table 10-1		
2.	Seasonal high groundwater noted on profile and proposed bottom of the facility per table 10-1 of Technogram 004-2018.	10.5.5		
C	**FACILITY PLAN VIEW**			
3.	Refer to SD/SWM Checklist for general plan information to be shown.			
4.	The BMP Summary Table is placed on the cover sheet of the design plans.			
5.	Location of test borings noted and numbered to match geotechnical report.	10.5.4.1		
6.	Inflow protection with appropriate labels and details provided.	10.5.4.1		
7.	Facility bottom dimensions and spot elevation of bottom noted.	10.5.4.1		
8.	The angle of the pipe entering a structure with a flat wall is between 45 and 90 degrees.			

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9.	Except for facilities that have an impervious bottom and sides, the facility located at least 10 feet from any slab building, 20 feet from any building with a basement, 30 feet from water supply wells and 25 feet from septic systems. Any practice that will infiltrate into the ground is located at least 50 feet from confined water supply wells and 100 feet from unconfined water supply wells.	MDE 5.84		
10.	Existing and final contours are maximum 2 foot intervals for 1"=30 feet plan. Facility enlargement at 1"=10 or 20 feet provided for facilities that have a bottom surface area less than 1,000 sf. Existing and proposed improvements that impact the facility shown. Extraneous information on enlargement is not shown.	10.5.4.1		
11.	Storm drain system connection, underdrain, and outlet structure profile shown.	10.5.4.1		
12.	Embankment side slopes are 3:1 maximum for all areas outside of parking lot islands and in residential use areas. 2:1 side slopes are only used for facilities inside of parking lot islands in non-residential use areas. Vertical drop shall be considered based on structural design for a retaining wall. Structural retaining wall design is provided on the plan set or it is noted that structural shop drawings for any vertical drop are required prior to fabrication.	10.5.4.1		
13.	Elevations for top of berm (provide minimum 6 inches freeboard between water quality storage elevations to top of berm), water quality storage elevation, riser/weir crest, and top of facility provided.	10.5.4.1		
14.	Safe conveyance of weir overflows shown, if applicable.			
15.	A minimum of 5 feet horizontal clearance between any utility and the 10-year WSEL for the facility is maintained, if feasible. Light poles adjacent to the facility, extend the pole base a sufficient distance below bottom of device to support the light pole if the facility is excavated.			
16.	For public facilities, sufficient easement area around the facility provided to allow for maintenance (may include 10' wide access road.)	10.5.4.3		
17.	Facility access from a paved surface (Min 10' wide) to facility in common areas with a maximum running slope of *15*% and a minimum cross slope of 4% provided.	10.5.4.1		
18.	For a private facility, a system maintenance agreement provided.	10.5.4.3		
19.	The device is not located above or on a Marlboro Clay, Howell, or Christiana soil without an impermeable liner.	10.5.4.1		
20.	A 3"x5" block has been reserved on the cover sheet for the as-built certification block.			
D	**SUBMERGED GRAVEL WETLAND (M-2)**			
1.	The submerged gravel wetland (SGW) is encouraged to be located in or adjacent to an environmental setting. For residential areas, the outside limit of the facility is located a minimum of 25 feet from residential lot line or 50 feet from a building.	10.8.2.1		

