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SECTION 700

ENVIRONMENTAL SYSTEMS

STORM DRAINAGE, GRADING, STORM WATER MANAGEMENT, FLOODPLAINS, EROSION AND SEDIMENT CONTROL

701.00 STORM DRAINAGE SYSTEMS - POLICY:

701.01 Adequate Storm Drainage Design in General:

A. Adequate drainage must have the hydraulic characteristics to accommodate the expected flow of storm waters from a given watershed, or portion thereof, for a specified duration and intensity of rainfall.

B. The size and capacity of an adequate drainage system shall be determined in accordance with the densities and intensities reflected in the Long Range Future Land Use Plan, the existing zoning, or development in the watershed or affected portions thereof, whichever is greater.

C. Adequate drainage systems shall be designed in accordance with the following:

1. To accommodate storm water runoff resulting from the ultimate development of the drainage area, unless existing SWM facilities already provided or SWM facilities bonded for construction will provide the required controls. In such cases, the design outflow rates from these facilities shall be considered in the design of the drainage system.

2. To honor major natural drainage divides.

3. To account for both offsite and onsite peak and base flows.

4. To convey surface and subsurface (seeps, springs, etc.) waters to a stream, water channel, natural drainageway, or existing facility.

5. To discharge surface and subsurface waters to a natural drainageway by tying into the drainageway at natural elevations or by discharging the storm water into an existing facility of sufficient capacity to receive the same.

D. Drainage structures shall be constructed in such a manner that they can be maintained at reasonable cost. To facilitate design, construction and maintenance, said drainage structures shall meet or conform to County or VDOT standards.

E. State law requires that properties and waterways downstream from new development sites be protected from erosion due to increases in the volume, velocity, and peak flow rate of storm

water runoff. To satisfy these requirements, the criteria for discharges into adequate or inadequate receiving channels shall apply.

F. The engineer shall use the following procedure to establish the adequacy of receiving channels based on a personal visit by the design engineer. All plan submissions must contain supporting computations as justification for the conclusions contained in the outfall narrative. For consistency, the following items are to be included:

1. Site-specific narrative with a description of the elements of the storm drainage system and adjoining properties.

2. Outfall location(s) map with the contributing drainage areas for each outfall and detailed hydrologic and hydraulic calculations. Digital pictures of the outfall shall be included.

3. A profile for each outfall channel.

4. Two field-run cross-sections, at a minimum, at each critical location to verify the outfall adequacy. Cross-sections shall be based on a 2-foot field run contour interval and additional spot elevations in the vicinity. The cross-sections shall have the same vertical and horizontal scales and should identify the top of banks for the stream channel. If the top of the banks do not appear to be obvious, the banks should correspond to the corresponding stream cross sectional area for a 2-year undeveloped peak discharge based on hydrologic analysis.

Description of the outfall channel and permissible velocity. The Manning's roughness coefficient shall be supported by soil classification, cover material and/or channel lining. The description of physical characteristics shall include the amount of stream meandering, material classification of stream and its banks, vegetation, obstruction to flow, variations in cross sections and surface irregularity.

5. Design velocities shall be compared with the permissible velocities of the existing channel as given in the State's E&S Handbook. If the protection measures are provided, necessary design details shall be shown and supported by calculations.

6. Drainage easement when channel improvements are proposed.

701.02 Discharge into an Adequate Channel: To satisfy the requirements in Section 701.01 of this manual, the following design criteria options shall apply:

A. Concentrated storm water runoff leaving a development site shall be discharged directly into a well-defined, natural or man-made off-site receiving channel or pipe

B. Channel must not be subject to erosive velocities for the two-year storm. The designer will check velocity at the point of discharge and at cross sections within three hundred (300) feet or upstream of the next control section (culvert, improved channel, storm sewer, etc.), whichever occurs first, that has a steeper slope, or a less stable bed than the point of discharge.

C. If there is not a well-defined off-site receiving channel or pipe, one shall be constructed to convey storm water to the nearest adequate channel. Newly constructed channels shall be designed as adequate channels.

D. A receiving channel may be considered adequate at any point where the total contributing drainage area is at least one hundred (100) times greater than the drainage area of the development site in question or if it can be shown that the peak rate runoff from the site generated by storms up to the applicable designed storm will not be increased after development. The runoff rate and channel adequacy shall be verified with engineering calculations.

701.03 Discharge into an Inadequate Channel: To satisfy the requirements in Section 701.01 of this manual, the following options shall apply:

A. Improvements to the receiving channel to an adequate condition may be made with permission from downstream property owners. Channel modifications shall comply with applicable laws and regulations.

B. A site plan may be developed that will maintain the predevelopment peak storm water runoff rate. This may be accomplished by enhancing the infiltration capability of the site or by providing on-site storm water detention measures. The predevelopment and post development peak runoff rates shall be verified by engineering calculations.

C. A combination of channel modifications, storm water detention, nonstructural practices, low impact development site design or other measures which are satisfactory to the director of Public Works and VDOT may be provided to prevent downstream channel erosion. Easement shall be provided in accordance with Section 702.08 of this manual.

701.04 Reference Manuals and Standards: All manuals and/or standards referenced in this section shall refer to the latest version of such manual or standard.

702.00 STORM DRAINAGE SYSTEMS - PLANNING AND DESIGN

702.01 Drainage Areas Up To 200 Acres: For drainage areas up to two hundred (200) acres, the rational method, as set forth in the VDOT drainage manual, shall be used for storm drainage design and as outlined in Table 7-1.

702.02 Drainage Areas Greater Than 200 Acres: The latest editions of Technical Release 55 (TR-55), Urban Hydrology for Small Watersheds, as developed by the Soil Conservation Service (SCS), Technical Release 20 (TR-20) or the U.S. Army Corps of Engineers Flood Hydrograph Package, HEC-1, HEC-HMS , shall be used for storm drainage design in drainage areas greater than two hundred (200) acres. The SCS methodologies should be used to compute times of concentration and runoff curve numbers. Other methodologies may be used if approved by the director of Public Works prior to the submission of final plans.

702.03 Rainfall Frequencies and Duration:

A. For storm drainage systems that are located within public right-of-ways and/or will be included for maintenance under the state highway system, the rainfall frequencies required by the VDOT drainage manual shall be used, with the exception that no system shall be designed for less than a ten (10) year storm unless allowed elsewhere in the Design and Construction Standards Manual.

B. The VDOT Drainage Manual shall be used for the design of inlets or catch basins unless the conditions require the design for a larger storm event as determined by the director of Public Works. The ten (10) year storm and the actual time of concentration shall be used for the design of grate inlets. The grate inlets (DI-7) shall be designed using a fifty percent (50%) clogging factor. The depth of water shall not exceed four (4) inches.

C. For the design of storm drainage systems not to be included in the state highway system, the twenty-five (25) year storm shall be used for drainage areas larger than six hundred (600) acres.

D. The ten (10) year frequency storm shall be used for storm drainage systems in drainage areas equal to or less than six hundred (600) acres.

E. Floodplain studies shall be based on the one hundred (100) year storm.

F. A two (2) hour storm duration shall be used if the rational formula is applied. A twenty-four (24) hour storm duration shall be used for TR-55, TR-20, and HEC-1.

702.04 Storm Drainage Systems in General:

A. At a minimum, storm drainage systems shall be designed to provide the overland relief from the one hundred (100) year storm event, without damaging or endangering nearby buildings due to the proposed development. The design and the limits of the 100 year overland ponding and elevations shall be shown on the plans to ensure that nearby buildings are not impacted. The overland relief computations are required when the drainage area flowing into a given inlet exceeds 0.5 acre. The overland relief shall be computed assuming that the inlet is completely clogged. In addition, the engineer shall also take into consideration the elevation difference between the overland relief and the lowest opening in a structure to ensure that the structures are not affected. In some situations, the director of Public Works may require the computations for drainage areas less than 0.5 acre to prevent potential localized flooding problems due to overland relief.

B. Closed storm drainage systems, generally, shall be designed to minimize the possibility of interior water surface elevations approaching the level of the inlet throats or manhole covers. The following design characteristics of closed systems shall be avoided or their effect compensated for:

1. Numerous bends.

2. Shallow systems.

3. Junctions with directly opposed laterals.

4. Systems which rely on pipes flowing full at high velocities.

C. The design capacity of piped storm drainage systems shall not be computed using headwater pressure in junctions, such as curb inlets, manholes, etc. Piped storm drainage systems shall be acceptable where the hydraulic grade line for the applicable design storm flow is below the elevation of the inlet throats or manhole rim and the capacity of pipes flowing full (by Manning's formula) equals or exceeds the applicable designed storm flow.

D. The location of the hydraulic grade line (HGL) shall be calculated and submitted with the site plans for systems when the design flow in the proposed system exceeds 80 percent of its capacity. When the flow velocity within the proposed system exceeds 12 feet per second, HGL is required, even when the system carries less than 80 percent of its capacity. The HGL shall be at least 9 inches below the top elevation of structures. The HGL shall be shown on storm sewer profiles.

E. Calculation of the hydraulic grade line shall include consideration of head losses at all junction structures. The hydraulic grade line shall be computed by the method set forth in the VDOT drainage manual. Other established methods may also be used with the approval of the director of Public Works prior to the submission of final plans.

F. The hydraulic grade line may be lowered in a system by the following methods:

1. Increasing pipe sizes to reduce the necessary velocities.

2. Eliminating bends

3. Lowering the elevation of the system to provide deeper structures.

4. Eliminating opposing laterals by offsetting their centerline a distance equal to the sum of the diameters.

5. Limiting the extent of individual systems.

6. Providing effective channelization.

7. Providing inlet shaping.

702.05 Storm Drainage Systems for Streets:

A. Storm drainage systems shall be provided when the storm water reaches an eight (8) foot spread, measured from the face of curb on public streets with a pavement width up to thirty-six (36) feet (see Exhibit 7).

B. Storm drainage systems shall be provided when the storm water reaches a ten (10) foot spread on public streets with a pavement width greater than thirty-six feet (36) feet (see Exhibit 7).

C. Whenever streets with curb and gutter are proposed, storm water shall not be allowed to cross the surface of the street intersection, except in unusual circumstances where the subsurface conveyance of storm water is deemed impractical by the director of Public Works, such as the distance to the nearest structure. The surface storm water flow shall not exceed one (1) cubic foot per second (fps). In such cases, the means of surface conveyance shall be approved by the director of Public Works and VDOT.

D. For curb inlets occurring in sag points of a street, a minimum length of throat of six (6) feet shall be required. Spread shall be calculated based on a one-tenth percent (0.1%) grade and the incremental flow from each direction. For most streets, the vertical curve has sufficient length to result in a gutter section whose effective gradient is one tenth (0.1) of a percent. In cases where special treatment of the gutter gradient is provided, the flattest slope that will actually occur should be used in lieu of the customary one tenth (0.1) of a percent. The spread requirements at the one-tenth (0.1) of a percent grade do not apply to inlets at sump locations within the turnaround of a cul-de-sac, provided that the flow does not overtop the curb or adjacent driveways.

E. Storm drainage systems occurring under curb and gutter shall have a minimum of nine (9) inches of clearance from the bottom of the gutter or as may be permitted by the director of Public Works.

F. Whenever streets without curb and gutter are proposed, storm water shall not be allowed to cross a street intersection. The storm water shall be handled by a storm sewer pipe or culvert.

G. Expansion joints in storm drainage structures shall be placed and constructed in accordance with VDOT requirements and standards.

702.06 Ditches:

A. Open drainageways shall be designed in accordance with the current VDOT drainage manual.

B. Open drainageway stabilization shall be required based on velocity as referenced in Chapter 3, Tables 3.17A and 3.17B, of the Virginia Erosion and Sediment Control Handbook, current edition.

C. Graded grass or sod-lined swales and ditches outside of the right-of-way shall be sloped a minimum of two percent (2%).

D. Riprap lined ditches shall be sloped adequately to ensure positive flow. Within the right-of-way, paved ditches shall be required when the ditch centerline grades are in excess of

five percent (5%) unless it can be shown through calculations that the velocity of flows is permissible for the alternative lining specified and/or the soil type. If the slope of a ditch located outside of a right of way exceeds 15 percent, the ditch is required to be paved.

E. Ditch linings of poured concrete are generally acceptable.

F. Permanent ditch linings of part-circle section composed of bituminous or asbestos fiber pipe, or plastic or similar lightweight materials with nonrigid properties, shall not be acceptable.

G. Swales in the back of single-family detached dwelling units shall be designed and located to preclude water from entering the dwellings. The elevation of flow resulting from the ten (10) year storm flow level shall be kept below the nearest opening (doors, windows, etc.) to the dwelling.

702.07 Headwater and Tailwater Computations:

A. The current edition of the VDOT drainage manual shall be used for these computations.

B. The maximum allowable headwater depth is that depth where the water does not exceed a height greater than eighteen (18) inches below the edge of the roadway shoulder, or where the depth of the ponded area equals fifteen (15) feet.

702.08 Easements in General:

A. Easements shall be provided for storm drainage systems and areas of concentrated flow.

B. Easements for natural stream channels shall not be required.

C. Adequate access shall be provided for storm drainage systems. Generally, storm sewer systems shall be constructed to the property line. If a storm drainage system terminates or starts short of a property line, adequate easements shall be dedicated to allow for maintenance and future extension of the system to or from adjoining properties.

D. The drainage easement shall not be less than the widths listed in Table 7-2. Trenches with depths greater than six (6) feet shall have five (5) feet of additional easement width for each five (5) foot increment of additional depth.

E. Storm drainage pipe shall be placed within the middle third of the easement.

F. Permanent structures or unauthorized obstructions and encroachments such as fences and walls shall not be located within easements. Existing trees may remain but new trees shall not be planted within the easements unless otherwise approved by Public Works. The location of drainage systems shall be taken into consideration in platting of subdivisions or lots to minimize the possibility of such encroachments.

G. Offsite drainage easements are required where water backs up into adjoining property as a result of the installation of culverts and other storm drainage systems and appurtenances. Easements shall include the ponded area associated with the applicable design storm for the drainage system. An easement is not required if the resulting ponding area from the proposed development does not exceed the predevelopment ponding area.

H. Ponding area for the Ten (10) year water surface elevation and tail water shall be included within storm drainage easements.

I. Drainage easements shall not be located within buffer areas with the exception of minimum utility crossings in accordance with Section 800 of the DCSM, or subject to approval of the director of Planning and provided that these crossings are allowed by applicable proffers.

702.09 Easements for Areas of Concentrated Flow:

A. Easements shall be required for areas of concentrated flow as determined by the director of Public Works. Areas of concentrated flow shall mean modified or constructed swales of ditches concentrating flows from more than one lot and where the drainage area exceeds two (2) acres. It shall also mean modified or constructed swales or stabilized existing drainageways leading into and handling the outfall of culverts located within public rights-of-way.

B. For open drainageways (areas of concentrated flow) an easement is required of the same width that is required for a pipe sized to carry the designed flow based on the drainageway slope. Easements for drainage ditches shall be of sufficient width for proper maintenance.

702.10 Storm Drainage Systems in Relation to Utility Lines:

A. The minimum allowable vertical distance between storm drainage pipe and other underground piping, with the exception of waterlines, shall be one (1) foot. The minimum allowable vertical distance between storm drainage pipes and waterlines shall be 0.5 feet.

B. Where a storm drainage pipe crosses below a sanitary sewer line within three and one-half (3-1/2) feet ductile iron pipe shall be required for the sanitary system. Encasements shall require an increase in the storm drainage excavation at least five (5) feet into undisturbed earth.

702.11 Storm Drainage Systems in Relation to Property Lines:

A. Storm drainage pipes or systems, including energy dissipating devices, shall be extended to the property line to protect adjacent properties. In circumstances where there is a fill slope, existing or proposed at the property boundary, the system shall be continued to the toe of the slope to prevent potential erosion.

B. When a storm drainage system is proposed to tie-in with an existing drainage system, the developer shall be required to notify the owners of that system and inform them about the proposal in writing. In addition, the developer shall be responsible to inform the owners prior to the start of construction in the vicinity of the existing system.

C. Outfall structures shall be terminated at the property lines.

702.12 Storm Drainage Systems in Relation to Slope:

A. Slopes over twenty percent (20%) for a storm drainage system are generally not acceptable, unless specifically approved by the director of Public Works.

B. When the slope of a storm drainage system exceeds sixteen percent (16%), anchors shall be required to prevent sliding of the pipe. Adequate erosion control shall be installed at the outlet to prevent undermining of the endwall.

