



DINWIDDIE COUNTY

PLANNING, ZONING, CODE COMPLIANCE AND ENVIRONMENTAL

DRY SWALE

Plan Name: _____ Date Submitted: _____

The following checklist only identifies the information and details that must be included in the SWM plan

Level 1

Level 2

LEVEL 1 MINMUM DESIGN CRITERIA:

	SELECT
The surface area of the swale must be calculated using the following equation: Tv – the volume reduced by an upstream BMP)/Storage Depth;	
The swale must detain the treatment volume for 12 hours;	
The flow must not exceed 1.5 ft./s.;	
The side slopes must be 3:1 or flatter;	
The filter media depth must be at least 18 inches (maximum is 36 inches);	
Sub-soil testing must be provided showing the infiltration rate is > 0.5 in/hr, unless an underdrain is incorporated;	
The media mix has a phosphorus index (P-Index) between 10 and 30 or have 7-23 mg/kg of P in the soil media;	
Pre-treatment is required.	

LEVEL 2 MINMUM DESIGN CRITERIA:

	SELECT
The surface area of the swale must be calculated using the following equation: (1.1)(Tv – the volume reduced by an upstream BMP)/Storage Depth;	
The swale must detain the treatment volume for 12 hours.	
The flow must not exceed 1.5 ft./s.;	

LEVEL 2 MINMUM DESIGN CRITERIA:

	SELECT
The side slopes must be 3:1 or flatter	
The effective swale slope must be $\leq 1\%$.	
The filter media depth must be at least 24 inches (maximum is 36 inches).	
Sub-soil testing must be provided per every 200 linear feet of filter surface showing the infiltration rate is > 0.5 in/hr, unless an underdrain is incorporated;	
If an underdrain are used, they must be specified as Schedule 40 PVC with cleanouts and have a minimum 12-inch layer of stone underground storage layer.	
The media mix has a phosphorus index (P-Index) between 10 and 30 or have 7-23 mg/kg of P in the soil media.	
Pre-treatment is required.	
The facility is designed as an off-line facility or multiple treatment cells.	
The vegetation must be turf cover with trees and shrubs.	

PLAN REQUIREMENTS:

	SELECT
Provide a site map identifying pertinent information regarding the Dry Swale:	
- The contributing drainage area (CDA) boundaries, acreage, and land cover (recommended CDA slope is 1%-5%);	
- Topography of the site area including the Dry Swale, its CDA, and pre-treatment practices;	
- Provide soil infiltration test locations, including the results of the soil infiltration rate tests, if no underdrain is specified.	
Provide a plan view showing the following:	
- The locations and dimensions of the pre-treatment practices;	
- The locations of all conveyance system outfalls into the swale with pre-treatment are shown and outlet protection has been designed in accordance with the VE&SCH;	
- The location of the check dam(s) is shown;	
- Adequate maintenance access to the facility is provided.	

PLAN REQUIREMENTS:

	SELECT
<ul style="list-style-type: none"> - The layout and dimensions of the Dry Swale(s) <ul style="list-style-type: none"> a) A parabolic cross-sectional shape is used for hydraulic maintenance and aesthetic purposes; a trapezoidal shape is only used as long as the soil filter bed boundaries lay in the flat bottom of the swale (if applicable); b) The Dry Swale(s) have a bottom width of from 4 to 8 feet to provide adequate filtering area; if the swale will be wider than 8 feet, the designer will incorporate berms, check dams, level spreaders or multi-level cross-sections to prevent braiding and erosion of the swale bottom; c) The top of bank and basin bottom elevations are shown; d) The elevations of treatment volume and maximum design water surface elevations for all appropriate design storms and safety storms are shown; e) The location of the observation well(s) is shown. 	
Provide profiles, section views, and details showing the following:	
- Provide detail of appropriate pre-treatment	
- The elevations of treatment volume and maximum design water surface elevations for all appropriate design storms and safety storms;	
- The maximum ponding depth at the downstream point, displaying adequate freeboard;	
- The longitudinal slope;	
- Swale bank elevations;	
- Locations and design of underdrains (if applicable);	
- Observation wells;	
- Filter media;	
- Filter fabric;	
- Topsoil;	
- Surface Cover;	
- Check dams.	

