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6-1800 PLATES

STANDARD DESIGNATION	PLATE NO.	DESCRIPTION	SECTION
N/A	1-6 (1M-6)	Small Private Drainage System	6-0204
N/A	2-6 (2M-6)	Water Quality Storage Requirements Related to Percent Imperviousness and Rational Formula "C" Factor	6-0402
N/A	3-6 (3M-6)	Intensity Duration Frequency Curves	6-0803
N/A	4-6 (4M-6)	Time of Concentration of Small Drainage Basins	6-0803
N/A	5-6 (5M-6)	Velocity and Flow Time in Gutter	6-0803
N/A	6-6 (6M-6)	Flood Frequency Curves for Selected Degrees of Basin Imperviousness	6-0804
N/A	7-6 (7M-6)	Lag Time as a Function of Length-Slope Index	6-0804
N/A	8-6 (8M-6)	Nomograph for Computing Required Size of Circular Drain, Flowing Full	6-0902
CTY-1	9-6 (9M-6)	Standard Reinforced Concrete Prefabricated "T" or "Y" Connection	6-0902
CB-1	10-6 (10M-6)	Standard Reinforced Concrete Prefabricated Bend	6-0902
DPW-26	11-6 (11M-6)	Concrete Pier for Storm Sewer Pipe	6-0902
N/A	12-6 (12M-6)	Closed Conduit	6-0904
N/A	13-6 (13M-6)	Energy Losses at Storm Sewer Junctions	6-0904
N/A	14-6 (14M-6)	Energy Losses at Storm Sewer Junctions	6-0904
N/A	15-6 (15M-6)	Closed Conduit Junction	6-0904

STANDARD DESIGNATION	PLATE NO.	DESCRIPTION	SECTION
RC-1	16-6 (16M-6)	Minimum Radius of Curvature for Concrete Pipe-line	6-0906
RC-2	17-6 (17M-6)	Minimum Radius of Curvature for Concrete Pipe-line – Beveled Pipe	6-0906
RC-2A	18-6 (18M-6)	Minimum Radius of Curvature for Concrete Pipe-line – Beveled Pipe	6-0906
PD-A, B, C, D	19-6 (19M-6)	Paved Ditches Type A, B, C, and D	6-1002
TR-1	20-6 (20M-6)	Transition – Paved or Sodded Ditch to Yard Inlet	6-1002
GB-1	21-6 (21M-6)	Gabions – Typical Section Open Channel	6-1002
GB-2	22-6 (22M-6)	Gabions – Typical Section Revetment with Toe Wall	6-1002
GB-3	23-6 (23M-6)	Gabions – Typical Section Weir	6-1002
N/A	24-6 (24M-6)	Open Channel	6-1007
N/A	25-6 (25M-6)	Energy Loss Coefficients for Curved Channels	6-1007
N/A	26-6 (26M-6)	Open Channel Transition and/or Horizontal Curve	6-1007
N/A	27-6 (27M-6)	Manning n for Vegetal-Lined Channels (Deleted by 61-98-PFM)	
N/A	28-6 (28M-6)	Curb Inlet Design Chart – Curb Inlets on Grade	6-1102
N/A	29-6 (29M-6)	Curb Inlet Design Chart – Curb Inlets on Grade	6-1102
N/A	30-6 (30M-6)	Spread and Depth of Gutter Flow vs. Cross Slope	6-1102
N/A	31-6 (31M-6)	Capacity of Curb Inlets and Yard Inlets at Low Point in Grade	6-1102
YI-1	32-6 (32M-6)	Standard Yard Inlet	6-1103
YI-1	33-6 (33M-6)	Typical Concrete Apron for Yard Inlets	6-1103
MH-1	34-6 (34M-6)	Standard Manhole Cover and Frame for Use in Easements Outside of VDOT Right-of-Way	6-1104
N/A	35-6 (35M-6)	Hydraulic Capacity of Grate Inlets on Grades	6-1105
N/A	36-6 (36M-6)	Hydraulic Capacity of Grate Inlet in Sump	6-1105
N/A	37-6 (37M-6)	Rooftop Stormwater Detention	6-1302
N/A	38-6 (38M-6)	Typical Rainfall Ponding Ring Sections	6-1302
N/A	39-6 (39M-6)	Mass Diagram	6-1303.6A(3)
N/A	40-6 (40M-6)	Unit Inflow Hydrograph – 10-Year – 2-Hour Storm – 1 Impervious Acre	6-1303.7B
N/A	41-6 (41M-6)	Unit Hydrograph per Impervious Acre 100-Year Frequency Storm (85-04-PFM)	6-1303.7B
N/A	41A-6 (41AM-6)	Percolation Trench	6-1303.4B
SW-1	41B-6 (41BM-6)	Notice of Location of Stormwater Facility	6-1305.7F
N/A	42-6 (42M-6)	Unit Flow Hydrograph – 2-Year – 2-Hour Storm	6-1305
N/A	43-6 (43M-6)	Discharge – 15" (375mm) Culvert	6-1305
N/A	44-6 (44M-6)	Inflow Hydrograph – 10-Year – 2-Hour Storm – 5-Minute Time of Concentration	6-1305
N/A	45-6 (45M-6)	Floodplain	6-1403
N/A	46-6 (46M-6)	24-Hour Design Storm Chart for Spillway Design Flood (SDF) (84-04-PFM)	6-1603
N/A	47-6 (47M-6)	County 100-Year, 24-Hour Rainfall Distribution	6-1603
N/A	48-6 (48M-6)	100-Year, 24-Hour Rainfall Distribution (Hyeto-graph)	6-1603
N/A	49-6 (49M-6)	Typical Wet (Retention) Pond Layout Showing Key	6-1604