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2.	The facility is located in Hydrologic Soil Group (HSG) of either C or D soils. Alternatively, a high ground water table, hard pan or other confining layer is present. Any soil with this confining condition is considered to be HSG C or D for purposes of locating a SGW.	MDE 5.77 and 10.8.2.1		
3.	If the SGW is located in a park, either current or proposed, MNCP&PC Parks Department approval is provided.	M-NCPPC		
4.	The devices may be located within a floodplain and no floodplain analysis is required if the facility is in cut.	CCS 32.205		
5.	The minimum drainage area is 1 acre.	MDE 5.77		
6.	Hot spot or Marlboro clay areas that drain to the facility include a 30 mil thick HDPE geosynthetic liner, 6-12 inches of clay, or equivalent, encompassing the facility.			
7.	**Sizing Criteria** • Pretreatment volume is at least 10% of the required volume. • Storage calculations shall account for the porosity (40%) of the gravel media above the water table. • The preferred length to width ratio is between 1:1 to 1:2, i.e. a stubby configuration. • The preferred width does not exceed 100 feet. • The surface storage depth does not exceed 2 feet deep.			
8.	If flow splitter is used to divert the ESDv to the forebay, a detail is provided.	MDE 5.78		
9.	Groundwater is within 1 foot of the bottom of the device.			
10.	Stormwater is uniformly distributed from the forebay to the SGW.			
11.	Forebay is no lower than the top of gravel and draws down between storms.			
12.	A gravel layer at least 2 feet wide is placed between the forebay inflow into the SGW and the wetland soil.	MDE 5.78		
13.	An 8 inch thick wetland soil mix is used on the surface of the SGW.			
14.	A minimum 2 ft x 2 ft pea gravel chimney located a minimum of 15 feet from the underdrain is provided.			
15.	A 3 inch thick pea gravel layer (# 7 or 8) is provided between the gravel and wetland soil mix. Acceptable gravel size is number 4, 5, 57, or 6.			
16.	Geotextile is provided along all vertical interfaces between different media types and in-situ soils.			
17.	An overflow pipe is provided and the invert is set 4 – 8 inches below the top of the wetland soil elevation and at least 6 inches above the seasonally high ground water table. A minimum of 4 inches of cover is provided over the top of pipe. The overflow pipe is sized to drain the dry storage volume within 24-48 hours.	10.8.2.4		
18.	The gravel thickness is 24 to 48 inches below the wetland soil and pea gravel layer.	10.8.2.4		
19.	An observation well is set at least 6 inches above grade.	MDE 5.78		
20.	County standard specifications and typical section provided.	10.5.4.1		
21.	Landscape Plan provides at least 3 different species and a plant schedule. Plan signed by Landscape Architect.	MDE 5.78		

Item #	Design Checklist Item	Reference	CONSULT	DPIE
E	**LANDSCAPE INFILTRATION (M-3)**			
1	Prince George's County requires underdrains in all bio soil type devices, use the micro-bioretention checklist.	MDE 5.83		
F	**MICRO BIORETENTION (M-6)**			
1.	The drainage area to micro-bioretention practices is limited to a treated drainage area of 20,000 sf or less. The area of the device and supporting slopes is not included in the 20,000 sf limitation.	MDE 5.98		
2.	Micro-bioretention practices are located down gradient and setback at least 10 feet from slab structures or 20 feet from structures with basements. Micro-bioretention variants (e.g., planter boxes) that must be located adjacent to structures include an impermeable liner.	MDE 5.98		
3.	Micro-bioretention systems designed off-line whenever possible. A flow splitter is used to divert excess runoff away from the filter media to a stable, downstream conveyance system. Where bypassing a micro-bioretention practice is impractical, an internal overflow device is used.	MDE 5.97		
4.	ESD storage depth does not exceed 12 inches from the top of the bio-soil media. PGSCD guidance was utilized for Small Pond exemption criteria.	PGSCD II-11		
5.	Groundwater analysis performed in accordance with Techno-Gram 004-2018			
6.	An underdrain is provided for all micro-bioretention facilities. The minimum length of perforated pipe is at least 5% of the surface area.			
7.	The bottom of the facility is set at least 4 feet above the ground water table.	MDE 5.98		
8.	In hot spot or Marlboro clay areas, a 30 mil HDPE geosynthetic liner, 12 inches of clay, or an equivalent, encompassing the facility is provided. The liner is keyed into the surrounding soil a minimum of 18 inches horizontally from the top of bio-soil media.	MDE 5.97		
9.	Bio-soil thickness is between 24 and 48 inches deep. Bio-soil media specifications are provided on the plan.	MDE 5.98		
10.	A minimum of 5 feet horizontal clearance between any utility and the 10-year WSEL for the facility is maintained, if feasible. Light poles adjacent to the facility have a base that extends below bottom of stone.			
11.	An observation well is provided and is set at grade for mowed areas and 6 inches above grade for landscape areas. Cleanouts are located at the end of all pipe runs and have removable caps.	10.8.6.4		
12.	Surface volume is calculated at 100% for dry volume from the bottom of the mulch to the overflow elevation and media storage volume at 40% for the BSM, sand, and gravel above the underdrain pipe invert.			
13.	If a M-9 Enhanced Filter (EF) was added below the underdrain, there is a 4 foot separation from the bottom of the EF gravel to the groundwater elevation and infiltration testing performed at the depth of the bottom of the EF gravel is greater than 0.52 in/hr.			
14.	Storm drain inlet(s) is not located within 5 feet horizontally of any BMP outfall structure.	10.8.6.4		