COMPUTATIONS:

	SELECT
Provide appropriate hydraulic design computations.	
- The treatment volume will be completely filtered within a maximum of 6 hours following a storm.	

COMPUTATIONS:

	SELECT
- 3 – 5 feet of hydraulic head are provided.	
- The swale is designed with enough capacity to: <ul style="list-style-type: none"> a) Convey the runoff from the 2-year and 10-year design storms at non-erosive velocities. b) Contain the 10-year flow within the banks of the swale with a minimum of 3 inches of freeboard. 	
- The bottom width and slope are designed so that the velocity from a 1-inch rainfall will not exceed 1.5 ft./sec.	
- Hydrologic analysis must be based on a 24-hour storm event using site specific rainfall precipitation frequency data recommended by the U.S. National Oceanic and Atmospheric Administration (NOAA) Atlas 14	
- The U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) synthetic 24-hour rainfall distribution and models, including but not limited to TR-55 and TR-20; hydrologic and hydraulic methods developed by the U.S. Army Corps of Engineers; or other standard hydrologic and hydraulic methods must be used to conduct the analyses necessary to demonstrate compliance with the stormwater quality and quantity requirements	
- The Rational Method may be used for evaluating the peak discharge.	
- The Modified Rational Method may be used for evaluating volumetric flows to stormwater conveyances.	
- Provide pre- and post-development hydrologic and hydraulic information for the 1- year, 2- year, and 10- year, 24-hour storms, as needed.	
- Provide the complete input used for the hydrograph generation on the plans.	
- Provide a stage/storage table.	
- Provide a stage/discharge for each component of the outlet structure.	
- Provide a composite stage/discharge table.	
- Provide an outlet control analysis.	
- Provide receiving conveyance system channel protection and flood protection calculations carried to the appropriate limits of analysis.	

CHECK DAMS:

	SELECT
Check dams, if used, meet the following design criteria: The items checked below have not been properly addressed:	
- Check dams are composed of permanent, non-erodible material or should be configured with elevated driveway culverts; creosote treated materials and stone check dams are unacceptable.	
- Check dams must be firmly anchored into the side slopes and channel bottom.	
- The maximum check dam height is 12 inches or 18 inches with additional design elements to ensure stability of the check dam for challenging sites.	
- Armoring is provided, if necessary, at the downstream toe of the check dam.	
- Check dams are designed with a center weir sized to pass the channel design peak flow (10-year storm event for man-made channels).	
- The average ponding depth throughout the channel is 12 inches and must not exceed 18 inches.	
- The ponded water at a downstream check dam does not touch the toe of the upstream check dam.	
- Each check dam must have water quality perforations designed to provide a detention time of 12 hours with wire mesh and stone placed in front of the water quality perforations.	

LANDSCAPING:

	SELECT
Provide a landscape plan that specifies the following:	
- The landscaping plan must indicate the methods to be used to establish and promote long term vegetative cover in the SWM facility and its buffer area.	
- SWM facilities that are visible from the right-of-way must be effectively screened from the public right-of-way or less intense uses of adjacent properties. Examples of acceptable screening include fencing, landscaping, or a combination of these features.	

MAINTENANCE:

	SELECT
Provide a summary of the long term maintenance requirements for the SWM facility on the SWM plan.	
SWM facilities that are visible from the right-of-way must be effectively screened from the public right-of-way or less intense uses of adjacent properties. Examples of acceptable screening include fencing, landscaping, or a combination of these features.	

CONSTRUCTION:

	SELECT
The sequence of construction must address the SWM facility installation and appropriate inspections, including: initial site preparation, excavation/grading, and installation of the embankment, principal outlet structure, and emergency spillway. We recommend the County staff be involved in these inspections..	
The sequence of construction must clearly state that a construction record drawing and certification that the stormwater management facility has been constructed in accordance with the approved plan must be submitted to the County and approved prior to Environmental Compliance Bond (ECB) release.	

Engineer Signature: _____ Date: _____