STANDARD DESIGNATION	PLATE NO.	DESCRIPTION	SECTION
		Elements	
N/A	50-6 (50M-6)	Typical Dry or Extended Dry (Detention) Pond Layout Key Elements	6-1604
N/A	51-6 (51M-6)	Typical Sections at Stormwater Management Facilities	6-1604
N/A	52-6 (52M-6)	Permissible Velocities for Vegetated Emergency Spillways	6-1604
N/A	53-6 (53M-6)	Schematic Detail of Pre-Cast Circular Riser and Trash Rack for Use with Dry or Extended Dry Detention Ponds	6-1604
N/A	54-6 (54M-6)	Schematic Detail of Standard Cast in Place Rectangular Riser and Trash Rack for Use with Wet or Dry Ponds	6-1604
N/A	55-6 (55M-6)	SCS Standard 2-Way Covered Riser for Use with Wet or Dry Ponds	6-1604
N/A	56-6 (56M-6)	Typical Wet (Retention) Pond Layout when Using Roadway Embankments as Dams	6-1604
N/A	57-6 (57M-6)	Typical Dry or Extended Dry (Detention) Pond Layout when Using Roadway Embankments as Dams	6-1604
N/A	58-6 (58M-6)	Riprap Size for Use Downstream of Energy Dissipators	6-1604
N/A	59-6 (59M-6)	Riprap Placement for Outlet Protection Below Culverts	6-1604
N/A	60-6 (60M-6)	Riprap Basin	6-1604
N/A	61-6 (61M-6)	BMP Extended Drawdown Device (Example Detail)	6-1604
N/A	62-6 (62M-6)	Example Low Level Drain for a Wet Pond –Sluice Gate Nomenclature	6-1604
N/A	63-6 (63M-6)	Trickle Ditch Detail	6-1604
N/A	64-6 (64M-6)	Minimum Geotechnical Design Standards for Small Dams	6-1605
N/A	65-6 (65M-6)	Typical Embankment Dam Sections (See continuation on Plate 66-6 (66M-6))	6-1605
N/A	66-6 (66M-6)	Typical Embankment Dam Sections (Continued from Plate 65-6 (65M-6))	6-1605
N/A	67-6 (67M-6)	Standard Concrete Cradle Details for Circular Conduits Extending Through Dam Embankments	6-1605
N/A	68-6 (68M-6)	Suggested Minimum & Maximum Core Sizes for Small Dams with Zoned Embankments	6-1605
N/A	69-6 (69M-6)	Recommended Side Slopes for Small Dams on Stable Foundations	6-1605
N/A	70-6 (70M-6)	Standard Maintenance Access Road Details for Stormwater Management Ponds	6-1606
N/A	71-6 (71M-6)	Standard Access Road Gate Design	6-1606
N/A	71A-6 (71AM-6)	Standard Access Road Gate Design	6-1606
N/A	72-6 (72M-6)	Modified Yard Inlet (Single Throat)	6-1103.4
N/A	73-6 (73M-6)	Top Detail Modified Yard Inlet (Single Throat)	6-1103.4
N/A	74-6 (74M-6)	Modified Yard Inlet (Double Throat)	6-1103.4