C. A cut-off wall shall be required at the outfall of a storm drainage system exceeding sixteen percent (16%) slope (see VDOT Road and Bridge Standards, Detail 101.27).

D. For closed drainage systems, the minimum required velocity is 3 feet per second to prevent the sediment in runoff settling within the pipes.

702.13 Pipe in General:

A. Pipe used for storm drainage systems shall generally be concrete. Concrete pipes within the right-of-way of a public street or beyond the limits of the right-of-way, shall meet the three (3) edge-bearing strength test requirements for ASTM C76 Class III reinforced concrete pipe, latest revision. Culvert pipe classed as "seconds" by the manufacturer, or pipe which has been rejected from another project, shall not be permitted. The laying length shall not be less than three (3) feet.

B. Pipe size shall, generally, not be reduced along the direction of flow except for storm water management systems. The director of Public Works may also allow reduction in one pipe size increment when tying into an existing drainage structure where the outflow pipe is at least thirty-six (36) inches in diameter.

C. Storm sewer pipe size shall be determined by using Manning's formula, where:

$$\frac{V = 1.49\, R^{2/3}\, S^{1/2}\ \text{feet/sec}}{n}$$

D. Pipe shall have a minimum coefficient of roughness in accordance with Table 7-3.

E. The minimum pipe size for a culvert and storm drainage system shall be fifteen (15) inches or equivalent, except when used under a driveway entrance on a ditch section street where twelve (12) inch or equivalent culverts may be permitted.

F. The maximum distance of piping to be uninterrupted by appurtenances shall be eight hundred (800) feet for pipes thirty-six (36) inches in diameter or greater and four hundred (400) feet for pipes less than thirty-six (36) inches in diameter.

G. Pipe shall be straight between manholes, catch basins, or other appurtenances.

702.14 Corrugated Metal Pipe:

A. Corrugated metal pipe, where permitted by the director of Public Works and VDOT, shall meet current VDOT standards.

B. Corrugated metal pipe, when permitted by VDOT east of Interstate 95, shall be fully bituminous coated with a paved invert.

702.15 High Density Polyethylene Pipe (HDPE) and Polyvinyl Chloride Pipe (PVC): High density polyethylene pipe (HDPE) and polyvinyl chloride pipe (PVC), may be used in both residential and nonresidential sites under the conditions specified in Section 702.16.

702.16 Use of High Density Polyethylene Pipe (HDPE) and Polyvinyl Chloride Pipe (PVC): The use of HDPE and PVC in storm drainage systems shall be conditioned upon the following:

A. The system is completely enclosed.

B. The maximum pipe size is forty-eight (48) inches. However, if located inside state right-of-way and approved by the Virginia Department of Transportation, the maximum culvert size may be sixty (60) inches.

C. For the pipes to be installed in residential (excluding apartment rental complexes) sites, the maximum depth of a trench, when measured from final grade, shall be 10 (ten) feet or less.

D. Pipe used shall have a smooth interior.

E. Installation shall be in accordance with manufacturer's specifications (ASTM D2321) or latest VDOT standards, whichever is more stringent.

F. HDPE pipe joints shall have rubber gaskets with a bell and spigot joint. Gaskets shall meet or exceed ASTM F 477. Joints shall be certified to meet a minimum lab air test of 3.5 psi when tested in accordance with ASTM 3212.

G. For residential installations, pipes shall be checked by visual inspection prior to bond release and acceptance. During the visual inspection, the County may choose to conduct mandrel testing randomly on the pipe. Installed pipe deflections that exceed 7.5 percent of the initial inside diameter should not be accepted and shall require the replacement of the pipe. For pipe installations in non-residential sites and in apartment complexes, the County recommends that a visual inspection be performed to ensure proper installation similar to residential installations.

702.17 Pipe for High Velocity Flow: Pipe manufactured with six thousand (6,000) pounds per square inch concrete, and meeting the strength requirements of ASTM C76 Class III, latest

revision shall be used if velocities in storm sewer pipe exceed twenty (20) feet per second, based on the ten (10) year storm. Such velocities shall require approval of the director of Public Works.

702.18 Pipe Cover:

A. Class of concrete pipe shall be increased above the requirements in Section 702.13 of this manual based on the amount of cover.

B. The minimum and maximum cover shall conform to VDOT standard PC-1 for drainage pipes within the street right-of-way.

C. Pipe laid outside of street right-of-way shall have a minimum of one (1) foot of cover.

D. If the minimum cover requirements as set forth in this section cannot be met, then structural modifications may be submitted for approval by the director of Public Works and VDOT.

702.19 Major Culverts:

A. Major culverts shall be designed in accordance with VDOT standards.

B. A pipe culvert may be used where drainage requirements call for an opening of thirty-six (36) square feet or less.

C. A box culvert, a standard span, or a specially designed bridge shall be used where drainage requirements call for an opening over fifty (50) square feet

D. The installation of culverts in streams shall comply with the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality requirements to countersink the culverts, if applicable.

702.20 Storm Drainage Structures in General:

A. Structures and appurtenances for inlets, curb and gutter, endwalls, junctions, etc., shall conform to the current edition of the road and bridge standards of VDOT unless approved otherwise in writing by the director of Public Works. The use of pre-cast structures from an approved manufacturer shall be in accordance with VDOT standards and specifications.

B. A drainage structure shall be located at every change in line and grade and change in pipe size. Where permitted by the director of Public Works and VDOT, pipes may tie directly into box culverts.

C. Where pick up of additional storm water is required, a curb inlet or drop inlet shall be constructed.

D. At every structure, a tenth (0.10) of a foot drop in invert is required.

E. The ends, entry or exit, of a storm drainage system shall be provided with a standard headwall, endwall, curb inlet, flared end section, or other appurtenance suitable for the intended use of the storm drainage system.

702.21 Headwalls and Endwalls:

A. Standard endwalls or end sections shall be provided on culvert pipe, except twelve (12) inch and fifteen (15) inch diameter pipe culverts under driveways along streets with open drainage ditches.

B. A standard endwall or end section shall be provided at the outlet of a closed storm drainage system and at the inlet of such a system where no other approved structure is required.

C. The following guidelines shall be used to determine the use of headwalls and endwalls:

1. On culverts or storm drainage system inlets and outlets from twelve (12) inches in diameter to twenty-four (24) inches in diameter, a flared end section shall be used unless the height of fill and side slopes exceeds ten (10) or two-to-one (2:1), respectively, in which case a standard headwall should be used. Generally, if the headwater over diameter (HW/D) ratio is up to one and one-half (1-1/2), then a headwall or approved end treatment shall be required, provided it can be installed safely and not create a potential traffic hazard in the opinion of VDOT and the Department of Public Works.

2. On a culvert or a storm drainage system inlet and outlets between twenty-four (24) inches and thirty-six (36) inches in diameter, either a standard flared end section or headwall shall be required depending upon the height of the fill and the quantity of water and its velocity for the designed year storm. Generally, a flared end section can be used in accordance with the following:

a. if the fills are ten (10) feet or less.

b. HW/D is less than one and one-half (1-1/2),

c. less than fifty (50) cfs inflow, or

d. If the installation of a headwall would constitute a safety hazard in the opinion of VDOT and the Department of Public Works.

3. If the culvert or closed storm drainage inlet and outlet exceeds thirty-six (36) inches in diameter, a standard headwall shall be provided, unless this headwall would constitute a safety hazard to the traveling public in the opinion of VDOT and the Department of Public Works. In this case, a flared end section should be considered. Only endwalls are available for oval elliptical concrete culverts.

702.22 Erosion Protection in General: Erosion protection shall be required where curb and gutter terminates on fill sections, or on soil that has eroding characteristics as determined by the director of Public Works.

702.23 Erosion Protection at Outfalls:

A. Erosion protection at the outlets of storm drainage systems shall be provided in accordance with the outlet protection standards contained in the Virginia Erosion and Sediment Control Handbook and the VDOT drainage manual, with the exception that the use of grouted riprap will not be acceptable (See Exhibits 17 and 18).

B. Velocities in excess of eighteen (18) feet per second shall require special design energy dissipaters or impact basins. These structures may be designed in accordance with the following publications: Hydraulic Design of Stilling Basins and Energy Dissipaters, Engineering Monograph #24, U.S. Department of the Interior, Bureau of Reclamation; Design of Small Dams, U.S. Department of the Interior, Bureau of Reclamation, or similar text. Appropriate riprap protection should be provided in conjunction with these devices to prevent erosion and scour below the structure.

C. The following guidelines shall be considered in the layout of storm drainage systems to minimize the erosion problems and subsequent construction failures which occur at a storm drainage system outlet:

1. The outlet of the storm drainage system shall discharge directly into a stabilized existing drainageway.

2. The outlet of the storm drainage system should be as compatible as possible with the grade, horizontal and vertical alignment, and location of the existing drainageway.

3. Placing outlet structures of storm drainage systems on fill material should be avoided. If the outlet is on fill, additional erosion protection shall be provided.

4. If deviations from (1) and (2) of this subsection are necessary, the preferred alternative would be a stabilized ditch of adequate capacity to convey the designed storm flow from the outlet structure to the existing drainageway. Deviation from above stated policy shall be subject to the review and approval of the director of Public Works.

5. SWM/BMP outflow structures or storm drainage outfalls shall be designed such that the concentrated flow from these structures can be properly accommodated within the receiving channel and not subject the receiving channel to erosion.

6. Stream channel erosion impacts due to development, shall be addressed for each point of discharge of concentrated flow from the development project.

703.00 STORM DRAINAGE SYSTEMS - SUBMISSION REQUIREMENTS

703.01 Schematic Drainage Plan:

A. A schematic drainage plan shall be submitted with a final plan.

B. A drainage plan shall include the following:

1. Proposed detention areas.

2. Proposed major drainage systems.

3. Existing drainage divides, and proposed modifications to these divides.

4. Outline of the on-site drainage area.

5. Contours of a two (2) foot interval.

6. Differential areas shown with respect to the point of concentration and the acreage.

7. A minimum scale of one (1) inch equals one hundred (100) feet, unless otherwise approved by the director of Public Works.

8. Off-site drainage areas contributing storm water runoff to the system being designed shown on County topographic maps or other acceptable maps.

703.02 Plan, Plat, and Profile Elements:

A. Storm drainage systems shall be shown in plan and profile on twenty-four (24) by thirty-six (36) inch sheets.

B. The plans and profiles shall contain the following:

1. Construction information, including invert elevations (in and out), size, type of pipe, gauge, length and percent of slope shown in plan and profile.

2. Storm drainage appurtenances identified by the type and number (i.e., DI-1, DI-3B), including number and length of throats and locations on the profile and/or the plan.

3. The appropriate notes and details for construction of erosion control measures at outlets shown on the plan.

4. Drainage arrows shown on curb and gutter, storm sewers, ditches, site pavement, and drainage divide maps.

C. Easements for storm drainage systems and areas of concentrated flow shall be shown on the plan and plats.

D. Ditches:

1. All ditches to be utilized for open conveyance of storm water shall be shown in plan and profile with stationing and grade.

2. Computations used in drainage ditch design shall be submitted with the plans.

3. A typical ditch section shall be shown on the plan. The transitioning of paved ditches to other appurtenances shall also be shown.

703.03 Drainage Computation Sheets: Drainage computation sheets shall be submitted on forms approved by the Department of Public Works. This shall include consideration of both onsite and offsite drainage.

703.04 Headwater and Tailwater Computation Forms: Headwater and tailwater computations shall be submitted on standard forms approved by the director of Public Works.

703.05 Cut Sheets: Cut sheets shall be submitted to the Department of Public Works in accordance with Section 704.03 of this manual.

704.00 STORM DRAINAGE SYSTEMS - CONSTRUCTION STANDARDS

704.01 Construction in General:

A. Construction of storm drainage systems shall be in accordance with the approved plans, specifications, and/or the cut sheets submitted to the Department of Public Works.

B. Substantial deviations in location, line, or grade of a storm drain, structure, or accessory from that shown on the approved construction plans shall be submitted to the Department of Public Works for review and approval prior to construction.

C. Drainage ditches shall be constructed in accordance with the current VDOT drainage manual. Ditch stabilization will be required based on velocity as is referenced in Chapter 3 of the Virginia Erosion and Sediment Control Handbook, current edition.

D. Drainage ditches shall be constructed true to the approved cross section and shall be set on a uniform grade and a straight line with the longitudinal axis of the pipe, unless otherwise approved by the director of Public Works. The side slopes shall be free from rocks, stumps, and woody vegetation. After dressing the slopes to the proper cross section, they shall be seeded or sodded with grass to prevent erosion in accordance with the Virginia Erosion and Sediment Control Handbook.

704.02 Line and Grade Stakes: The field layout of storm drainage systems shall be performed by the applicant's engineer or surveyor, who shall place adequate line and grade stakes and furnish elevation for manhole tops in accordance with the approved plans.

704.03 Cut Sheets

A. After setting grade lines and stakes, the applicant's engineer or surveyor shall prepare suitable cut sheets in a clear and legible manner, giving necessary construction data.

B. Two (2) sets of cut sheets, certified by a professional engineer or surveyor shall be submitted to the Department of Public Works. The engineer or surveyor who certifies the cut sheets shall also provide the following statement on both sets: "The professional seal and signature appearing on this document certifies that information shown conforms to the approved plan and/or actual field conditions. Minor deviation from the approved plan shall be performed in a manner comparable to the original design and shall meet applicable standards." The Department of Public Works may perform a cursory review to verify conformance to the approved plans.

704.04 Bedding and Trenching: VDOT standards shall apply to bedding.

704.05 Pipe Joining:

A. The use of rubber gaskets when joining pipes is permitted, provided that installation is in strict accordance with manufacturer's specifications and the recommended lubricant is used. The type of rubber gasket, lubricant, and pipe shall be subject to approval by the director of Public Works or designated agent.

B. When corrugated metal pipe culvert is used, jointing shall be in strict accordance with the pipe manufacturer's specifications and VDOT standards.

704.06 Backfilling:

A. Backfill in areas subject to vehicular traffic or structural loading shall begin at the top of the standard granular bedding and shall be placed in uncompacted lifts no greater than eight inches thick. These lifts shall be compacted ninety-five percent (95%) of the maximum dry density, as determined by ASTM D698, AASHTO T99, or VTM-1.

B. Backfill material shall be free of organic material, frozen clods, highly plastic silt or clay and other unsuitable material. Rock pieces larger than one inch shall not be used in the backfill which is within two feet of the pipe. No stone or rock larger than 10 inches in any dimension shall be used in backfilling of sewer lines.

C. Backfill in areas not subject to vehicular traffic shall be compacted sufficiently so that any subsidence that may occur shall not be objectionable or detrimental to normal use.

D. Backfill and replacement work in existing or proposed roads to be accepted into the VDOT system shall be executed in accordance with all applicable VDOT standards. All surplus materials shall be disposed in approved areas.

704.07 Grading within Jurisdictional Wetlands: The site and subdivision plans must clearly show the streams, ponds, and jurisdictional wetlands areas on the project parcel(s). Any proposed impacts to the wetlands and the stream, including the impacts associated with stream crossings must be clearly shown on the plans. The wetlands and the wetlands impact shall also be identified on the plan by type, such as forested, shrub-scrub, emergent, etc. If the project proposes wetlands/stream disturbance, the developer shall submit a wetlands permit application and plan to the state and federal agencies for review. The applicant shall demonstrate evidence of appropriate permit approval from state and federal agencies prior to final plan approval. The County will also require two additional plan sets to address the wetlands impacts in accordance with the County's "Administrative Procedures for the Management of the Site Development Plan Process".

710.00 GRADING - POLICY

710.01 General Policy for Grading and Clearing:

A. Grading within the following areas should be avoided:

1. Wooded slopes equal to or greater than twenty-five percent (25%) and having a continuous area of ten thousand (10,000) square feet or greater.

2. Wooded one hundred (100) year floodplain.

3. Wooded slopes equal to or greater than fifteen percent (15%) adjacent to a stream.

4. Jurisdictional wetlands, to the extent practicable.

B. Slopes steeper than three to one (3:1) are not acceptable, unless the existing grades are already in excess of three to one (3:1), or tying out steeper slopes to existing grades is required to preserve woodland areas that are to remain undisturbed. These preserved woodland areas must be in addition to the required minimum tree canopy and landscaping. In this instance, the developer shall be responsible to have a geotechnical engineering report prepared by a professional engineer and shall implement the recommendation in the report for the grading and stabilization of the area.