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15.	Facility dimensions length and width noted**.** Side slopes shall be 3:1 or 2:1 in nonresidential parking lot. Vertical drop shall be considered based on structural design for a retaining wall. Structural design is provided on the plan set or it is noted that structural shop drawings are required prior to fabrication.	10.5.4.4		
16.	Underdrain outfall shall terminate in a structure such as manhole or inlet or if a free discharge in an end section.			
17.	Energy dissipation is provided at concentrated inflow points using a plunge pool, rip rap, large gravel, splash blocks, stone check dams, etc.	10.8.7.4		
18.	When grass overflow spillway is permitted by DPIE, the underdrain outfall cannot be placed within the limits of the spillway. Earthen (grass) spillways must be lined with a geotextile			
19.	Outfall pipe is sized for 10-year storm if "Exempt by Definition" per PGSCD criteria, otherwise sized for 100-year storm.	SCD II-11		
20.	Typical section and specifications provided.	10.5.4.1		
21.	Landscape Plan and plant schedule with individual schedules for each facility and a summary schedule provided and signed by Landscape Architect.	MDE 5.98 and 10.8.6.5		
22.	No trees are proposed in the bottom of the facility, within the media. Major trees are not planted within 15 feet of the bottom area of the device and small ornamental and flowering trees are located on the side slopes.			
23.	Sod is **NOT** proposed on the bottom of the facility. (Sod may be used on side slopes)	10.8.6.5		
G	**BIORETENTION (Structural) (F-6)**			
1.	Minimum surface area of filter met.	MDE 3.40		
2.	The contributing drainage area is less than 10 acres.	MDE 3.38		
3.	WQv and CPv are calculated per MDE Chapter 3, not per ESD Chapter 5.			
4.	If runoff is delivered by a storm drain pipe or is along the main conveyance system, the filtering practice was designed off-line with a flow splitter or other diversion.	MDE 3.38		
5.	Overflow for the 10-year storm provided to a non-erosive outlet point (e.g., prevent downstream slope erosion).	MDE 3.38		
6.	Dry or wet pretreatment equivalent to at least 25% of the computed WQv provided prior to filter media.	MDE 3.38		
7.	The entire treatment system (including pretreatment) temporarily holds at least 75% of the WQ_V as above ground storage and prior to filtration.	MDE 3.39		
8.	Direct maintenance access provided to the pretreatment area and the filter bed.	MDE 3.41		
H	**RAIN GARDEN (M-7)**			
1.	Facility is located in HSG A or B soils. If located in HSG C or D soils, or if an underdrain is required, bio-soil media is provided. See Table 10-1 for geotechnical requirements.	MDE 5.105 10.8.7.1		
2.	An underdrain is provided unless the tested infiltration rate is greater than 0.52 in/hr.			