STANDARD DESIGNATION	PLATE NO.	DESCRIPTION	SECTION
N/A	75-6 (75M-6)	Top Detail Modified Yard Inlet (Double Throat)	6-1103.4
N/A	76-6 (76M-6)	Permissible Shear Stress Cohesive Soils	6-0203.5
N/A	77-6 (77M-6)	Permissible Shear Stress Non-cohesive Soils	6-0203.5

6-1900 TABLES

STANDARD DESIGNATION	TABLE NO.	DESCRIPTION	SECTION
N/A	6.1	Hydrology – Small Private Drainage System	6-0204
N/A	6.2	Hydraulics – Small Private Drainage System	6-0204
N/A	6.3	Phosphorus Removal Efficiencies	6-0402
N/A	6.5	Acceptable Hydrologies – Applications	6-0801
N/A	6.6	Runoff Coefficients and Inlet Times	6-0805
N/A	6.7	Incremental Unit Hydrograph Intensities – Inches/Hour	6-0806
N/A	6.8	Minimum Easement Widths/Pipe Size	6-0902
N/A	6.9	Pipe and Culvert Materials – Roughness Coefficients	6-0903
RC-1	6.10	Radius of Curvature for Straight Deflected Pipe Length of 4' (1.2m)	6-0906
RC-1	6.11	Radius of Curvature for Straight Deflected Pipe Length of 6' (1.8m)	6-0906
RC-1	6.12	Radius of Curvature for Straight Deflected Pipe Length of 7 ½' (2.3m)	6-0906
RC-1	6.13	Radius of Curvature for Straight Deflected Pipe Length of 8' (2.4m)	6-0906
RC-1	6.14	Radius of Curvature for Straight Deflected Pipe Length of 10' (3m)	6-0906
RC-1	6.15	Radius of Curvature for Straight Deflected Pipe Length of 12' (3.6m)	6-0906
RC-1	6.16	Radius of Curvature for Straight Deflected Pipe Length of 16' (4.8m)	6-0906
N/A	6.16A	Minimum Easement Widths – Channels	6-1005.2E
N/A	6.17	Channel Materials – "n"	6-1006
N/A	6.18	Time of Concentration to Use – Paved Ditch	6-1010
N/A	6.22	Rainfall Distribution	6-1302.11
N/A	6.23	Storm Volume in Inches of Rainfall	6-1302
N/A	6.24	Mass Diagram Analysis	6-1303
N/A	6.25	2-Year Storm Routing	6-1305
N/A	6.26	10-Year Storm Routing	6-1305
N/A	6.27	General Ratings for Dams, Embankments and Reservoirs	6-1605

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6-0000 STORM DRAINAGE

6-0100 GENERAL INFORMATION

6-0101 Drainage Systems

6-0101.1 It is the intent of § 6-0000 et seq. to require that public facilities meet or exceed applicable drainage laws.