C. Graded slopes steeper than two to one (2:1) are not permitted

D. The limits of clearing shall be depicted on the grading plans. They shall be located at the outermost limits of the area to be cleared, which shall include the erosion and sediment controls. The limits of clearing shall not include any unnecessary clearing.

710.02 Disturbed Area Greater Than 5,000 Square Feet: An approved lot grading plan certified by a land surveyor or professional engineer is required for single family development and additions to existing single family development where the generated disturbed area exceeds five thousand (5,000) square feet

710.03 Disturbed Areas Less than 5,000 Square Feet: A non-engineered plan, showing the land to be disturbed, is required prior to the issuance of any permits for an addition to existing single family development where the disturbed area is less than five thousand (5,000) square feet. Any proposed addition or improvement shall clearly demonstrate that the storm water flow is not impeded by the improvement as evidenced by elevations or grading as necessary around the improvement.

710.04 Land Disturbance Permit: A land disturbance permit, as defined in the Administrative Procedures Manual, is required when no other permits are required for land disturbances greater than two thousand five hundred (2,500) square feet but less than five thousand (5,000) square feet, or within easements when changes in grade are proposed. The permit shall require compliance with the appropriate erosion control criteria in accordance with Section 750.00 of this manual.

710.05 Grading Permit:

A. An approved grading plan and permit shall be required to be on the job site during construction. The approved grading plan is used to check the final grading prior to the issuance of the occupancy permit. The occupancy permit may be denied if the grading plan and the actual grading of the site do not substantially agree.

B. Substantial deviation from the approved lot grading plan shall require approval of a revised grading plan. The director of Public Works may approve deviations if they are substantially in accordance with the intent of this manual. Those not in substantial accordance shall be denied.

C. Lot grading plans that are part of subdivision plans are valid for the life of the subdivision plans, provided there have not been any approved revisions to the lot grading portions of the subdivision plan in the interim.

D. The validity period for lot grading plans that are not part of the subdivision plans shall be equal to the time specified for final site plans in Section 100 of this manual. If, during that period, a building permit is not issued, then a new lot grading plan conforming to the current requirements of the DCSM must be submitted and approved prior to the issuance of a building permit.

710.06 Permit for Retaining Walls:

A. Retaining walls shall require a structural design certified by a professional engineer to be submitted for plan review approval and issuance of a building permit. Following are two exceptions to this requirement:

1. A single retaining wall that does not support the surge from any other structure and retains a total elevation difference equal to or less than two (2) feet in height shall be exempt from the requirements set forth in subparagraph A above.

2. The structural design for a single retaining wall or a tiered retaining wall system that retains a total elevation difference equal to or less than forty-eight (48) inches and is not associated with any other buildings or structures shall not require the certification and signature of a professional engineer, but does require plan review approval and issuance of a building permit.

B. Prior to construction, the developer or builder shall post a bond with the County equal to the cost of constructing the permitted retaining walls.

C. Retaining walls must meet the approval of the zoning administrator.

1. The design of all wall systems shall show all topographic information for a distance of one and one-half (1.5) times the height of the wall to the high side and at least twice the height in front of the wall; under no circumstances shall the distance shown on either side of the wall be less than twenty (20) feet.

2. Walls greater than two (2) feet made of timber or other materials subject to decay or rot or walls located in more than one lot shall have an easement in accordance with subparagraph (4) below for maintenance, repair, reconstruction and/or restoration. The owner shall record restrictive covenants on the property in accordance with subparagraph (4) below that shall prohibit the installation of other structures, buildings and utility lines which were not designed in conjunction with the wall design.

3. All non-engineered walls greater than two (2) feet and less than or equal to forty-two (42) inches shall be subject to restrictive covenants, which are in accordance with the distances set forth in subparagraph (4) below, that prohibit the installation of other structures, buildings and utility lines on, below, or through the retaining wall system.

4. When required, retaining wall maintenance easements shall be granted to property owners**,** homeowners associations or other similar organizations. The “durable” retaining walls such as, concrete and masonry may not require a maintenance easement. The scope of the retaining wall maintenance easement and/or restrictive covenants shall encompass the entire retaining wall system. This easement and/or restrictive covenants shall extend along the ground above the retaining wall system and along the ground below the retaining wall system a distance of at least two and one-half (2.5) times the total height of the retaining wall system, and the distance of this easement and/or restrictive covenants shall be not less than ten (10) feet, regardless of the height of the retaining wall system. The retaining wall maintenance easement and/or restrictive covenants shall extend a minimum of ten (10) feet from each end of the retaining wall system. The retaining wall maintenance easement and/or restrictive covenants shall be placed to provide an equal amount of clear access space on all sides of the retaining wall system.

For retaining walls that utilize soil reinforcement techniques for stability, appropriate "soil reinforcement zone easements" shall be recorded and shown on the plat to ensure the long-term stability of the retaining wall.

When the proposed retaining wall crosses multiple lots, the director of Public Works may require that the retaining wall be located in HOA common areas.

D. When a retaining wall is determined by a County field inspection to have the characteristics or conditions that may be hazardous to public health, safety, and welfare, safety devices such as guardrails, fences or any other measures as required by the County building official shall be installed.

E. In areas prone to graffiti vandalism, the surface of retaining wall shall be treated by a protective coating which can easily be washed and wiped. Instead of a protective surface coating, the retaining wall can be covered or access to the wall blocked with plantings in accordance with Section 804.03 of this manual.

F. No occupancy permit shall be issued until all retaining walls in the general area of the units scheduled for occupancy have been constructed, inspected and approved.

711.00 GRADING - DESIGN

711.01 Grading Design in General:

A. Where permitted, slopes steeper than three to one (3:1) shall be stabilized with pegged sod or other vegetation approved by the director of Public Works.

B. Benches or diversions shall be provided on slopes three to one (3:1) or steeper, when vertical height of slope exceeds fifteen (15) feet. Benching shall be in accordance with Exhibit 22 to minimize the flow of stormwater along the face of the slope. The flow shall be directed to and collected by a storm drainage system at each bench. The width of benches may be decreased to four (4) feet, if runoff is diverted away from the top of the bench and into a defined drainage system. For retaining wall applications, refer to Section 710.06 of this manual.

C. Swales shall be sloped a minimum of two percent (2%), but should preferably be three percent (3%). Any swale with steep longitudinal slopes shall be properly stabilized in accordance with the most recent edition of the Virginia Erosion & Sediment Control Handbook.

D. Grading for the perimeter area immediately adjacent to a proposed building shall be designed in such a manner as to lead water away from the building, with a minimum 6 inches fall within the first 10 feet. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within the first 10 feet, drains or swales shall be provided to ensure drainage away from the structure. In single-family dwellings where the finished yard slopes are steeper than four to one (4:1), a ten (10) foot wide transition area with slopes no greater than ten percent (10%) shall be provided.

E. Utilizing the side yards between houses as a route for a significant amount of surface water can create problems, i.e., the discharge of significant volumes of water at a single point across a street sidewalk. Where the longitudinal grade of the street exceeds five percent (5%), the water has a tendency to run along the outer edge of the sidewalk, rather than running directly into the street. This can create serious erosion problems around and under sidewalks which may be avoided as follows:

1. Design overlot grading, to route storm water between several houses and toward the street so that only small amounts of water drain between one (1) pair of adjacent houses. This solution may not always be adequate to prevent storm water from running parallel with a steeper street along the outer edge of the sidewalk.

2. Install adequate inlets at intervals in the mid-block drainage swale with the storm water being intercepted by the inlet and carried in a storm drainage system between houses to connect with the storm drainage system in the street. If possible, this should be designed when the drainage plan is approved, otherwise the approved drainage plan shall be revised to compensate for this occurrence. If construction of the streets has taken place, the finished construction could be affected.

F. Grading for single-family detached development, where the minimum lot size required is one-half (1/2) acre or less, shall be designed so that the maximum drainage area for a surface swale located within individual lots shall be one (1) acre and the total drainage area flowing into any grate inlet within these lots shall not exceed one (1) acre. A closed storm drainage system shall be required when the drainage area exceeds one (1) acre. Surface swales draining more than one acre may be located within common areas. Particular circumstances and other considerations may require other measures to be shown on the plan.

G. When a structure is proposed in a problem soil or a high ground water area, the builder shall be responsible to have a geotechnical engineering report prepared by a professional engineer. The recommendation in the geotechnical report shall be applied to the proposed dwellings.

711.02 Flood Protection for Residential Development:

A. Lot grading, house siting, and house elevation shall provide for protection of the house against flooding from storms exceeding the capacity of the normal designed storm for which the storm drainage system is sized. Consideration of this factor will also provide protection against occasional blockage of pipes.

B. Houses shall be sited outside of depressed grade areas, particularly where overland flow from the depressed area could only take place when ponded water reaches an elevation higher than that of the first floor elevation of the house. Provision of an inlet in the depression is required, but not sufficient by itself, since it can be blocked or its capacity exceeded by a storm exceeding the ten (10) year designed storm.

C. County requirements for storm drainage systems in relation to the one hundred (100) year flood shall be considered. Paths of overland flow should, in conjunction with the pipe system,

provide for discharge of similar flows through internal areas of a development without flooding of homes. Where overlot grading and house locations do not appear to meet this requirement, the Department of Public Works shall require that hydraulic calculations be submitted which provide the adequacy of the proposed plan to dispose of the designed flood.

D. Where flood elevations have been established with floodplain studies, the siting of the lots shall be in accordance with Section 730.04 of this manual.

711.03 Grading Design for Single-family Attached Development:

A. Grading plans for single-family attached dwellings shall account for access to the rear of the lots. An owner or builder of a single-family attached dwelling may erect a fence along the rear property lines to enclose the maximum available area of rear yard. If a cut or fill slope begins at the rear yard line, and fences are erected at the line, then pedestrian access is severely restricted. A pathway area five (5) feet in width abutting the rear line of lots shall be provided with a maximum cross slope of 8 percent.

B. Storm drainage, sanitary sewer and water line easements shall not be located within fifteen (15) feet of the rear wall of any individual single-family attached dwelling unit.

C. Drainage swales shall not be routed through an individual single-family attached lot. Such swales may be blocked by fences and other improvements and generally restrict the use of the available yard area.

D. Open ditches within single-family attached development should be carefully considered from the viewpoint of maintenance, attracting nuisance, erosion, and the limitations on pedestrian access. Carrying the flow within pipes rather than open ditches eliminates these problems. However, where ditches or swales are used, shallow channels with flat side slopes utilizing partial protective linings should be considered. For major storm drainage channels, where carrying the flow in pipes would be economically impractical, such considerations become even more important. Where major channels intervene between units and important pedestrian destinations (such as a school site), consideration should be given to provide a pedestrian bridge. Where major channels are immediately adjacent to housing, fencing to prevent nuisance shall be considered. All channels should be designed to prevent ponding of water. This should be particularly considered in flat bottom channels with flow-line grades by providing a cross slope to a minor low flow channel in the bottom of the main channel.

E. Utility lines (including sewer, water, gas, telephone, and electric lines), shall be placed to avoid conflicts with the other utilities, and provide accessibility for their maintenance and repair, particularly in off-street areas.

F. The slope of a driveway for a single family attached home shall not exceed twelve (12%).

711.04 Yard Lighting

A. Subdivision Lighting: On each single-family detached residential building lot within a subdivision, where the minimum required lot area is twenty thousand (20,000) square feet or less including lots with no minimum area requirements, the subdivider shall install a yard light on each lot which conforms to the design standards of this manual (See Exhibit 21). All required yard lights shall be installed prior to occupancy.

B. A photoelectric yard light (Exhibit 21) must also be installed on single-family attached building lots, unless the owner or builder elects, pursuant to the Uniform Statewide Building Code, to install photoelectric lighting at individual outdoor entrances. Notwithstanding anything in this manual to the contrary, photoelectric cell lights are not required to be placed at dwelling entrances to single-family attached dwelling units, unless the owner or builder so elects, pursuant to this provision and the Uniform Statewide Building Code.

C. A photoelectric entrance light shall be used on an individual single-family attached dwelling unit unless an alternative is approved by the director of Public Works.

712.00 GRADING - SUBMISSION REQUIREMENTS

712.01 Grading Plans in General:

A. A lot grading plan, certified by a professional engineer or land surveyor, shall be submitted for review and approval prior to or concurrent with a building permit application. An approved lot grading plan is a prerequisite to the issuance of a building permit for single family attached and detached dwellings.

B. Site development plans for single-family development where the minimum lot size required is less than one acre shall incorporate future grading for all individual lots to provide effective erosion and sediment control measures and reduce future drainage problems.

C. A site plan for single-family attached dwellings shall be included with the final subdivision plan.

D. A grading plan may be submitted for review after approval and release of the final subdivision plan. Building permits shall be issued after the subdivision plat has been recorded.

E. Some revisions to the grading plan may be permitted, should the house type be revised if the owner demonstrates that the change does not materially affect proposed grading adjacent to major drainage systems or preclude erosion control in accordance with Section 750.00 of this manual.

F. The plan shall clearly delineate and show the areas that are highly erodible, highly permeable, and/or marine clay on slopes greater than 15 percent that may be disturbed only if mitigation measures are approved and used in accordance with the requirements of DCSM.

G. The plan shall also clearly delineate and show the areas with slopes 25 percent and greater. These areas shall not be disturbed unless mitigation measures are used to preclude adverse impacts.

H. Wooded slopes 25 percent and greater that abut perennial streams and have a contiguous area of 10,000 square feet or greater shall be clearly shown on the plans as conservation areas. These slopes shall not be disturbed before, during or after development, except for the installation of utilities and road crossings as approved on a site or subdivision plan. Exceptions to the requirement to establish conservation areas may be considered by the Zoning Administrator in accordance with the provisions in the Zoning Ordinance.

I. The site-specific mitigation measures proposed by the engineer will be reviewed by the director of Public Works.

712.02 Lot Grading Plan Elements:

A. The following items shall be provided and indicated on grading plans for residential development:

1. Scale of one (1) inch equals thirty (30) feet or less for lots with areas less than one (1) acre. A scale of up to one (1) inch equals fifty (50) feet shall be allowed for lots with areas of one (1) or greater.

2. Legend in accordance with Table 7-4.

3. Contours at two (2) foot intervals defining the lot grading. All contours and spot elevations shall be referred to USGS datum and certified by the professional who prepares the plan. The five (5) foot contour topographic maps prepared by the County may be used to prepare individual lot grading plans for lots which were not platted and approved as part of a subdivision, provided that: (1) the lots are greater than two (2) acres, and (2) the limits of clearing and grading are no less than fifty (50) feet from any property line. Any information prepared by others shall be verified to be reasonably accurate at the time the plans are submitted for review.

4. Only for individual lots, distances from structures to the property lines, building restriction lines, and other proposed changes.

5. Spot elevations at building entrances, each corner of the buildings, at driveway entrances and at changes in the grade of driveways.

6. Walkout basements showing the proposed elevations and spot elevations at basement entrances.

7. Driveways for single-family development dimensioned at a minimum of ten (10) feet in width; sloped a minimum of one percent (1%) average and a maximum of twelve percent (12%) average if the driveway is fifty feet or less in length. For driveways exceeding fifty

feet, the first twenty feet from the right-of-way and the last twenty feet adjacent to the garage shall not exceed 12%. All other portions of the driveway shall not exceed a slope of 15%.

The driveways for single-family dwelling lots with required minimum areas of less than one (1) acre shall be paved with a minimum of four (4) inches of VDOT 21A stone and two (2) inches of asphalt or bituminous concrete, or 5 inches of concrete over adequately compacted subgrade. For lots where the minimum lot area is one (1) acre or more and the streets are paved, driveways shall be paved from the edge of pavement to the right-of-way line. Driveway apron construction shall be included in the subdivision construction bond. Where allowed, gravel driveways shall have a minimum of six (6) inches of VDOT number 21A stone. The 21A stone may be topped with additional clean aggregate.

8. Parking pads for single-family development not less than three hundred sixty (360) square feet, sloped a minimum of one percent (1%) and a maximum of five percent (5%) where there is no garage or carport for two or more vehicles.

9. Driveway entrances for single-family development aligned with garages and carports. When the driveway length is less than forty (40) feet (measured from the garage entrance or carport front wall to the street right-of-way), the driveway entrance and entire driveway length shall be in accordance with Section 650.36 (DE-2), typical section of this manual. An appropriate turnaround shall be provided when the driveway length is fifty (50) feet or more.

10. Lead walks, risers, and the elevations at landings.

11. Grading of the front of the lots and cuts and fills which define the ditch line and the location of the driveway culvert.