Item #	Design Checklist Item	Reference	CONSULT	DPIE
3.	Rain gardens are placed at a relatively flat slope (< 5%) to accommodate runoff filtering through the system.	5.104 and 10.8.7.1		
4.	The facility is not located above or on a Marlboro Clay, Howell or Christiana soil.	10.8.7.1		
5.	The rain garden is located in full to partial sun, is at least 2 feet above the seasonal high ground water table, has 6-12 inches of topsoil or bio-soil media, and 3 inches of mulch.	MDE 5.105		
6.	Rain gardens in series are "scalloped" terraces and convey water in a non-erosive manner.	MDE 5.105		
7.	A minimum internal slope of one percent is maintained and a shallow berm surrounding the rain garden is provided to avoid short-circuiting.	MDE 5.105		
8.	The facility is sized to capture and store 100% of the calculated treatment volume as surface storage.	10.8.7.3		
9.	Runoff enters the rain garden at the surface by sheet flow, grass swale and/or a gravel bed. Runoff for the 1-year storm enters, flows through, and exits the facility in a non-erosive manner (less than 2 fps).	10.8.7.4		
10.	Energy dissipation provided for at downspout discharges using a plunge pool, rocks, splash blocks, stone dams, etc.	10.8.7.4		
11.	Downstream slopes are less than 15% for a distance of at least 20 feet.	10.8.7.1		
12.	All public utilities including water and sewer service connections located at least 5 feet from the edge of any rain garden.	10.8.7.4		
13.	The drainage area serving a single lot in a residential subdivision is 2,000 sf or less. The maximum drainage area to a rain garden for all other applications is 10,000 sf.	MDE 5.105		
14.	The surface area (A_F) of rain gardens is at least 2% of the contributing drainage area.	MDE 5.105		
15.	Typical section and standard specifications provided.	10.5.4.1		
16.	Landscape Plan provided and signed by Landscape Architect.	10.8.7.5		
17.	Sod is **NOT** proposed on bottom of facility. (Sod may be used on side slopes)			
I	**SWALES (M-8)**			
1.	Grass swales are located in HSG A, B, or C. Wet swales are located in HSG C or D. (Bioswales may be located in any HSG)	10.8.8.1		
2.	Drainage area does not exceed 1 acre before an inlet or outfall is provided.	5.108 10.8.8.1		
3.	The swale is designed to safely convey the 10-year, 24-hour storm at a non-erosive velocity with at least 6 inches of freeboard to edge of paving or flow line of curb.	MDE 5.109		
4.	Swale is not used to treat hotspot areas, unless lined.	MDE 5.109		
5.	The bottom width of the swale is between 2 and 8 feet, side slopes are 3:1 or flatter, and the maximum longitudinal slope is 5%.	MDE 5.109 10.8.8.1		
6.	Swale width, length, and slope noted.	MDE 5.109		
7.	A minimum of 6 inches of freeboard is provided. Freeboard for a roadside swale is measured to the edge of paving or bottom of curb.	10.8.8.3		
8.	Table summarizing required and provided ESD_V is provided.	10.5.4.1		

Item #	Design Checklist Item	Reference	CONSULT	DPIE
9.	Typical section and specifications provided.	10.5.4.1		
10.	Check dams are not provided in the public right-of-way. If check dams are provided: • A notch is provided in the weir to pass the 10-year storm. • Check dam or weir is proposed to be earth, wood, adequately sized stone, or concrete and are anchored into the swale wall. • They are spaced so the top of the ESD_V storage is no higher than the toe of the upstream weir crest. • If the drop from weir crest to the toe of check dam exceeds 12 inches, a plunge pool or other energy dissipater and/or computations are provided showing stability downstream.	10.8.8.4		
11.	Maximum velocity is 1 fps for the 1-year storm. Roughness coefficient is 0.15.			
12.	Landscape plans specify the proper grass or wetland plantings based on the design variant chosen and anticipated hydrologic conditions along the channel. Sod is not provided on swale bottom.	5.110		
13.	No trees are located in the bottom of the swale. If street trees are proposed on the side slope of the channel, they are small ornamental or flowering trees. Trees are water and drought tolerant, such as the following species: • Amelanchier arborea -Downy Serviceberry • Asimina triloba- Pawpaw • Chionanthus retusus- Chinese Fringetree • Hamamelis virginiana-Common Witch Hazel • Magnolia virginiana-Sweetbay Magnolia • Syringa reticulata-Japanese Tree Lilac If proposed trees are located within the public right-of-way, **DPW&T has approved the species** and determined whether they can be counted as street trees.			
14.	Dry (Grass) Swales: • Treated volume is computed using the 1-year flow depth times the length and width of swale. • Maximum flow depth is 4 inches. • Surface storage behind a check dam can be counted toward treated volume. • Located in A, B or C soils. • Groundwater table is at least 2 feet below the swale invert.	MDE 5.109 10.8.8.3		

Item #	Design Checklist Item	Reference	CONSULT	DPIE
15.	Bio-Swales: • Treated volume is computed using 40% voids within the bio-soil media, sand and gravel layers above the underdrain. • Surface storage behind a check dam can be counted toward treated volume. • Bio-soil media is 24″ to 48″ thick. • An underdrain is provided. • A cleanout or inlet is located every 200 feet along profile. • Do not contain an enhanced filter (M-9) below the swale. • Groundwater table is at least 2 feet below the underdrain.	10.8.8.3 MDE 5.110 10.8.8.4 10.8.8.1		
16.	Wet swales: • Treated volume is computed using the storage behind the check dams. • Are installed in areas with a high groundwater table, at or above the invert of the swale.	MDE 5.110 10.8.8.4		