6-0101.2 The overall drainage system is divided into 2 parts, the minor system and the major system.

6-0101.2A The minor drainage system (normally designed for the 10-yr storm) consists of storm sewer appurtenances and conduits such as inlets, manholes, street gutters, roadside ditches, swales, small underground pipe and small channels which collect the stormwater runoff and transport it to the major system.

6-0101.2B The major system (designed for the less frequent storm up to the 100-yr level) consists of natural waterways, large man-made conduits, and large water impoundments. In addition, the major system includes some less obvious drainageways such as overland relief swales and infrequent temporary ponding at storm sewer appurtenances. The major system includes not only the trunk line system which receives the water from the minor system, but also the natural backup system which functions in case of overflow from or failure of the minor system. Overland relief must not flood or damage houses, buildings or other structures on the development site.

6-0101.3 Special attention is invited to:

6-0101.3A The current Virginia E&S Control Handbook and the Virginia Stormwater Management Handbook Volumes I & II. These handbooks address State criteria for stormwater management to be applied to control flooding and erosion.

6-0101.3B Planning Bulletin 319, "BMPs for Hydrologic Modifications," published by DEQ. The bulletin is a guide to be used whenever modifications to flowing streams are proposed.

6-0101.3C Engineering Properties of Fairfax County Soils, published by Fairfax County Department of Public Works and Environmental Services.

6-0101.3D Copies of the handbooks, the bulletin and the soils document are available for viewing at the Department of Public Works and Environmental Services.

6-0102 VDOT Requirements. See § 1-0602 et seq. regarding VDOT Standards.

6-0103 Metric Requirements. Until hydraulic and hydrologic design aids are available in metric units, design computations may continue to be performed in English units with the description of proposed structures converted to metric after computations are complete.

6-0200 POLICY AND REQUIREMENTS FOR ADEQUATE DRAINAGE

6-0201 Policy of Adequate Drainage

6-0201.1 In order to protect and conserve the land and water resources of this County for the use and benefit of the public, measures for the adequate drainage of surface waters shall be taken and facilities provided in connection with all land development activities. (See also § 2-602 of the Zoning Ordinance).

6-0201.2 Adequate drainage of surface waters means the effective conveyance of storm and other surface waters through and from the development site and the discharge of such waters into a natural watercourse, i.e., a stream with a definedchannel(bed and banks), or man-made drainage facility of sufficient capacity without adverse impact upon the land over which the waters are conveyed or upon the watercourse or facility into which such waters are discharged.

6-0201.3 The provision of the necessary onsite and offsite easements to accomplish this also shall be required. These are to include sufficient easement extensions to property lines to permit future development reasonable access to drainageways or drainage facilities for connections.

6-0202 Minimum Requirements

6-0202.1 Determination of the size and capacity of the drainage system shall be based on the planned

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development, existing zoning or existing development, whichever is greater, within the watershed.

6-0202.2 The drainage system shall be designed:

6-0202.2A To honor natural drainage divides.

6-0202.2B To account for both off-site and on-site surface waters.

6-0202.2C To convey such waters to a natural water course at the natural elevation, or an existing storm drainage facility.

6-0202.2D To discharge the surface waters into a natural watercourse or into an existing or proposed man-made drainage facility of adequate capacity except as may be provided for in § 6-0203.

6-0202.3 Concentrated stormwater runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe or storm sewer system or the developer must provide a drainage system satisfactory to the Director to preclude an adverse impact (e.g. erosion, sedimentation, yard flooding, inadequate overland relief) on downstream properties and receiving channels in accordance with § 6-0203.

6-0202.4 Stormwater runoff leaving a development site shall not aggravate or create a condition where an existing dwelling or a building constructed under an approved building permit floods from storms less than or equal to the 100-year storm event. If such a dwelling or building exists, detention for the 100-year storm event shall be provided in accordance with § 6-0203.5.