12. Driveway culvert, computations designed to pass the ten (10) year storm, and culvert invert elevations. A minimum culvert size of twelve (12) inches shall be required, and in VDOT right-of-way, the minimum culvert size shall be 15 inches.

13. Yard light locations shown on each lot in accordance with Section 711.04.

14. Platted storm drainage and sanitary sewer easements.

15. Areas to remain undisturbed as intended by Section 710.01 of this manual, and indicated by a limit of disturbance line.

16. An appropriate construction entrance and erosion control measures only for individual lots to be disturbed.

The erosion and sediment control measures shown on individual lot grading plan shall clearly identify and reference all applicable erosion and sediment control measures used, by the state minimum standard number, in accordance with the current Virginia Erosion and Sediment Control Handbook.

17. Steep slope stabilization methods when disturbance of steep slopes is permitted.

18. Retaining walls with proposed elevations.

19. The location of the driveway entrance for a single-family dwelling shall conform to the requirements of Section 600.

20. Landscaping requirements including size and type of trees.

21. Signature and seal of a professional licensed to prepare the design by the Commonwealth of Virginia.

22. A "Tabular Rating System" score card with each lot grading plan submission. The Tabular Rating System (Appendix B) will be used by the County to determine the frequency of erosion and sediment control inspections.

23. The downspouts shall discharge into stabilized areas and not cause erosion on adjacent lots.

B. A grading plan shall include the appropriate notes and/or details for the necessary erosion and sediment control measures. The original erosion controls for a subdivision may be satisfactory for an addition to a subdivision as long as the erosion controls will not be removed until the construction on the lot is completed, the ground stabilized, or the release of the escrow is requested and approved.

C. Storm drainage system plans for pipes, inlets, etc. (which are approved as part of street construction plans) are based upon a storm drainage map showing the areas contributing to flow at various inlets. Overlot grading plans should delineate the drainage divide lines to insure that an approved drainage map is followed, or notation should be made on the plan that it conforms to the approved overall drainage plan.

D. A block for approval with the following minimum information in the same order as it appears for lot grading plans submitted individually:

GPIN: _____
Zoning: _____
Address: _____
Owner: _____
Zoning Approved By: _____
Date: _____
Maximum Height 35'
Approved Lot Grading Only
Department of Public Works
By: _____
Date: _____

E. A block with the following minimum notes for lot grading plans submitted individually:

1. No inspection will be made unless an approved lot grading plan is on the job site.

2. The approval of this lot grading is for building permit application only as shown on the site development plan. Mass grading is not permitted unless building permits are obtained.

3. This lot grading plan is approved for:

Non-manufactured dwelling(s) _____
Manufactured dwellings(s) _____

4. A note that sidewalks or trails must be in place prior to occupancy permit if the approved subdivision plans show them in the vicinity of this lot.

5. A note that a yard light must be in place prior to occupancy permit if such light is required.

6. A note to indicate if the lot grading plan is a revision of the original approved one.

7. A note to indicate if a proffer contribution is required prior to the issuance of any building permits.

8. A note that all required landscaping associated with the lot must be in place prior to the issuance of a final occupancy permit, unless a winter waiver is obtained.

9. A note to indicate that "All erosion and sediment control practices shall be constructed and maintained according to the approved lot grading plan, which meets the minimum standards and specifications of the Virginia Erosion and Sediment Control Handbook and the County's Design & Construction Standards Manual. No trade or site inspections will be made unless the required erosion and sediment control practices are in place".

720.00 STORM WATER MANAGEMENT (SWM) - POLICY

720.01 General Policy for SWM:

A. All development occurring within the County shall provide storm water management facilities and best management practices adequate to reduce increased runoff rates and no point source pollution, respective to their pre-developed condition. The design shall include control of stream flow rates, water surface levels, and runoff volumes.

B. The County encourages the construction of regional SWM facilities when such facilities benefit the watershed by virtue of where they are located. Regional facilities are generally expected to have drainage areas of one hundred (100) acres or larger and to be located as determined by watershed studies.

Developers are encouraged to discuss, with the Department of Public Works, the possibility of participating in the construction of a regional SWM facility and to share in the benefits of larger facilities downstream. The Department of Public Works shall provide guidelines for the design, construction, and maintenance of such facilities.

The County's objectives for regional SWM facilities are as follows: (1) To encourage a regional approach to storm water detention (2) To facilitate the implementation of the regional SWM ponds through the development process; and (3) To reduce the impact on the environment by encouraging the use of nonstructural best management practices (BMPs), biofilters and sediment forebays. If a regional facility is under construction or funded and scheduled for construction, the properties within the service area of the facility shall be required to participate in the implementation of the regional pond and pay a pro rata share.

C. The Department of Public Works reserves the right to disapprove certain types of SWM and BMP systems for certain types of development, if there are documented concerns regarding the effectiveness or maintainability of these systems.

D. The Department of Public Works reserves the right to ask for a pro rata share contribution for certain sites, in lieu of providing onsite storm water management facilities, based on watershed conditions, as stated in Section 720.06.A. of this manual.

E. For SWM design purposes, all pervious lands in the site shall be considered in good hydrologic condition regardless of the conditions existing at the time of design. Hydrologic condition is used in describing non-urbanized lands such as woods, brush, meadow, agricultural lands, and open spaces associated with urban areas, such as lawns, parks, golf courses and cemeteries.

F. If SWM facilities that rely on infiltration into underlying soils are proposed, the engineer shall ascertain that the soils are suitable.

720.02 General Policy for BMP and Storm Water Quality:

A. All development or redevelopment occurring within the County shall incorporate water quality measures (best management practices). A minimum of twenty percent (20%) phosphorus removal shall be provided for redevelopment sites.

The current edition of the Northern Virginia BMP Handbook, prepared by the Northern Virginia Planning District Commission (NVPDC), and/or Virginia Storm Water Management Handbook shall be used in the design and review of BMP facilities.

Innovative and alternative water quality BMPs may be allowed for land development at the discretion of the director of Public Works, subject to pollutant removal efficiencies recognized by the Virginia Department of Conservation and Recreation.

B. The use of environmentally sensitive design techniques, often referred to as low impact development, that incorporate infiltration and ground water recharge as well as the replication of

predevelopment volume, runoff rates and times of concentration, is encouraged as an alternative to the ponds and other more common SWM/BMP devices. Guidelines published by the Department of Public Works (appendix C) shall be used when low impact development techniques are used. Design procedures developed by jurisdictions within the Metropolitan Washington Area may also be used in the design and review of these facilities.

C. Residential lots 20,000 square feet or smaller shall not be platted with tree save areas credited towards satisfying BMP requirements (BMP conservation areas).

D. For all other residential lots, tree save areas credited towards satisfying BMP requirements may be platted within individual lots, if setbacks are a minimum distance of 30 feet from the principal structure. BMP conservation areas shall be delineated on the plan and plat with a note "BMP Conservation Area, no use or disturbance of the area is permitted without the written approval of the director of Public Works".

720.03 Exemptions: Development exemptions from Prince William County SWM plan submission requirements (refer to Section 720.05 of this manual for waiver of BMP) are as follows:

A. Minor land disturbing activity involving less than five hundred (500) cubic yards of earthwork and less than two thousand five hundred (2,500) square feet of disturbed area, which is promptly stabilized to prevent erosion and sedimentation, not including creation of paved or other impervious surfaces.

B. Accepted agricultural and management practices permitted by the Zoning Ordinance and/or in accordance with an approved siltation and erosion control plan. Examples of such practices in an agricultural zoning district are plowing, nursery operations, such as the removal or transplanting of cultivated sod, shrubs, trees, and tree cutting at or above existing ground, and logging operations leaving the stump, ground cover and root intact.

C. Individual private septic systems which do not alter the natural terrain.

720.04 Waiver of Storm Water Quantity Control Requirements:

A. The director of Public Works may consider granting a waiver for on-site detention facilities under the following conditions, provided that the applicant has provided adequate justification for a waiver consideration:

1. The hydraulic characteristics of the receiving stream or the environmental characteristics of the stream or the site are such that on-site management or detention of flows are contrary to sound engineering practices and detrimental to the environment.

2. The increased amount or velocity of storm water generated by the development will have a minor detrimental effect on the receiving stream.

3. An off-site SWM facility has been identified for construction in the capital improvements program, and the applicant agrees to a financial contribution or dedication of an easement or land for the construction thereof.

4. Two or more developments (including that of the applicant) have provided for the management of storm water, jointly, through reciprocal easements or other means.

5. Existing off-site SWM facilities provide the required control. In such cases, on-site SWM shall be exempt, provided that the delivery system from the developing site to the off-site SWM facility is adequately protected against erosion.

6. Inadequate site availability for a suitable structure, or where the only feasible structure would entail unreasonable cost, as determined by the Department of Public Works.

B. The waiver application shall include technical documentation and computations necessary to support any of the above items. The director of Public Works shall consider granting a waiver for on-site detention facilities under the above-mentioned conditions upon submission of a written request. A sample waiver request form is shown in Exhibit 11.

C. Each waiver request shall be considered individually by the director of Public Works.

D. In reviewing the waiver application, storm drainage outfalls, receiving channels, channel capacities, velocities, and other related storm drainage discharge, considerations shall be closely examined to determine the need for additional outfall treatment and/or channel protection measures.

E. The applicant shall furnish the Department of Public Works a declaration of adequacy, prior to granting a waiver, when adequacy of the receiving storm drainage system is in question.

F. A monetary contribution shall be substituted when on-site SWM is waived. This contribution shall be computed in accordance with sections 720.07, 720.08 and 720.09 of this manual.

720.05 Waiver of BMP (Storm Water Quality) Requirements:

A. Maintenance, alteration, use, or improvement to an existing structure which does not degrade the quality of surface water discharge, as determined by the director of Public Works, may qualify for a waiver of the requirements of this subsection, provided that it complies with erosion and sediment control requirements of Section 750.00 of this manual.

B. The director of Public Works may also consider granting a waiver of BMP requirements for sites where the SWM requirements for storm water quantity have been waived in accordance with Section 720.04 of this manual, provided that it does not result in the degradation of the quality of surface water discharge.

720.06 Pro Rata Share Contribution for SWM in General:

A. The Department of Public Works encourages the use of various methods of on-site storm water detention to minimize the adverse effects of increased runoff on upstream and downstream drainageways. Where the public interest is diminished, however, the director of Public Works reserves the right to deny on-site detention and requires a financial contribution from the applicant. Conditions under which the director of Public Works might deny on-site detention could include, but not be limited to, the following:

1. Proximity of a major waterway to which storm water could be adequately discharged.

2. Proximity of an existing or proposed off-site facility that has adequate storage capacity for handling storm water flows.

3. Indication from the hydrology and hydraulic model available to the Department of Public Works that detention will cause more harm than benefit.

B. An applicant may seek permission to either construct or provide the funds for the construction of more than the proportionate share of the downstream off-site drainage improvements in order to proceed with land improvements without damaging other properties.

C. The County shall attempt to collect (on a pro rata basis) excess funds expended beyond the proportionate share from other property owners within the watershed served by drainage improvements. Such properties shall be developed within a period of ten (10) years from the date that the drainage improvements are financed or constructed. These funds shall be released (without interest) to the initial developer or assigns.

720.07 Pro Rata Share Contribution for a Regional SWM Facility with Allocated Funds:

A. In watersheds where a major off-site detention facility is planned, and funds are allocated to the facility design, the applicant shall be required to pay a pro rata share of the cost of the facility, dedicate land, and/or provide easements to be used for the proposed facility, or for other improvements.

B. The Department of Public Works shall study and compute the total estimated cost of the ultimate SWM facilities required to serve a watershed, when and if such watershed is fully developed (in accordance with the adopted Comprehensive Plan). The computation of estimated costs shall include a watershed study and the total cost and design, construction, operation, maintenance, and land or easement acquisition. The total cost shall be updated annually by applying the Engineering News Record cost index factor to the construction costs.

C. The watershed studies and cost estimates mentioned in B above shall constitute the general drainage improvement program for the affected watershed.

D. A list of the watersheds where major off-site facilities are planned, and design funds allocated, shall be published and updated once adopted by the Board of County Supervisors.

E. An applicant may be required to contribute to necessary drainage facilities located outside the land owned or controlled by the applicant, but necessitated or required, at least in part, by the construction or improvement of the applicant's development. If a general drainage improvement program has been established, pro rata share shall be determined based on the total updated cost of the program.

720.08 Pro Rata Share Contribution for a Regional SWM Facility Without Allocated Funds:

A. In watersheds where the total improvement costs for a particular drainage project have not been calculated, and where monetary contribution in addition to (or in lieu of) on-site detention is allowed, the pro rata share shall not be determined by Table 7-5. The pro rata share shall not exceed the calculated cost required to provide full SWM in accordance with the applicable provisions of this manual.

B. The amount calculated from Table 7-5 shall not exceed the estimated construction cost for a SWM facility that will provide the full SWM requirements for a site. Construction quantity estimates, certified by a professional engineer or land surveyor, shall be submitted for the SWM facilities. The current Prince William County bond estimate price list shall be applied to the quantities to arrive at the calculated cost.

C. The required pro rata share contribution shall be paid prior to the issuance of site preparation, site development or early grading permits. Contributions not paid within six (6) months of the waiver approval shall be recalculated using the current ENR construction cost index.

720.09 Pro Rata Share Payments:

A. Payments received pursuant to this section shall be expended for the administrative costs, land acquisition, design, construction, operation, and maintenance of those drainage facilities for which payment was required. This contribution is nonrefundable.

B. The payment of the applicable pro rata share calculated in the manner described in sections 720.07, 720.08 and 720.09 of this manual shall be a condition of the issuance of any permits.

720.10 Maintenance Policy for SWM/BMP Facilities in General: The entity responsibility for the maintenance of storm water management and drainage facilities shall depend on the type of development containing these facilities as outlined in sections 720.11 through 720.14. In addition, the following policies apply:

A. When the storm drainage system is eligible for maintenance by the County, in accordance with this section, it shall be accepted only if it is bonded and inspected by County inspectors during construction.

B. The Department of Public Works shall maintain the SWM/BMP facilities and the storm drainage systems to prevent a potential safety hazard, a significant impediment to flow, danger of

severe flooding, or erosion. Drainage facilities located within the public street right-of-way are the responsibility of VDOT.

C. The owner of the property on which there is located an easement for storm drainage or SWM purposes shall be responsible for the following items when applicable:

1. Grass mowing with reasonable frequency.

2. Removal of debris and other matter to the best of owner's ability, where such debris or matter has impeded or threatens to impede free flow of storm water.

3. To notify the Prince William County Department of Public Works of: (1) any defects with the structures, pipes, if applicable, and fencing within the easements; (2) any debris or other matter which is beyond the ability of the owner to remove; and (3) any excessive flooding, sedimentation or soil erosion within the area of the easement.

720.11 Residential Properties:

A. The County is responsible for the maintenance of all SWM/BMP, as well as other drainage facilities within the drainage easements, in all residential properties. Wet ponds are accepted for maintenance in accordance with paragraph D.

B. For drainage facilities under privately owned roads, drives and parking areas, the County shall also be responsible for maintenance. However, the maintenance responsibilities exclude resurfacing, paving, and landscaping.

C. The County shall accept maintenance responsibilities of SWM/BMP and other facilities in existing developments (i.e., single-family attached subdivisions with plans approved prior to 1985); after the fee owner(s) have demonstrated that the facilities are operating according to approved plans and have properly dedicated easements. In cases where the plans are not available, or better technology is available, the property owner(s) have to demonstrate that the facility is properly operating.

D. For wet ponds, the County may accept certain maintenance items, such as inspections of dams and outlet structures, removal of debris, dredging activities, etc. The maintenance responsibility shall, however, be determined on a case-by-case basis. Landscaping, special features such as fountains, and maintenance for aesthetics shall not be part of the County maintenance responsibilities.

720.12 Nonresidential Properties:

A. The County is responsible for maintenance of all (dry) detention ponds in nonresidential properties. However, the fee owner(s) shall demonstrate that the facilities are functioning according to approved plans and that the facility has properly dedicated easements, prior to the County assuming maintenance responsibilities. In cases where the plans are not available, or

better technology is available, the property owner(s) have to demonstrate that the facility is properly operating.

B. For wet ponds, the County may accept certain maintenance items, such as inspection of dams and outlet structures, removal of debris, dredging activities, etc. The maintenance responsibility shall, however, be determined on a case-by-case basis. Landscaping and maintenance for aesthetics shall not be part of the County maintenance.

C. The County will not accept maintenance of any underground SWM/BMP facilities. Fee owners are responsible for the maintenance of underground SWM/BMP facilities, and all other types of facilities not described above.