6-0202.5 Concentrated surface waters shall not be discharged on adjoining property, unless an easement expressly authorizing such discharge has been granted by the owner of the affected land or unless the discharge is into a natural watercourse, or other appropriate discharge point as set forth above.

6-0202.6 The owner or developer may continue to discharge stormwater which has not been concentrated into a lower lying property if:

6-0202.6A The peak rate after development does not exceed the predevelopment peak rate; or

6-0202.6B The increase in peak rate and volume caused by the development will not have an adverse impact (e.g. soil erosion, sedimentation, duration of ponding water, inadequate overland relief) on the lower lying property as determined by the Director; and

6-0202.6C The new development will not aggravate any existing drainage problem on the downstream property.

6-0202.7 Increases in peak rates or volumes of sheet flow that may cause an adverse impact on lower lying properties shall be discharged into an adequate drainage system or the developer shall provide a drainage system satisfactory to the Director to preclude an adverse impact upon the adjacent or downstream property.

6-0202.8 (31-90-PFM) Drainage structures shall be constructed in such a manner that they may be maintained at a reasonable cost. To facilitate design, construction, and maintenance, drainage facilities shall meet and conform, insofar as practical, to County and VDOT standards. However, small private drainage systems may be acceptable (See § 6-0204) for solving existing drainage problems that may develop during the course of construction of a new development or for implementation by property owners in existing developments. See § 6-0205 and Plate 1-6 (1M-6) for construction details and example.

6-0202.9 If off-site downstream construction and easements are necessary, no plans shall be approved until such storm drainage easements have been obtained and recorded. If the downstream owner or owners refuse to give or to sell such easements, the owner or developer may request condemnation of the easements by the County at the developer's cost.

6-0202.10 Storm sewers shall be discharged into the area least likely to erode.

6-0202.10A Generally, it is better to discharge at the floodplain limit into an adequate watercourse

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Deleted: 6-0202.4 The drainage system shall be designed such that properties over which the surface waters are conveyed, from the development site to discharge point(s), are not adversely affected.

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channel leading to the main streambed, rather than disturb the floodplain by extending the storm sewer.

6-0202.10B If an adequate watercourse channel does not exist, the only alternative is to discharge into the main streambed.

6-0202.10C In either case, energy dissipation devices are required.

6-0202.11 The requirements of Chapter 104, (Erosion and Sedimentation Control) of the Code, and the further requirements for protection of streambeds by detention-retention of surface waters, set forth in § 6-0000 et seq. must be satisfied. Additionally, BMP requirements to protect water quality must be met, if applicable (§ 6-0400 et seq.).

6-0202.12 All drainageways, including overland relief pathways, must be separated from buildings. (See § 6-1500).

6-0202.13 (27-89-PFM) Consideration must be given in the preparation of the plans to preclude adverse impacts due to higher rates and volumes of flow that will occur during construction. Special consideration shall be given to the design of sediment traps which discharge into existing residential yards. In this case, in order to reduce concentrated flows and simulate existing sheet flow conditions, the 10-yr peak discharge shall be designed to be not greater than 0.5 CFS (0.014 CMS) using a minimum runoff C factor of 0.6 for all areas to be disturbed.

6-0202.14 In those cases in which the drainage plans of a proposed development do not satisfy these minimum requirements because necessary off-site facilities or improvements are lacking, the developer shall delay development until the necessary off-site facilities or improvements are constructed or other arrangements, satisfactory to the Director, are made.

6-0203 Analysis of Downstream Drainage System

6-0203.1 The downstream system shall be analyzed to determine the adequacy of the system (§ 6-0203.3), or it shall be shown that there is no adverse impact to the downstream system and an incremental improvement of the existing conditions (§ 6-0203.4 and § 6-0203.5)

6-0203.2 The extent of the review of the downstream drainage system shall be:

6-0203.2A To a point that is at least 150 ft (46 meters) downstream of a point where the receiving pipe or channel is joined by another that has a drainage area that is at least 90% of the size of the first drainage area at the point of confluence; or

6-0203.2B To a point at which the total drainage area is at least 100 times greater than the contributing drainage area of the development site; or

6-0203.2C To a point that is at least 150 ft (46 meters) downstream of a point where the drainage area is 360 acres (1.46 km^2) or greater.

6-0203.2D When using §§ 6-0203.2A and 6-0203.2C for the extent of review, the analysis must be to a point where all the cross-sections are adequate in the most downstream reach of 150 feet. A minimum of three cross-sections shall be provided in the 150-foot reach. If the detention method described in §6-0203.4C is used, the three cross-sections in the most downstream reach of 150 feet shall be limited to showing a defined channel or a man-made drainage facility and checking for flooding as described in § 6-0203.4C(3) and § 6-0203.5.

6-0203.2E The Director may require further downstream analysis when the submitted narrative described in § 6-0204 and all related plats and plans are insufficient to show the true impact of the development on surrounding and other lower lying properties, or if there are known drainage problems downstream.

6-0203.2F Cross-section selection and information shall be determined in accordance with Chapter 5 of the latest edition of the Virginia Erosion and Sediment Control Handbook (Virginia Department of Conservation and Recreation) under the section titled "Determination of Adequate Channel." Cross-sections shall be shown on the plans with equal horizontal and vertical scales.

6-0203.2G If the downstream owner(s) refuse to give permission to access the property for the collection of data, the developer shall provide evidence of this refusal and make arrangements satisfactory to the Director to complete the outfall analysis.

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6-0202.15B Alternatively, the developer may choose to supply the off-site facilities that are necessary for adequate drainage.¶

6-0203.3 Adequacy of all natural watercourses, channels and pipes shall be verified as follows:

6-0203.3A The developer shall demonstrate that the total drainage area to the point of analysis within the channel is 100 times greater than the contributing drainage area of the project site; or

6-0203.3B(1) Natural watercourses shall be analyzed by the use of a 2-year frequency storm to verify that stormwater will not overtop channel banks nor cause erosion of channel bed or banks;

6-0203.3B(2) All previously constructed man-made channels shall be analyzed by the use of a 10-year frequency storm to verify that stormwater will not overtop its banks and by the use of a 2-year frequency storm to demonstrate that stormwater will not cause erosion of channel bed or banks;

6-0203.3B(3) Pipes, storm sewer systems and culverts, which are not maintained by VDOT, shall be analyzed by the use of a 10-year frequency storm to verify that stormwater will be contained within the pipe or system; and

6-0203.3B(4) Culverts and storm sewer systems, which are maintained by VDOT, shall be analyzed by the use of the 10-year or greater frequency storm in accordance with VDOT requirements.

6-0203.3C Determinations of the adequacy of drainage systems shall be performed in accordance with methods contained in Chapter 5 of the latest edition of the Virginia Erosion and Sediment Control Handbook (Virginia Department of Conservation and Recreation) under the section titled "Determination of Adequate Channel."

6-0203.3D If the developer chooses to install a storm drainage system, the system shall be designed in accordance with established, applicable criteria for such systems.

6-0203.4 Incremental improvement and no adverse impact of the downstream drainage system shall be shown by one of the following methods:

6-0203.4A Critical Shear Stress Method

6-0203.4A(1) If the outfall is inadequate due to erosive velocities along the extent of review, which is described in § 6-0203.2, the critical shear stress method may be used to show no adverse impact due to erosive velocities. The erosive work on the channel for the post-development conditions shall be reduced to a level below the erosive work on the channel under pre-development conditions by the required incremental improvement. The required incremental improvement of the downstream system at each inadequate cross-section is the ratio of the post-development CA (see § 6-0803 for a description of CA) for the contributing drainage area of the site to the existing development CA for the entire drainage area at that cross-section. The required incremental improvement is computed as follows:

$$P_i = [C_d A_d / C_{cs} A_{cs}] \times 100 \text{ where,}$$

P_i = Required Incremental Improvement (%)
C_d = Runoff Coefficient for the Contributing Drainage Area of the Site in a Post-development Condition
A_d = Contributing Drainage Area of the Site
C_{cs} = Runoff Coefficient for the Contributing Drainage Area to the Cross-section in a Existing Development Condition
A_{cs} = Contributing Drainage Area to the Cross-section