720.13 Apartment Rental Complexes and Mobile Homes: Apartment rental complexes and mobile home developments shall be considered as nonresidential properties for maintenance purposes.

720.14 Regional Facilities in Residential and Nonresidential Properties: The County shall be responsible for the maintenance of all public regional BMP/SWM facilities, except for aesthetic items, such as fountains, landscaping, etc.

720.15 Maintenance Agreements for Owner-maintained SWM/BMP Facilities:

A. Prior to the issuance of site development permits, owners of developments with SWM facilities, which will not be maintained by the County, shall be required to execute a SWM maintenance agreement (see Exhibit 2 of this manual). This agreement is designed to give the County authority to maintain or reconstruct any SWM facility, and to assure its long term operational and functional effectiveness. This agreement shall be recorded with the plat for the property. No modifications to this agreement can be made without the approval of the Department of Public Works and the property owner.

B. The landowner, successors and assigns of owner maintained SWM/BMP facilities shall be required to provide/arrange annual inspections of the facilities. This inspection shall be performed by an individual familiar with the design and operation of SWM/BMP facilities. The annual inspection report shall address the maintenance needs of the facility in accordance with this section and shall include the observations, measurements, or tests which were performed, and the schedule for repairs if needed. Annual inspection reports shall be forwarded to the Department of Public Works before June 30 of each year.

C. Inspection reports certified by a professional engineer licensed in Virginia shall be forwarded to the Department of Public Works before June 30, every 3 years. The Department of Public Works shall review reports and comment on the report findings, and may perform inspections as necessary. The Department of Public Works may require additional maintenance which shall be completed within thirty (30) days of notification. The repairs and reconstruction of the SWM/BMP facilities should be performed under the direction of registered professionals. If the Department of Public Works performs maintenance, the owner may be responsible for the costs incurred from the maintenance operation.

720.16 County Maintained SWM/BMP Facilities:

A. County maintained SWM/BMP facilities shall be inspected and maintained by the Department of Public Works. Easements shall be dedicated to public use during the land development process. Drainage easements are required for the maintenance of storm sewer systems, open channels as defined by the Virginia Erosion and Sediment Control Handbook, improved drainageways of increased concentrated runoff, and for facilities where required by this section.

B. Access easements and driveways are necessary for emergency public access to maintain a drainage way or a storm drainage system located on private property. Furthermore, drainage easements are intended to restrict disturbance of land in the easement which would detrimentally alter the drainage way.

C. Prior to the County performing maintenance or repair on SWM/BMP and drainage facilities, the property owner will be required to enter into an agreement with the County which will hold harmless the County and its agents and employees for any and all damages, accidents, casualties, occurrences or claims which might arise or be asserted against the County for the repair or maintenance of the SWM/BMP or drainage facilities.

720.17 Golf Courses:

A. Prior to the issuance of site development permits, owners of the golf courses, new or expanded, shall be required to execute an agreement. This agreement is designed to give the County the authority to ensure that nutrient management and Integrated Pest Management (IPM) plans (water quality agreements) are developed for the golf course within one year following the construction of the golf course.

B. Reports to document the implementation of the nutrient management and IPM plan, in accordance with the executed water quality agreements, shall be forwarded to the Department of Public Works before June 30th of each year.

721.00 SWM/BMP FACILITIES - PLANNING AND DESIGN

721.01 Facilities Design in General:

A. Storm water management (SWM) addresses the quantity of runoff while best management practices (BMP) addresses the quality of runoff. While there are differences between performance criteria, the two management strategies will often be employed within the same structure or facility. Standards which apply to one set of performance criteria shall not lessen the performance criteria for the other.

B. If both SWM and BMP are provided within the same facility, the final design shall ensure that the performance criteria and maintenance are compatible.

C. The engineer shall use the "Virginia Storm Water Management Handbook" as a supplement to DCSM for the design of SWM facilities subject to approval from the director of Public Works.

D. An acceptable SWM plan can be obtained by the following measures:

1. Providing the necessary facilities within the project area.

2. Entering into a joint effort with other developers to provide multisite facilities

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3. Entering into an agreement with the County, subject to prior approval by the Department of Public Works for a financial contribution for off-site SWM. Such contributions shall be held by the County and used only for SWM facilities within the major drainage basin wherein the developer's project is located. The County may choose to construct such facilities, or may use the contributions to reimburse developers who provide SWM facilities in excess of their own needs.

4. Granting an easement or dedicating land for a larger SWM facility, subject to prior approval by the Department of Public Works, in lieu of the required on-site SWM.

5. When the County determines that additional storage capacity (beyond that required by the applicant for on-site SWM) is necessary, it may acquire from the applicant or owner, by purchase or dedication, additional land as may be necessary, and/or participate financially in the construction of the SWM facility to the extent that it exceeds the required on-site SWM.

6. Participation in a regional SWM facility.

721.02 Design Criteria for SWM/BMP Facilities:

A. Peak flows and rainfall frequencies and durations shall be determined using the provisions of this subsection.

B. The ten (10) year storm shall be used in determining pre-developed flow, except in critical watershed areas (see G. below). The twenty-four (24) hour SCS Type II rainfall distribution shall be used. SWM facilities shall be designed to regulate the two (2) and ten (10) year storm such that the post development peak flows do not exceed predevelopment peak flows. In certain watersheds, the director of Public Works may require that the SWM facilities be designed to regulate the one (1) and ten (10) year storm events.

C. A ten (10) year storm shall be used in determining the developed flow, except in critical watershed areas. If the rational method is used, five (5) or ten (10) minute increments of this storm shall be computed and compared to the pre-developed runoff to determine the amount of storage required (see Exhibit 13). In cases where there is no significant difference between pre and post-development discharges, the designer should determine if a SWM facility is beneficial for the watershed. A pro rata share may be substituted upon approval by the director of Public Works.

D. The control structures of SWM ponds shall be designed and located such that they reduce the ten (10) year post development flows for the entire watershed at the point of location by at least twenty percent (20%).

E. SWM facilities located upstream of existing or future (in accordance with the Comprehensive Plan) residential areas with required minimum lot sizes less than one (1) acre shall be designed to regulate the peak discharge from the two (2) and ten (10) year storm.

F. SWM facilities shall be designed to regulate the peak discharge from the two (2), ten (10), and one hundred (100) year storms, if located upstream of existing residential developments with required minimum lot sizes less than one (1) acre and located adjacent to special flood hazard areas, as delineated in the County's FIRM.

G. In critical watershed areas, in addition to the two (2) year and ten (10) year storms, SWM facilities must also be designed to regulate post development flows to the predevelopment levels for the twenty-five (25) year storm events. A list of critical watersheds shall be maintained by the Department of Public Works. Monetary contribution, in addition to providing storage for the ten (10) year storm, may be allowed by the director of Public Works, in lieu of regulating the twenty-five (25) year storm. Requests for such substitutions must be made in writing.

H. The effect of the one hundred (100) year storm must be considered in the design of all SWM facilities unless, due to the height of the dam and the capacity of the impoundment, smaller frequency storms have to be considered during the design. Emergency spillways and ponds shall be designed to pass the one hundred (100) year storm, with the assumption that the principal outlet structure is inoperative. Dam design shall be performed in conformance with Section 721.07 of this manual.

I. Where required, the use of anti-vortex devices and trash racks shall be included in the design of the principal spillway. Possible flotation of the outlet devices and structures shall be avoided.

J. Pollution loads shall be determined by calculation methods set forth in the Northern Virginia BMP Handbook. Where required, BMP facilities shall be designed to reduce projected phosphorus runoff resulting from site development by at least fifty percent (50%). Phosphorus removal efficiencies for the different types of BMP systems are included in the Northern Virginia BMP Handbook. Where a method or facility without an efficiency rating is proposed, the designer shall be required to adequately substantiate the ratings before the design is approved. The Virginia Storm Water Management Handbook, as amended, may be used as reference to supplement the information provided in the Northern Virginia BMP Handbook**.**

K. Concrete trickle ditches shall not be allowed in SWM facilities, unless a continuous low flow exists. To ensure positive drainage, dry ponds shall have a minimum slope of 2% (two percent). The SWM facilities shall be designed to minimize standing water beyond the design detention time to prevent the problems associated with the propagation of insects, particularly mosquitoes.

L. The following methods are considered acceptable to achieve the pollution load objectives of this section:

1. Structural measures that store storm water and rely upon solid settling processes to remove pollutants. Minor modifications could practically convert a storm water detention facility to a multipurpose facility, satisfying both water quality and quantity needs. Extended detention ponds and wet ponds are examples of acceptable structural measures.

2. Volume control BMP, such as porous pavement, sand filters, modular pavement, and infiltration pits or trenches (when the soil permeability allows) or nonstructural BMPs such as bioretention practices, vegetated swales, etc.

3. Entering into a joint agreement with other developers to provide appropriate multisite facilities.

4. Entering into an agreement with the County, subject to prior approval by the director of Public Works, which provides for a financial contribution for off-site SWM and BMP. Such contributions shall be held by the County and used only for SWM and BMP facilities within the major drainage basin where the developer's project is located. The County may construct such facilities, or use the contributions to reimburse developers who provide SWM facilities in excess of their own needs.

5. Restoring a minimum of twenty percent (20%) of the site to vegetated open space on a redevelopment site that is predominantly impervious as currently developed.

6. Preservation of existing or woodland vegetation in conjunction with minimizing impervious cover.

a. In accordance with the CBPA designation and management regulations (VR-173-02-01), the one hundred (100) foot buffer area achieves a seventy-five percent (75%) reduction of sediments and a forty percent (40%) reduction of nutrients. To achieve this effectiveness, the method of flow over and through the buffer shall be generally sheet flow that promotes sedimentation and nutrient uptake. A large drainage area resulting in high volumes or velocities flowing through a concentrated swale cannot have this effectiveness as research has indicated that concentrated flows are not treated effectively in natural open spaces.

b. Large lot residential subdivisions with five (5) acres or greater lots are considered to meet these criteria.

M. For redevelopment incorporating an existing BMP, an engineer shall certify that the facility is in good working order and performing at the necessary level of service. Maintenance records may be necessary to verify that the facility has been operating correctly.

N. Underground structures detaining flows but not providing inground percolation, or not documented to reduce pollution loads, shall not be allowed.

O. Concrete shall be used for outlet pipes and structures. Outflows from a BMP facility shall be regulated by either a bolted-on plate or a lockable gate valve. Outlet structures shall be designed so that the downstream side of the BMP orifices is accessible when ponds are at the flooding stage. BMP plates shall have only one hole unless holes are three (3) inches in diameter or greater and shall be made of rustproof material or rendered rustproof. The BMP plate shall be provided on the inside of the riser structure to allow for easier maintenance. The engineer shall provide a debris cage in front of the BMP orifice to prevent the potential clogging of the BMP orifice.

P. Storm water outfalls should be located at a distance equal to or greater than two-thirds (2/3) the maximum dimension of the pond (length or width) from the outlet structure. The two (2) year and ten (10) year storm should be used in determining the pond's dimensions. Baffles may be used to increase the effective distance between inlets and outlets.

Q. Wet pond designs shall include specific provisions to permit dredging of sediment. Gate valves shall be provided to permit the dewatering of the facility. Other possible provisions shall include sediment forebays (with sediment dewatering within easy reach of drag line or other designated equipment), and sediment dewatering beds, designed to permit hydraulic dredging. Sediment dewatering areas should be adjacent to the facility, drain into the facility, and be protected by an easement.

R. For infiltration trenches/pits that receive surface flow, sheet flow across a grass filter strip shall be used. This grass filter strip shall be fifteen (15) feet wide and included within the easement.

S. For infiltration trenches that receive runoff through a pipe, pretreatment devices for the removal of oil, sand and gravel shall be incorporated in the design. The use of oil and grit separators as primary BMPs is not acceptable.

T. Infiltration trenches shall have monitoring wells or other equally accurate means to measure the need for renewal of the stone. Such devices shall be provided at the rate of one (1) per each two hundred (200) cubic yards of stone. The design computation shall identify specific measurements which indicate when renewal of the stone is required, and these measurements shall be included in the maintenance agreement.

U. All parking lots, as conventionally constructed, shall be considered impervious and therefore included in the impervious area considerations. Specially designed treatments with proven results and accompanying supportive documentation may be considered.

V. Resurfacing a previously approved or legally nonconforming impervious area shall not require SWM or BMP, nor shall it be included in the impervious area calculation.

W. Impervious area calculations for buildings shall include overhanging projections such as eaves, canopies, and porticos.

X. All dry pond/BMP designs shall include a minimum 6-inch diameter gate valve to permit complete dewatering of the facility in the event of a clog.

Y. In general, SWM facilities, BMPs and associated features shall be designed to ensure positive drainage.

Z. The invert of the inflow pipes (outfalls) discharging into a wet pond shall not be kept below the normal (permanent) pool elevation, unless the design accommodates for the backwater conditions within the storm sewer. In a submergence situation, the backwater from the normal pool shall not extend beyond the first upstream structure, and the first upstream structure shall not be located closer than 50 feet from the nearest dwelling. For dry ponds, as a general rule, the invert of the inflow pipe should be kept above the BMP water surface elevation to the extent possible. In any case, the invert of the inflow pipes into a dry pond shall be kept at least 2 feet above the bottom elevation of the pond. For both dry and wet ponds, the backwater within the storm sewers shall not cause inundation within the VDOT right of way or any private street during a 10-year storm event.

721.03 Location of SWM/BMP Facilities:

A. Above ground SWM and BMP facilities shall be located in conformance with the applicable sections of the Zoning Ordinance.

B. In general, SWM and BMP facilities shall be set back at least fifty (50) feet-from a dwelling unit. Likewise, a dwelling unit shall be set back at least fifty (50) feet from a SWM and BMP facility.

C. Unless authorized by the Zoning Ordinance, SWM and BMP facilities shall not be located in required buffer areas. They shall be set back from property lines a distance equal to the minimum width of the applicable required buffer yard established in Section 800.00 of this manual or setback established in the applicable zoning district or ten (10) feet whichever distance is greater.

D. Notwithstanding the provisions of the preceding paragraph, a SWM and BMP facility in nonresidential districts shall not be located within thirty (30) feet of a property line along which a buffer zone is required.

E. In single-family detached and single-family attached developments, SWM and BMP facilities shall be located within easements in lots which will be conveyed to and maintained by a homeowners' association. In the absence of a homeowners' association, SWM and BMP facilities may be located in individual lots, provided that the minimum lot area required is met outside the area devoted to the SWM and BMP facilities and floodplains. The area devoted to storm drainage systems (including SWM and BMP) shall not exceed twenty percent (20%) of the total area of the lot.

F. SWM and BMP facilities shall not be located within individual single-family attached lots.

G. Nonregional SWM facilities shall not be located within identified special flood hazard areas delineated in the County's FIRM.

H. SWM and BMP setback areas shall be stabilized and landscaped, provided access easements remain clear in accordance with Section 721.05 and 800 of this manual.

I. All measured distances of setbacks mentioned above shall be to the one hundred (100) year ponding limits.

J. SWM and BMP facilities shall not be located within Resource Protection Areas except as allowed or in conformance with Section 740.

K. SWM Facilities shall not be designed and constructed to include jurisdictional wetlands, unless the wetland disturbance has been authorized by the state and federal agencies.

721.04 Easements for SWM/BMP Facilities:

A. An easement around the SWM/BMP facility shall be required.

B. SWM and BMP facility easements shall be provided to adequately contain the one hundred (100) year ponding level (plus required freeboard), embankment, outlet structures, and an appropriate width of maintenance area around the one hundred (100) year ponding area that permits access to the dam, outlet structures, and embankment.

C. For infiltration trenches and other underground systems, the easement shall include a ten (10) foot wide strip outside the edges of the structure. This width will be increased one (1) foot for each foot that the depth of structure exceeds six (6) feet.

D. The easement shall include a space to stockpile material which would be excavated during reconstruction or maintenance of the facility. If the stockpile area cannot be accommodated within the SWM easement, then an equally accessible area outside of the easement shall be provided.

E. Easement for pipes used as SWM and BMP facilities shall be provided in a manner similar to that described in Section 702.08 of this manual.

F. Retaining walls shall not be located within SWM easements located in residential subdivisions and/or within County maintained SWM facilities, unless approved by the director of Public Works.

721.05 Access to SWM/BMP Facilities:

A. Access to SWM/BMP facilities shall be within an easement of not less than twenty (20) feet in width and shall not exceed a grade of twenty percent (20%). If the grade exceeds ten percent (10%), the travelway shall be built in accordance with Category I pavement design. A curb cut from the road shall be provided.

B. The access easement and a minimum ten (10) foot travelway shall not have obstacles, vegetation, cross slopes, or grades which would prevent easy access by a four-wheel drive light truck onto the embankment and to the BMP or other outlet structures within the impoundment areas. The travelway shall have a minimum of six (6) inch VDOT 21A stone. A turnaround at the end of the travelway shall be provided if the length exceeds one hundred fifty (150) feet.

C. The access travelways to SWM facilities shall be built prior to the issuance of building permits for residential lots abutting the access easements.

D. The site development plans should consider the provision of adequate access to open space areas surrounding watercourses to allow equipment to maintain the area and watercourse, and any sanitary sewer or utility lines therein. The access should also relate to prospective recreational and park uses. Pedestrian crossings of streams may also be desirable in some instances.

721.06 Protection of SWM/BMP Facilities:

A. The Department of Public Works shall require protective devices and warning signs in conjunction with SWM and BMP facilities. Protective devices shall be in the form of one of the following:

1. Four (4) foot high chain link fence or approved equivalent with gate, in accordance with VDOT road and bridge standards.

2. Gradual slopes no steeper than ten to one (10:1) in the inner perimeter of the facility and a shallow water depth for a minimum horizontal distance of twenty (20) feet measured from the ten (10) year ponding elevation.

3. Alternate means of protection as approved by the director of Public Works.

B. Permanent fencing, when required, shall be installed with a fifteen (15) foot wide gate where the access road enters the facility. Fencing shall be installed around the easement in such a manner to minimize obstruction of the emergency spillway. Adequate access must be provided within the facility for maintenance. Wet ponds shall not require fencing.

C. Ponds in industrial or business parks remotely located from residential development and the public shall not require fencing. Wet ponds must have aquatic benches along the entire shoreline, except portions having slopes of ten to one (10:1) or flatter to a two (2) foot-depth of water.

D. A minimum of two warning signs or more, as required by the director of Public Works, shall be posted at SWM and BMP facilities within residential developments and commercial or industrial developments which are close to residential communities. These signs shall be in accordance with Exhibit 19 and 20 of this manual and are available from the sign shop.

721.07 Dams:

A. Items to be considered in the design of dams should include, but not necessarily be limited to, the following:

1. Embankment: Type of material, placement of material, compaction, permeability of material, settlement, vegetative cover, cross-section shape, stability, site geology, deformation and foundation contact conditions. Any design and stabilization recommended by the geotechnical engineer shall be shown on the plans. No other utilities shall be located within the SWM facilities and embankment areas. In addition, no trees shall be planted within the embankment area.

2. Seepage Considerations: Placement of impervious material or zoning of embankment materials, foundation material, cut-off trench, drains, concrete cradle drainage blankets, and internal drains, differential settlement, local ground water condition and foundation under seepage.

3. Riser and Culvert: Materials, joint connections, trash control, clogging, anti-vortex device, structural strength and stability, flotation, lake drawdown device, and differential settlement. Trash racks shall extend a minimum of one (1) foot beyond all sides of the riser structure.

4. Hydrology and Hydraulics: Ultimate upstream land use, freeboard, erosive velocities, water surface fluctuation, storage capacity, spillway capacity, staff gage, and storm durations and distributions.

5. Downstream Area: Existing development, existing zoning, ultimate land use, dam failure and analysis, and determination of inundated area with and without dam.

6. Maintenance: Vehicular access, safety of dam and appurtenances.

B. Any proposals for the construction of dams to form dry and wet ponds or lakes shall be fully supported by detailed engineering plans and calculations and shall generally include the following:

1. Inflow and outflow hydrographs for the two (2) year, ten (10) year, and one hundred (100) year floods, and principal spillway hydrograph, emergency spillway, and freeboard hydrograph.

2. Design calculations and details for the principal spillway, emergency spillway, and outlet works. Outlet analysis shall be provided in accordance with Section 701.02 of this manual.

3. Depth (elevation) versus volume of storage curve and depth (elevation) versus outflow curve. All formulas and assumptions used to develop these curves shall be included.

4. Emergency spillway design calculations for ponds with storage in excess of two (2) acre-feet shall include a free board safety factor in accordance with practices set forth in the National Engineering Handbook, Chapter 4, of the SCS. When the riser is used as the emergency spillway, the two (2) and ten (10) year flows must be controlled with a separate orifice or weir. A minimum of one (1) foot of freeboard from the one hundred (100) year ponding limits to the top of embankment shall be provided.

5. Embankment design computations, including seepage control, slope protection, freeboard calculations, and stability analysis.

6. Calculations or effects (if any) on established floodplain boundaries.

7. Description of the operation and maintenance plan for the facility, including an inspection schedule. The maintenance plan shall also include sediment deposition computations.

C. Special requirements:

1. A dam break analysis shall be required for wet ponds with a dam height of fifteen 15) feet or greater and an impoundment capacity of twenty-five (25) acre-feet or greater.

2. The design of the dam shall comply with Virginia Dam Safety Regulations as applicable. For dams regulated by the state, the owner is responsible for procuring necessary approval from the state.

D. Water quality impact assessment as may be required by Section 742.04 of this manual. For any impoundment, the design procedures, manuals, and criteria used by the United States Army Corps of Engineers, SCS, the Water and Power Resources Services (formerly the Bureau of Reclamation), the National Weather Service, and the Virginia Department of Conservation and Historic Resources may be used. In addition, other recognized design methods may be used with approval of the Department of Public Works.

E. Soil structures and characteristics shall be investigated. Plans, data and subsurface investigations conducted by a professional engineer, qualified as an expert in geotechnical engineering, shall be submitted with the plans. These submissions should consider and offer design solutions for frost heave potential, shrink-swell potential, soil bearing strength, water infiltration, soil settling characteristics, fill and backfilling procedures, and soil treatment techniques as required to protect the improvements or structures.

721.08 Sedimentation and Debris Basins:

A. In some locations, as may be allowed by Section 740.00 of this manual, sedimentation basins or debris barriers may be situated in the watercourses for the control of silt or debris while upstream construction is taking place.

B. The planning of these basins should include consideration of the necessity to remove these basins, and the trapped materials, when the construction process is completed. The effects of

these facilities on the surrounding environment shall also be considered (i.e., the deposition of silt over root systems, the preservation of existing woodland, etc.).

C. Sedimentation basins are not normally acceptable as permanent facilities due to maintenance problems and the long term desirability of eliminating erosion, rather than merely trapping a percentage of the eroded material.

D. The installation of permanent debris barriers (designs may be found in BPR publication, Hydraulic Engineering Circular No. 9) may be desirable in particular instances. The desirability of permanent debris barriers shall be assessed on an individual basis.

E. Permanent debris barriers, if approved, should be in a location accessible to heavy equipment and trucks and would primarily be for the purpose of trapping large debris such as dead tree limbs before such material could float downstream to block a culvert system. Location of such debris barriers should include consideration of flood water levels that could occur if the barrier had trapped a considerable amount of such debris.

F. A final step in the construction process should include the removal of any debris, rubbish, trash and waste construction material in a similar manner to that done for other portions of the development.

722.00 SWM/BMP - SUBMISSION REQUIREMENTS

722.01 General Requirements:

A. An application for a final plan of subdivision shall not be approved unless it includes the manner in which erosion, sediment, pollutant loading, and storm water resulting from the development will be controlled, managed, or waived. This plan shall indicate whether storm water or BMP shall be managed on-site or off-site, the location design criteria of facilities, and type of management proposed.

B. A building permit shall not be issued for a parcel or lot until a SWM and BMP plan, or waiver thereof (for the plat or parcel), shall have been approved by the Department of Public Works as meeting applicable requirements.

C. A SWM and BMP plan shall be provided as a part of every site development plan submission, unless a waiver of the requirements of the policy is approved by the director of Public Works, in accordance with provisions of sections 720.04 and 720.05 of this manual.

D. Final SWM and BMP plans shall be submitted with final site development plans. They shall be subject to the applicable review and notification procedures and time schedules presented in the Administrative Procedures Manual.

722.02 Plan Elements: The following information shall be included in the final SWM and BMP plans:

A. Information provided in the preliminary plan with required changes. This usually includes a description of the approach proposed to manage storm water in the site.

B. Calculations, assumptions, and criteria used in the design of the storm drainage system and SWM facilities. This includes, but is not limited to, time of concentration, time of concentration flow paths, runoff curve numbers, soil types, runoff coefficients, etc.

C. Plans and profiles of proposed storm drainage systems and open channels, including horizontal and vertical controls, elevations, sizes, slopes, and materials.

D. Locations, dimensions, and design details required for the construction of facilities, including details for installation of trash rack and antivortex devices on riser pipes.

E. Drainage area maps, soil maps, and land use maps, no smaller than 1"=200' scale or as requested by the director of Public Works.

F. Inflow and outflow hydrographs generated by the design storms for pre- and post-developed conditions.

G. Depth (elevation) versus volume of storage curve and depth (elevation) versus outflow curve, including formulas and assumptions used to develop these curves.

H. Contours that adequately describe the final topography.

I. Project specifications for erosion and sedimentation control (refer to Section 750.00).

J. Deed restrictions, easements, and rights-of-way.

K. Description of the operation and maintenance needs for SWM and BMP facilities, including a schedule of sediment removal and/or control. A maintenance agreement, as shown in the exhibit section of this manual, stating the ownership and maintenance responsibilities for SWM and BMP control structures, both during and after development. The identity of the responsible individual, corporation, association, or other specific entity, including the specific maintenance outlined on the plan and plat.

L. SWM fact sheet (See Exhibit 15).

M. Depth to severest high water table or peaked water table. Percolation tests and calculations for gravel trenches or pits proposed to incorporate infiltration into soil. The Department of Public Works reserves the right to require additional calculations or information which may be necessary to evaluate the design of the facility.

722.03 Modification of Approved Plans: Modification of an approved SWM/BMP plan involving a change in control methods or techniques, the relocation or redesign of control measures, or where soil or other conditions are not as stated on the approved application, shall be

approved under the procedures contained in the Administrative Procedures Manual. The Department of Public Works shall notify the applicant when such plan modification is required.

722.04 Maintenance Notes for Residential Properties (Not Including Apartments and Mobile Home Parks) Where SWM, BMP and Storm Drainage Systems Qualify for County Maintenance:

The record plats and plans shall contain the following notes for facilities and systems that are eligible for County maintenance:

> "The County shall maintain drainage, storm water management, and best management practices facilities and systems to ensure that they function properly. The County shall not be responsible for repaving or resurfacing paved areas or maintaining landscaping within easements. The fee title owner shall be responsible for grass mowing with reasonable frequency, if applicable, and for the removal of debris and other matter that has impeded or threatens to impede the free flow of storm water.
>
> The fee title owner shall notify the Department of Public Works of any defects with the structures, pipes and fencing within the easement, of any debris or other matter which is beyond the ability of the owner to remove, and of any excessive flooding, sedimentation or soil erosion within the area of easement."

722.05 Maintenance Notes for Nonresidential Properties (Including Apartments and Mobile Home Parks) Where the SWM, BMP and Storm Drainage Systems Do Not Qualify for County Maintenance:

The record plats and plans shall contain the following notes for facilities and systems that are not eligible for County maintenance:

> "The fee title owner shall be responsible for the maintenance of all drainage, storm water management, and best management practices facilities and systems in accordance with the maintenance agreement to ensure that they function properly.
>
> Subject to other limitations, the fee title owner may landscape the easement to include vegetation, signs and fences, provided that drainage and the County's or the owner's ability to access the easement is not compromised and that the County is not in any way responsible for the repairs of these landscape items even if damaged by County forces."

722.06 Maintenance Notes for Nonresidential Properties (Including Apartments and Mobile Home Parks) Where the SWM and BMP Systems Qualify for County Maintenance but All Other Storm Drainage Systems are Maintained by the Fee Title Owner:

> "The fee title owner shall be responsible for the maintenance of all storm drainage systems, except the storm water management and best management practices pond(s) to ensure that they function properly.

The County shall maintain storm water management and best management practices pond(s) to ensure that they function properly. The County shall not be responsible for repaving or resurfacing paved areas or for maintaining landscaping within easements.

The fee title owner shall be responsible for grass mowing with reasonable frequency, if applicable, and for the removal of debris and other matter that has impeded or threatens to impede the free flow of storm water. The fee title owner shall notify the Department of Public Works of any defects with the structures, pipes, and fencing within the easement, of any debris or other matter which is beyond the ability of the owner to remove, and of any excessive flooding sedimentation or soil erosion within the area of easement.

Subject to other limitations, the fee title owner may landscape the easements to include vegetation, signs, and fences, provided that drainage and the County's or the owner's ability to access the easement is not compromised and that the County is not in any way responsible for the repairs to these landscape items, even if damaged by County forces."

730.00 FLOODPLAIN MANAGEMENT - POLICY

730.01 General Policy:

A. Whenever the balance established by nature between a watershed and its naturally stabilized drainageways is disturbed by development, some corrective measures shall be taken to restore the balance and to avoid downstream flooding and damage. The need for corrective measures does not preempt any requirements established in Section 740.00 or elsewhere in this manual.

B. Persons wishing to construct or repair bridges, culverts, embankments, channelizations, dams, reservoirs, and small ponds must obtain any necessary permits or certificates from the federal or state agencies regulating these types of activities in the County's waterways.

C. Permits or certificates obtained from federal or state agencies do not obviate the need to submit the required information and plans to the Office of Planning for distribution to other County agencies and for review and approval of this information and plans. The agencies that are often involved with or regulate construction on waterways are the U.S. Army Corps of Engineers, the Federal Emergency Management Agency, the Virginia Marine Resources Commission, the Division of Soil and Water Conservation of the Virginia Department of Conservation and Recreation, and the Department of Environmental Quality (DEQ). It is the responsibility of the property owner to initiate and obtain the necessary Federal Emergency Management Agency flood insurance map revisions or amendments if floodplain modifications occur in areas identified as special flood hazard areas (A and AE) in the FIRM. Copies of correspondence with these agencies regarding the project shall be provided.

730.02 Definitions: The following words and terms used in this subsection of the manual have the following meanings, unless the context clearly indicates otherwise:

A. Base Flood One Hundred Year Flood/Regulatory Flood - A flood that, on the average, is likely to occur once every one hundred (100) years (i.e., that has a one percent (1%) chance of occurring each year, although the flood may occur in any year).

B. Base Flood Elevation (BFE) - The Federal Emergency Management Agency designated one hundred (100) year water surface elevation.

C. Basement - Any area of the building having its floor subgrade (below ground level) on all sides.

D. Development - Any man-made change to improved or unimproved real estate including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

E. Floodplain - Any land area that would be inundated by floodwater as a result of the regulatory flood.

F. Floodway - The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base or regulatory flood without cumulatively increasing the water surface elevation more than one-half (1/2) foot in height. The Floodway District includes all areas delineated as floodways in the Flood Insurance Study and shown on the accompanying Flood Boundary and Floodway Map or Flood Insurance Rate Map and all floodways delineated from studies.

G. Freeboard - A factor of safety, usually expressed in feet, above a flood level for purposes of floodplain management.

H. Lowest Floor - The lowest floor of the lowest enclosed area including basement.

I. Recreational Vehicle - A vehicle which is (a) built on a single chassis; (b) four hundred (400) square feet or less when measured at the largest horizontal projection; (c) designated to be self-propelled or permanently towable by a light duty truck; and (d) designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational camping, travel, or seasonal use.

J. Substantial Damage - Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed fifty percent (50%) of the market value of the structure before the damage occurred.

K. Substantial Improvement - Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds fifty percent (50%) of the market value of the structure before the start of construction of the improvement. This term includes structures which have incurred substantial damage, regardless of the actual repair work performed. The term does not, however, include either (1) any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure

safe living conditions, or (2) any alteration of a historic structure, provided that the alteration will not preclude the structure's continued designation as a historic structure.

730.03 Floodplain Studies:

A. Floodplain studies shall be required whenever the drainage area is greater than one hundred (100) acres.

B. Drainage studies may be required for drainage areas greater than forty (40) acres if building lots (zoned for less than one acre minimum lot requirement) are proposed adjacent to the stream.

C. Minor drainage studies may only be required with a drainage area less than forty (40) acres if there are lots proposed adjacent to the stream on which the proposed building site is less than ten (10) feet above flow line of the stream. In lieu of a drainage study, a flood hazard area may be shown on the plan, coinciding as a minimum, with the contour which is ten (10) feet above the flow line of the stream. No permanent construction shall be permitted within this flood hazard area.