Each inadequate cross-section along the extent of review shall then be analyzed for the following:

6-0203.4A(2) The shear stress for both the predevelopment condition and the post-development condition for the 2-year storm shall be plotted in relation to time at each cross-section. On each graph, the permissible shear stress also shall be plotted. The permissible shear stress is based on the soil type, and may be determined for cohesive soils from Plate 76-6 (Plate 76M-6) and for non-cohesive soils from Plate 77-6 (Plate 77-M-6). The soil type may be determined by field test or the soil type designated on the County soils maps may be used. If the soil type is designated using the County soils maps, the most conservative permissible shear stress for the soil type shall be used. The plans shall indicate how the soil type was determined. The area between the permissible shear stress and the actual shear stress on the graph is erosive work on the channel. The erosive work for the post-development condition shall be less than the erosive work for predevelopment condition by a percentage equal to the required incremental improvement.

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The shear stress on the channel can be calculated using the following formula:

$\tau = \gamma RS$ where,

τ = shear stress in lb/sq.ft. (N/m^2)
γ = unit weight of water is 62.4 lb/ft^3 (9810 N/m^3)
R = hydraulic radius in ft (m)
S = slope of the channel bed

6-0203.4B Channel Capacity Method

6-0203.4B(1) If the outfall is inadequate due to inadequate capacity along the extent of review, which is described in § 6-0203.2, the channel capacity method may be used to show no adverse impact due to overtopping. The largest storm that does not exceed the actual channel, pipe, or culvert capacity under pre-development conditions shall be determined for the cross-section that is most frequently over its capacity. The post-development peak flows for the above storm and the 2-year and 10-year storms shall be reduced to a level below the pre-development conditions by a percent equal to the required incremental improvement. See § 6-0203.4A(1) for a description of the required incremental improvement.

6-0203.4C Detention Method [1]

6-0203.4C(1) It shall be presumed that no adverse impact and an incremental improvement will occur if on-site detention is provided as follows and the outfall is discharging into a defined channel or man-made drainage facility:

6-0203.4C(1)(i) Extended detention of the 1-year storm volume for a minimum of 24 hours. If extended detention of the BMP volume also is provided, the 24 hours shall be applied to the difference between the 1-year storm volume and the BMP volume; and

[1] Because of the long detention times resulting from this method, consideration shall be given to the hydrology, soils and extended detention when choosing the appropriate landscaping.

6-0203.4C(1)(ii) In order to compensate for the increase in runoff volume, the 2-year and 10-year post-development peak rates of runoff from the development site shall be reduced below the respective peak rates of runoff for the site in good forested condition. This reduction results in an incremental improvement and is computed as follows:

$R_i = [1 - (V_f / V_d)] \times 100$ where,

R_i = Reduction of Peak Flow Below a Good Forested Condition (%)
V_f = Runoff Volume from the Site in a Good Forested Condition
V_d = Runoff Volume from the Site in a Post-Developed Condition

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The calculation of the cumulative volumes shall be based on the NRCS (formerly SCS) methodology described in § 6-0802 or other methods as approved by the Director.

6-0203.4C(1)(iii) Computations demonstrating the 1½-year post-development peak rate of runoff from the development site does not exceed the 1½-year peak rate of runoff for the site in good forested condition are optional. The 1½- year storm is used to obtain Leadership in Energy and Environmental Design (LEED) certification.