D. In addition to determining the one hundred (100) year floodplain, calculation of a floodway shall be required for drainage areas of one square mile or larger.

E. The areas as established by the floodplain studies above shall be identified with boundary lines with bearings and distances and identified as a flood hazard area.

730.04 Platting Lots within the One Hundred (100) Year Floodplain:

A. Residential lots in zoning districts where the required lot area is ten thousand (10,000) square feet or less shall not be platted within the one hundred (100) year floodplain as established in accordance with this section. This includes lots with no minimum area requirements.

B. In all other residential zones (other than those listed in A. above), lots may be platted within the one hundred (100) year floodplain as established in accordance with this subsection provided that all primary and accessory structures and onsite sewage disposal systems including septic tanks and drainfields are located outside of the floodplain:

1. For lots where the minimum required area is up to five (5) acres, the minimum lot area required by the particular zone, or one acre, whichever is less, shall be located outside the limits of the one hundred (100) year floodplain; or

2. For lots where the minimum required area is greater than five (5) acres, a minimum of two (2) acres shall be located outside the limits of the one hundred (100) year floodplain.

730.05 Waivers:

A. In reviewing waivers for activities in the flood hazard overlay district, the director of Public Works shall consider the following factors:

1. The relative danger to life and property due to increased flood heights or velocities caused by encroachments.

2. The relative danger that materials may be swept onto other lands or downstream to the injury of others.

3. The degree to which the proposed water supply and sanitation systems are able to prevent disease, contamination and unsanitary conditions.

4. The degree to which the proposed facility and its contents is susceptible to flood damage and the effect of such damage on the individual owners.

5. The degree to which the proposed facility provides public service.

6. The need that facility has for a waterfront location.

7. The availability of alternative locations within the flood hazard area for the proposed use.

8. The extent to which the proposed use is compatible with development and development anticipated in the foreseeable future.

9. The extent to which the proposed use is compatible with the Comprehensive Plan.

10. The extent to which the property is safely accessible in time of flood.

11. The expected height, velocity, duration, rate of rise and sediment transport of the flood waters expected at the site.

12.. The repair or rehabilitation of historic structures upon determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the waiver is the minimum necessary to preserve the historic character and design of the structure.

13. Such other factors which are relevant to the purpose of this section of the manual.

B. Waivers shall be issued only after the director of Public Works has determined that the granting of such will not result in (a) unacceptable or prohibited increases in flood height, as identified in Section 731.01(A), (B) and 731.04(B); (b) additional threats to public safety; (c) extraordinary public expense; (d) and will not create nuisances; (e) cause fraud or victimization of the public; or (f) conflict with local laws or ordinances. Waivers will be issued only after the director of Public Works has determined that variances will be the minimum required to provide relief from any hardship to the applicant. The director shall notify the applicant for a waiver, in writing, that the issuance of a waiver to construct a structure below the one hundred (100) year flood elevation (a) increases the risks to life and property, and (b) will result in increased premium rates for flood insurance.

C. A record shall be maintained of the above notification as well as all waiver actions, including justification for the issuance of the waivers. Any waivers which are issued shall be noted in the annual or biennial report submitted to the federal insurance administrator.

730.06 Nonconforming Use Policy: A structure or the use of a structure or premises which was lawful before September 23, 1975, or the date of adoption of an applicant amendment to this article, but which is not in conformity with the provisions of this article, may be continued subject to the following conditions:

A. No structural alterations, additions, or repairs singularly or cumulatively to any nonconforming structure shall exceed fifty percent (50%) of its current appraised value, unless the structure is permanently changed to a conforming use.

B. If a nonconforming use is discontinued for twelve (12) consecutive months, any future use of the building/premises shall conform to this article.

C. If any nonconforming use or structure is destroyed by any means, including floods, to an extent of fifty percent (50%) or more of its value, it shall not be reconstructed, except in conformity with the provisions of this article. The Department of Public Works may permit reconstruction, if the use of the structure(s) is located outside the floodway, and upon reconstruction, is adequately and safely flood proofed, elevated, or otherwise protected.

730.07 Conflicting Provisions Policy:

A. Whenever any provisions of this section impose a greater requirement or a higher standard than is required in a state or federal regulation or other provision of this manual, or other County ordinances or regulations, the provisions of this section shall govern.

B. Whenever any provisions of any state or federal statute or other provision of this manual or other County ordinances or regulations impose a greater requirement or a higher standard than is required by this section, the provisions of the state or federal status or other provisions of this manual or other County ordinances or regulations shall govern.

730.08 Disclaimer of Liability for Areas Outside Flood Hazard Districts:

A. The degree of flood protection required by this article is considered reasonable for regulatory purposes. Larger floods may occur on rare occasions, or flood heights may be increased by man-made or natural causes, such as bridge openings restricted by debris. This article does not imply that areas outside the one hundred (100) year floodplain or land uses permitted within such districts will be free from flooding or flood damages.

B. The granting of a permit or approval of a site development plan in an identified flood hazard area shall not constitute a representation, guarantee, or warranty of any kind by any official or employee of the County of the practicability or safety of the proposed use and shall create no liability upon the County, its officials, or employees.

731.00 FLOODPLAIN MANAGEMENT - PLANNING AND DESIGN

731.01 Determination of Floodway and Limits of the Regulatory Flood:

A. In the floodway district no encroachments, including fill, new construction, substantial improvements, or other development shall be permitted unless it has been demonstrated through hydrologic and hydraulic analyses, performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in the one hundred (100) year flood elevation.

B. In unstudied (areas outside of the AE zones) or approximate floodplain areas, computation of the floodway shall be based on the area required to convey the regulatory flood without increasing flood heights more than one-half (1/2) foot at any point. Computation of increases in flood heights caused by an encroachment shall be based upon equal conveyance reduction on both sides of the watercourse within that reach. The Department of Public Works may allow use of the floodway delineation for streams studied in detail (Zone AE) in the flood insurance study, if determined to be an accurate representation of current conditions, and no floodplain disturbance is proposed.

C. For any floodplain disturbance or modification, the water surface elevations shall be established in accordance with Section 732.02 of this manual.

731.02 Floodplain Studies: The following procedure shall be used by the Department of Public Works in reviewing the computations for establishment of water surface elevations and balance of energy of flowing streams and their floodplains.

A. Examination of the topography of the floodplain area for the location of major constrictions, sharp changes of slope, or where the cross-section becomes narrow relative to the width of the channel.

B. Review of the plotted cross-sections of the stream.

C. Review of the water surface profiles for the one hundred (100) year discharges using the U.S. Army Corps of Engineers' HEC-2 water surface profiles program, and HEC-RAS.

D. Comparisons of determined values with available gauge data, USGS regional equations, or any existing reports by federal, state, or local agencies.

E. Check of the hydrologic models in the following areas:

1. Model representation of the watershed (schematic);

2. Tabular data for cross-sections and structures;

3. Precipitation data;

4. Drainage areas;

5. Runoff curve numbers;

6. Times of concentration;

7. Reservoir and channel routing parameters;

8. Miscellaneous items (assumptions, back-up data, other input parameters etc.)

F. Check of the hydraulic models in the following areas:

1. Length of study and relationship with other cases.

2. Discharges check.

3. Starting water surface elevations.

4. Manning's "n" values and contraction and expansion coefficients.

5. Cross-section spacing and accuracy.

6. Bridge modeling.

7. Floodway computations, if applicable.

8. Miscellaneous items (assumptions, critical depths, etc.).

G. Check of the representation of the hydrologic and hydraulic analyses on the plans and profiles.

731.03 Effects of Fills:

A. Filling within the one hundred (100) year floodplain of the original stream will frequently create an obstruction that will cause higher water levels upstream during flood flows. Such filling in floodplains is not allowed, except for road crossings, SWM facilities, or as allowed by Section 740.00 of this manual.

B. When filling of floodplain is allowed, hydrologic analyses shall be prepared and backwater curves should be carefully calculated based on the presence of the fill or other obstructions. Included shall be a comparison of the flood level at the upstream and downstream property line for existing and modified channel cross conditions.

C. If filling within the one hundred (100) year floodplain impacts offsite properties with regard to floodplain boundaries, the developer shall procure necessary flood hazard areas from the

offsite property owners and duly record the flood hazard areas. In addition, the developer shall obtain necessary approvals from the County and FEMA, as applicable.

731.04 Flood Damage Control: When a development is permitted in the flood hazard overlay district, it shall, at a minimum, comply with the following standards, except that the Department of Public Works may impose more restrictive standards as warranted:

A. Nonresidential structures, or parts thereof, may be constructed below the one hundred (100) year flood water surface elevation for developed conditions, provided these structures are designed to preclude or withstand inundation to an elevation of at least eighteen (18) inches above the one hundred (100) year flood water surface elevation for developed conditions.

B. Uses shall not be permitted in flood fringes and approximated floodplains, including fills and landfills, unless the applicant has demonstrated through the delineation of a floodway that the proposed uses, in combination with all other existing and reasonably anticipated uses, will not raise the water level of the predeveloped one hundred (100) year flood more than one-half (1/2) foot at any point, unless additional flood hazard areas are reserved to accommodate increases over one-half (1/2) foot.

C. When located within floodplains, new utilities shall be located and constructed to minimize or eliminate flood damage.

D. Fill shall comply with the following:

1. The fill shall be sloped to provide positive drainage away from any building or structure and shall extend fifteen (15) feet beyond the limits of such building or structure to a point which is no lower than the regulatory flood elevation for the particular area.

2. All fill shall consist of soil or small rock materials only. Sanitary and/or debris landfills shall be prohibited. The fill materials shall be compacted to provide the necessary permeability and resistance to erosion or scouring.

3. Fill slopes shall be no steeper than one (1) vertical unit to three (3) horizontal units, unless substantiating data justifying steeper slopes are submitted to and approved by the Department of Public Works.

4. The toe of fill shall not be within the designated floodway.

5. Compensatory excavation shall normally be required for fills in the floodplain, unless waived for environmental reasons.

E. Placement of buildings and structures shall comply with the following:

1. All buildings and structures shall be designed, constructed and placed on the lot so as to offer the minimum obstruction to the flow of water.

2. Fences, except two-wire fences, and other structures or matter which may impede, retard or change the direction of the flow of water, or may catch or collect debris carried by such water, or that could be carried downstream by the natural flow of the stream, shall not be placed in the floodway.

F. Anchoring shall comply with the following:

1. Buildings or structures shall be firmly anchored to prevent movement or collapse from the action of the regulatory flood.

2. Air ducts, large pipes, and storage tanks located at or below the regulatory flood elevation shall be firmly anchored to prevent floatation.

3. Minor structures which may be allowed within areas subject to major flooding (e.g., possible park structures, picnic tables, etc.) should be considered from the viewpoint of what will happen when a major flood occurs. Anchoring such structures will prevent them from being floated downstream to block a major culvert.

G. Wood flooring used below an elevation of eighteen (18) inches above the one hundred (100) year flood elevation shall be installed to accommodate a lateral expansion of the flooring, perpendicular to the flooring grain, without incurring structural damage to the building.

H. Electrical systems shall comply with the following:

1. All electrical water heaters, electric furnaces and other critical electrical installations shall be prohibited below an elevation of eighteen (18) inches above the regulatory flood elevation.

2. Electrical distribution panels shall be placed at least three (3) feet above the regulatory flood elevation. Separate electrical circuits serving areas below the regulatory flood elevation shall be dropped from above.

I. Plumbing and other mechanical installations shall comply with the following:

1. Water heaters, furnaces, and other critical mechanical installations shall be prohibited below an elevation of eighteen (18) inches above the regulatory flood elevation except for nonresidential structures which are floodproofed.

2. Gas and oil supply systems shall be designed to preclude the infiltration of flood waters into the systems and discharges from the systems into flood waters. Additional provisions shall be made for the drainage of these systems in the event that flood water infiltration occurs.

3. No part of an on-site disposal system, including drainfields, shall be allowed within the one hundred (100) year floodplain.

J. Paints and adhesives shall comply with the following:

1. Adhesives used below an elevation of eighteen (18) inches above the regulatory flood elevation shall have a bonding strength that is unaffected by inundation.

2. Doors and wood trim used below an elevation of eighteen (18) inches above the regulatory flood elevation shall be sealed with a waterproof paint or similar product.

3. Paints or other finishes used below an elevation of eighteen (18) inches above the regulatory flood elevation shall be capable of surviving inundation.

K. Materials that are buoyant, flammable, explosive, or in times of flooding could be injurious to human, animal, or plant life, shall not be stored in the one hundred (100) year floodplain, unless they are properly anchored or flood proofed to preclude their causing damage to life or property.

L. Sanitary sewers designed for flooding conditions shall comply with the following:

1. Sanitary sewers through areas which are frequently subject to flooding should be designed to prevent flood water infiltration into the system as would occur through ordinary vented manhole covers when placed at elevations below the flood surface.

2. Aerial sewers crossing a stream on supports should be designed with consideration of possible erosive scour around pier footings and for the prevention of access by children to such utility installations.

3. Design consideration should also be given to preventing a "picket fence" effect caused by using very closely placed piers which would act as a natural trap for debris.

M. Recreational vehicles placed within flood hazard areas shall be on the site for fewer than one hundred eighty (180) consecutive days, be fully licensed and ready for highway use, or meet the permit requirements for placement and the elevation and anchoring requirements for manufactured homes as contained in the Virginia Uniform Statewide Building Code. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.

732.00 FLOODPLAIN MANAGEMENT - SUBMISSION REQUIREMENTS

732.01 General Requirements:

A. The data required under this section and sections 730.00 through 732.00 of this manual shall be submitted to the Department of Public Works for technical evaluation and approval before development in the flood hazard overlay district. The issuance of a conditional letter of map amendment (CLOMA) or revision (CLOMR) from FEMA is required, prior to the approval of site development or construction plans, and prior to issuance of any building or flood hazard use

permits. An escrow or bond equal to the cost of processing a final letter of map amendment (LOMA) or revision (LOMR) shall be posted with the construction plans. The occupancy of any structures built within the flood overlay district will be contingent upon the submission of a certified FEMA elevation certificate. The issuance of a LOMA or a LOMR shall be required prior to the release of the escrow or construction bonds.

B. Plans drawn to scale, showing the elevation of the one hundred (100) year flood, topographic information showing existing and proposed ground elevations, the nature, location, dimensions and elevation of the lots, existing or proposed structures, fill, storage of materials, streets, water supply, sanitary facilities, flood proofing measures, and the relationship of the above to the location of the channel. For structures to be elevated, the elevation of the lowest floor (including basement) must be shown. For nonresidential structures to be flood proofed, show the elevation to which the structure will be flood proofed.

C. If required, a floodplain study as described in Section 731.02 of this manual, or the file number of the approved floodplain study shall be submitted to the Office of Planning.

732.02 Floodplain Study Criteria: The following items provide general criteria to be used in the preparation of floodplain studies.

A. Friction coefficient, "n" factor, both on-site and off-site shall be computed using the approved form (see Exhibit 16). Photographs of the stream, taken at appropriate cross-sections shall be submitted with the computations. The "n" factor must be approved prior to the submission of the floodplain study.

B. The discharge (Q) and the time of concentration shall be determined in accordance with Section 702.00 of this manual. Runoff curve numbers or coefficient of runoff shall be established based on ultimate development of the watershed in accordance with the current Comprehensive Land Use Plan and consultation with the Department of Public Works.

C. Field or certified aerial run topography of the stream through the site is required. The topography must extend three hundred (300) feet up and downstream from the property lines or to a control section. Field run or certified aerial topography shall extend to cover the limits of the floodplain freeboard, except in cases of abrupt change in the characteristics of the terrain. Additional topography may be required.

D. The cross-sections shall be perpendicular to the stream channel and/or floodplain and taken at all constrictions and other areas of change in the channel and/or floodplain.

E. For streams not identified as special flood hazard areas (Zone A and AE) in the flood insurance study of Prince William County, the one hundred (100) year discharge for predeveloped and developed conditions shall be provided. The discharges shall be determined using the methodology stated in Section 702.00 of this manual. The water surface elevations shall be computed using the methodology stated in Section 731.02 of this manual. For minor floodplain studies, normal depth calculations, using Manning's equation, shall be accepted.

F. For streams identified in the flood insurance study of Prince William County, the hydrologic and hydraulic analysis shall be prepared in conformance with the National Flood Insurance Program Regulations as stated in Parts 60, 65, 70 and 72 (Title 44) of the Code of Federal Regulations (CFR) as applicable. In addition, one hundred (100) year discharges and water-surface elevations for developed conditions shall be submitted to the Department of Public Works for review.