6-0203.4C(2) If this method is used, each outfall from the site shall be analyzed independently and the allowable release rate shall be based on the area of the site that drains to the outfall under predevelopment conditions.

6-0203.4C(3) If this method is used, the downstream review analysis shall be limited to providing cross-sections to show a defined channel or man-made drainage facility, and checking for flooding of existing dwellings or buildings constructed under an approved building permit from the 100-year storm event for the extent of review described in § 6-0203.2A, B , C and D.

6-0203.4D Other scientifically valid methods, which show no adverse impact regarding erosion or capacity for an inadequate outfall and show incremental improvement, may be approved by the Director.

6-0203.5 In accordance with § 6-0202.4, if an existing dwelling or a building constructed under an approved building permit, which is located within the extent of review described in § 6-0203.2, is flooded by the 100-year storm, the peak flow of the 100-year storm at the development site shall be reduced to a level below the pre-development condition by a percent equal to the required incremental improvement. See § 6-0203.4A(1) for a description of the required incremental improvement.

6-0204 Submission of Narrative Description

6-0204.1 In addition to plats, plans, and other documents that may be required, a description of each outfall of the storm drainage system from the development site shall be submitted as part of the relevant subdivision construction plan or site plan and shall include the following:

6-0204.1A The additional submission shall include a narrative and sketches describing the major elements (pipe, channel, natural watercourse stream, etc.) of each outfall drainage system, including discharges of non-concentrated surface waters from the development site. Photographs may also be included to assist in the description of the outfall.

6-0204.1B The downstream review, divided into reaches, shall note the existing surrounding topography, soil types, embankments, vegetation, structures, abutting properties, etc., which may be impacted by drainage and shall conclude with a written opinion, signed and sealed by the designer as to the adequacy of the downstream system(s) or that the development will not cause an adverse impact to the receiving system and will provide an incremental improvement, and that there is no flooding of existing dwellings or buildings constructed under an approved building permit by the 100-year storm event or that the existing flooding condition is not aggravated. If any portion of the outfall drainage system is a natural watercourse, then the designer shall also certify that the cross-sections analyzed and included on the plan are representative of stream reaches for the entire extent of review for the natural watercourse portion of the system. Based on the applied method of analysis, the submission shall include cross-sections, associated graphs, and computations to show that either the adequacy or the no adverse impact with incremental improvement requirements of §§ 6-0202.3 and 6-202.4 have been met.

6-0205 Small Private Drainage System (See Plate 1-6 (1M-6)) (31-90-PFM)

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6-0203.2 . Where erosion is an issue, the critical storm return period referred to in § 6-0203.1B normally would be the 2-yr storm.

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¶
6-0203.4 . Where house flooding is involved, the critical storm return period normally would be the storm that begins to flood the structure up through the 100-yr flooding event.¶
¶
6-0203.5 Where open streams are involved, the designer must assess the stream adequacy to receive the 2-yr runoff without causing erosion or overbank flooding using the methodology as outlined in the current edition of the Virginia E&S Control Handbook.¶

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¶
6-0203.6A To the point at which an adequate channel[1] is found; or¶

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[1]An adequate channel shall be defined as a natural or man-made channel or pipe which is capable of conveying the runoff from a 2-yr storm without overtopping its banks or eroding after development of the site in question, or without causing the flooding of structures from the 100-yr storm event.

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6-0203.6B To the point at which the total drainage area is at least 100 times greater than the area of the development site in question; or

6-0203.6C To the limit of the nearest 100-yr floodplain, as adopted by the Board, which has a contributing area of 1 mi.² (2.59 km²) or more.

6-0203.7 The Director may require further downstream analysis when the submitted narrative and all related plats and plans are insufficient to show the true impact of the development on surrounding and other lower lying properties.

6-0203.8 The narrative description may be omitted when the storm sewer discharge is into a pipe or other drainage system meeting current design standards and the peak rates of non-concentrated flows onto adjoining properties are not increased by the development.