G. All hydrologic and hydraulic computations shall be submitted in hard copy and digital format.

732.03 Plan Elements: The following information shall be provided on the plans:

A Drainage divides of contributing areas and their relation to the site in question at a maximum scale of one (1) inch equals one thousand (1,000) feet, or smaller as requested by the director of Public Works, using the County topographic maps as a base.

B. Cross-sections every one hundred (100) feet shall be plotted at a scale of one (1) inch equals ten (10) feet vertically, and one (1) inch equals fifty (50) feet horizontally. In cases of extremely flat terrain, a scale of one (1) inch equals five (5) feet vertically, and one (1) inch equals fifty (50) feet horizontally, shall be used. The cross-sections shall show existing and developed water surface elevations for the one hundred (100) year storms.

C. A profile of the floodplain and stream bed indicating the elevation of the water surface and invert of the stream every fifty (50) feet for the full length of the floodplain study area shall be submitted with the cross-sections. The scale of the profile shall be one (1) inch equals five (5) feet vertically, and one (1) inch equals fifty (50) feet horizontally. The profile shall show the one hundred (100) year water surface elevations for developed conditions.

D. A written description of the methodology used to determine hydrologic and/or hydraulic parameters.

E. Delineation of the one hundred (100) year flood boundaries predeveloped and developed conditions and floodway, and the location and alignment of cross-sections used in the hydraulic model.

1. This information should be shown on maps of suitable scale and topographic definition to provide reasonable accuracy.

2. All items should be labeled for easy cross-referencing to the hydrologic and hydraulic models and summary tables.

3. All lots and structures adjacent to the floodplain should be shown.

F. Source data, engineering documentation, and back-up data, for the previously mentioned items, as well as a reference list of other sources of information used.

G. The flood hazard areas shall be placed on all plats and plans for the site. Flood hazard areas shall coincide with the one hundred (100) year flood boundaries for developed conditions. The mathematical ties between the flood hazard area and the lot lines shall be required on the plats. The plats and plans shall also describe flood hazard area with metes and bounds. The following notes shall be clearly shown: "No use shall be made of, nor shall any improvements be made in the flood hazard area, without specific authorization from the Department of Public Works." In addition, a flood hazard use permit (FHUP) shall be required for any work within the flood hazard area.

H. Once the floodplain modifications are completed, the floodplain study shall be resubmitted and shall include construction plans for as-built conditions, if applicable. This as-built package is required as per part 65.6 (C), Title 44, CFR, and will be submitted to FEMA to obtain a revision of the flood maps.

732.04 Watercourse Stabilization:

A. Once the adequate capacity of the watercourse has been established, the engineer should provide details of the work required to maintain a stable channel and floodplain, and to prevent erosion or other adverse effects which could place an extreme maintenance burden on future users of the area.

B. All watercourse improvements and maintenance shall be in accordance with Section 740.00 of this manual.

C. Every plan submitted for areas containing a watercourse shall, in addition to the floodplain studies, be accompanied by a written report, signed by a professional engineer, setting forth his or her study, conclusions, and recommendations regarding the following factors and any others that may be pertinent to particular conditions:

1. Predeveloped watercourse conditions: The original condition of the watercourse and floodplain area, including such matters as probable velocities for the two (2) and ten (10) year storm under present watershed conditions (prior to development), particularly where no continuous channel improvements are proposed, the presence or absence of a meander pattern that may be shifting, areas of existing erosion processes, or where sedimentation is taking place, whether the watercourse appears to be perennial or merely wet weather, the material forming the bed of the natural channel (rock, cobbles, sediment and soil materials, etc.), the state of natural stability of banks and adjacent slopes, whether they are present within the floodplain, abandoned or cut off former courses of the stream, natural levees, etc.

2. Effect of developed conditions on the existing watercourse: For comparison, the velocity of the two (2) and ten (10) year flows, if the stream is left in an entirely natural condition, but after all of the watershed area has been completely developed according to the Comprehensive Land Use Plan, or in lieu of same, according to reasonable estimates of future development (where no continuous channel improvements are planned). These comparative calculations are to serve as a guide in assessing the probable effect on the stream of increased water discharges.

3. Proposed modifications: If the foregoing comparison, and other investigations made by the engineer, indicate that watershed environmental changes due to development will adversely affect the stream and probably create a heavy maintenance burden (unless modifications are made to the channel), then a thorough discussion of proposed modifications necessary to eliminate undue maintenance shall be included. Factors involved in such modifications include the use of concrete lining, rubble riprap lining, etc. Possible needed improvements could involve natural levees or abandoned portions of the old meander pattern. In certain areas, these may be for depressions with imperfect natural drainage, which are swampy in times of heavy rainfall, which may be valuable as a natural water quality element to remain.

4. Other uses as affected: Other proposed uses should also be covered in this report such as utility lines, road crossings, park and recreation areas and trails, etc.

5. Detailed hydraulic considerations: Adequate measures shall be proposed to prevent erosion from any entering flows, i.e., pipes or streams. Channel changes or partial linings should take into consideration increased erosive forces at bends. Wave action in supercritical flow should be allowed in linings. Riprap should be designed to withstand anticipated velocities. The effects of increased velocity on immediate downstream areas should be considered. Proposed channel changes which decrease velocity should be considered to determine if silt deposition will occur.

6. Effects on downstream and upstream lands: The engineer's report shall include a discussion of the effects of increased runoff on developed downstream and upstream properties and any mitigation measures.

732.05 Flood Damage Control for Structures:

A. The applicant shall provide the following factual information as certified by a registered professional engineer, surveyor or architect:

1. Proposed structure or substantial modifications to the floodplain that will not adversely affect the predeveloped one hundred (100) year flood level;

2. The lowest floor elevation (including basement) of the proposed structure located at least eighteen (18) inches above the one hundred (100) year water surface elevation for developed conditions;

3. The minimum horizontal distance of fifteen (15) feet provided between the one hundred (100) year water surface and the structure proper (the fifteen [15] foot setback requirement may be waived for specially designed commercial structures);

4. Adequate emergency access available to the structure during periods of maximum flooding.

B. The applicant shall specify the one hundred (100) year flood water surface elevation(s) on the plan.

740.00 CHESAPEAKE BAY PRESERVATION AREA – POLICY

740.01 General Policy:

A. The performance standards of this section implement the requirements of Part 504 of Chapter 32 of the Prince William County Code. These performance standards establish the means to minimize erosion and sedimentation potential, reduce land application of nutrients and toxicants, and maximize rainwater infiltration. Natural ground cover, especially indigenous woody vegetation, is most effective in holding soil in place and preventing site erosion. Indigenous woody vegetation, with its adaptability to local conditions without the use of harmful fertilizers or pesticides, filters storm water runoff. Minimizing impervious cover enhances rainwater infiltration and effectively reduces storm water runoff potential.

B. In addition to the objectives in part A of this subsection, the purpose and intent of the requirements of this section are also to implement the following objectives:

1. Prevent a net increase in nonpoint source pollution from new development.

2. Achieve a ten percent (10%) reduction in nonpoint source pollution from redevelopment.

C. Any development or redevelopment exceeding two thousand five hundred (2,500) square feet of land disturbance shall be permitted only upon compliance with the requirements of this section, in addition to any other requirements imposed by this manual prior to any clearing or grading of the site or the issuance of any building permit.

740.02 Definitions: The following words and terms used in this part have the following meanings, unless the context clearly indicates otherwise:

A. Agricultural land uses – Activities such as the tilling of the soil, planting and harvesting of crops or plant growth of any kind in the open, pasture, horticulture, dairying, floriculture, or raising of poultry or livestock. This does not include noncommercial ancillary agricultural activities on lands within existing platted residential subdivisions.

B. Applicant - A person seeking any determination under this part or permit required by this ordinance.

C. Best Management Practices (BMPs) - Practices, or combination of practices, that are determined by the County to be the most effective, practical means of preventing or reducing pollution inputs from nonpoint sources to water bodies.

D. Chesapeake Bay Preservation Area - Any land so designated by the Board of County Supervisors pursuant to Part III of the Chesapeake Bay Preservation Area Designation and Management Regulations, 9 VAC 10-20-070, et seq. , and Section 10.1-2107 of the Code of

Virginia. Chesapeake Bay Preservation Areas shall consist of Resource Protection Areas (RPAs) and Resource Management Areas (RMAs).

E. Chesapeake Bay Preservation Area Review Board – Board of County Supervisors appointed body which reviews exception requests for encroachment into RPA and takes action following a public hearing.

F. Development - The subdivision of land or construction, or substantial alteration of residential, commercial, industrial, institutional, recreation, transportation, or utility facilities or structures.

G. Dripline - A vertical projection to the ground surface from the lateral extent of a tree's leaf canopy.

H. Floodplain - All lands that would be inundated by flood water as a result of a storm event of a one hundred (100) year return interval. The limits of the floodplain shall be established in accordance with Section 731.00 of this manual.

I. Highly Erodible Soils - Soils (excluding vegetation) with an erodibility index (EI) from sheet and rill erosion equal to or greater than eight (8). The erodibility index for any soil is defined as the product of the formula RKLS/T where K is the soil susceptibility to water erosion in the surface layer; R is the rainfall and runoff; LS is the combined effects of slope length and steepness; and T is the soil loss tolerance.

J. Highly Permeable Soils - Soils with a given potential to transmit water through the soil profile. Highly permeable soils are identified as any soil having a permeability equal to or greater than six (6) inches of water movement per hour in any part of the soil profile to a depth of seventy-two (72) inches ("permeability groups rapid and very rapid") as found in the National Soil Survey Handbook of November 1996, in the Field Office Technical Guide of the U.S. Department of Agriculture Soil Conservation Service.

K. Impervious Cover - A surface composed of any material that significantly impedes or prevents natural infiltration of water into the soil. Impervious surfaces include, but are not limited to roofs, buildings, streets, parking areas, and any concrete, asphalt, or compacted gravel.

L. Infill IDA- Utilization of vacant land in previously developed areas.

M. Intensely Developed Area (IDA) – means those areas designated by the Board of County Supervisors to meet the criteria for designation as an Intensely Developed Area, as provided in Section 32-504.07 of the County Code and pursuant to 9 VAC 10-20-60 of the Chesapeake Bay Preservation Area Designation and Management Regulations.

N. Nonpoint Source Pollution - Pollution consisting of constituents such as sediment, nutrients, and organic and toxic substances from diffuse sources, such as runoff from agricultural and urban land development and use.

O. Nontidal Wetlands - Those wetlands other than tidal wetlands that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and that, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions, as defined by the U.S. Environmental Protection Agency, pursuant to Section 404 of the Federal Clean Water Act, in 33 C.F.R. 328.3b.

P. Noxious Weeds - Weeds that are difficult to control effectively, such as Johnson Grass, Kudzu, thistle and multiflora rose.

Q. Perennial water body –All water bodies identified as perennial when using a scientifically valid system of in-field indicators. Water bodies shall include all areas of natural inflow, including but not limited to: streams, impoundments, lakes and all areas of concentrated flow.

R. Plan of Development - The process for site plan or subdivision plat review to ensure compliance with Part 504 of Chapter 32 of the Prince William County Code, prior to any clearing or grading of a site or the issuance of a building permit.

S. Private road – a privately owned and maintained road designed and constructed in accordance with DCSM standards.

T. Public road – a publicly maintained road designed and constructed in accordance with DCSM or the Virginia Department of Transportation standards.

U. Redevelopment - The process of developing land that is or has been previously developed lawfully under then existing regulations.

V. Resource Management Area (RMA) - That component of the Chesapeake Bay Preservation Area that is not classified as Resource Protection Area and includes land types that, if improperly used or developed, have a potential for causing significant water quality degradation or for diminishing the functional value of the Resource Protection Areas. The following land categories have been considered by the Board of County Supervisors in establishing the resource management areas: floodplains; highly erodible soils including steep slopes; highly permeable soils nontidal wetlands not included in the resource protection area.

W. Resource Protection Area (RPA) - That component of the Chesapeake Bay Preservation Area comprised of lands adjacent to water bodies with perennial flow that have an intrinsic water quality value due to the ecological and biological processes they perform, or are sensitive to impacts which may result in significant degradation to the quality of state waters.

X. Silvicultural Activities – Forest management activities, including but not limited to the harvesting of timber, the construction of roads and trails for forest management purposes, and the preparation of property for reforestation that are conducted in accordance with the silvicultural best management practices developed and enforced by the State Forester pursuant to Section 10.1-1105 of the Code of Virginia and are located on property defined as real estate devoted to forest use under Section 58.1-3230 of the Code of Virginia for the purposes of this act only.

Y. Substantial Alteration - Expansion or modification of a building or development that would result in a disturbance of land exceeding an area of two thousand five hundred (2,500) square feet in the Resource Management Area only.

Z. Tidal Shore or Shore - Land contiguous to a tidal body of water between the mean low water level and the mean high water level.

AA. Tidal Wetlands - Vegetated and non-vegetated wetlands as defined in Section 28.2-1300 of the Code of Virginia.

BB. Water-Dependent Facility - A development of land that cannot exist outside of a resource protection area and must be located on the shoreline by reason of the intrinsic nature of its operation. As provided in Part 504 of Chapter 32 of the Prince William County Code, these facilities include, but are not limited to, (i) ports; (ii) the intake and outfall structures of power plants, of water treatment plants, of sewage treatment plants, and of storm sewers; (iii) marinas and other boat docking structures; (iv) beaches and other public water-oriented recreation areas; and (v) fisheries or other marine resources facilities.

CC. Wetlands –Tidal and nontidal wetlands.

740.03 Resource Protection Area (RPA) Boundaries:

A. Resource Protection Areas (RPAs) consist of lands adjacent to water bodies with perennial flow that have an intrinsic water quality value due to the biological and ecological processes they perform and are sensitive to impacts which may cause significant degradation to the quality of state waters. In their natural condition, these lands provide for the removal, reduction or assimilation of sediments, nutrients, and potentially harmful or toxic substances in runoff entering the Bay and its tributaries and minimize the adverse effects of human activities on state waters and aquatic resources.

B. The Resource Protection Area shall consist of lands that would include:

1. Tidal wetlands.

2. Nontidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow.

3. Tidal shores.

4. Perennial water bodies.

5. An area of 100 feet in width shall be located adjacent to and landward of the components listed in subsections 1 thru 4 listed above and along both sides of a water body with perennial flow. Such area shall be designated as the landward component of RPA, notwithstanding the presence of permitted uses, encroachments, permitted vegetation clearing in compliance

with Part IV (9 VAC 10-20- 130 et seq.) of the Chesapeake Bay Preservation Area Designation and Management Regulations.

6. Other lands with sensitive environmental features that have the potential of significantly affecting water quality, as determined by the director of Public Works.

C. The designation of the components listed under section B. 1-4 above shall be determined based on reliable, site-specific information as detailed in section 742 of this manual.

740.04 Exemptions in Resource Protection Areas: Land disturbances in RPA may be commenced for the following uses or purposes without the submissions and approvals otherwise required under section 740.

A. Water wells, passive recreation facilities such as boardwalks, trails, and pathways and historic preservation and archaeological activities**.** The trails and pathways shall be so located as to minimize the disturbance to RPA.

B. Construction, installation, operation and maintenance of electric, natural gas, fiber optic and telephone transmission lines, underground telecommunications and cable television lines, railroads, public roads and their appurtenant structures so long as they comply with Erosion & Sediment Control regulations and the Stormwater Management (SWM) Act of the Code of Virginia. The exemption of public roads is further conditioned on the road alignment and design being such as to minimize encroachment into the RPA and adverse effects on water quality is minimized. A WQIA will be required for public roads, as determined by the director of Public Works.

C. Construction, installation and maintenance of water and sewer lines owned, permitted or both by Prince William County or a regional service authority provided that:

1. To the degree possible, the location of such utilities should be outside RPA.

2. No more land shall be disturbed than is necessary to provide the necessary utility installation.

3. The construction, installation and maintenance of such utilities and facilities shall comply with all applicable state and federal permits and shall be designed and constructed in a manner that protects water quality.

D. Any disturbance exceeding 2,500 square feet shall comply with Erosion & Sediment Control requirements.

740.05 Permitted Uses in Resource Protection Areas: The following uses will be allowed in the RPA with the submission of a Water Quality Impact Assessment (WQIA):

A. A new or a expanded water dependent facility may be allowed provided that the following criteria are met:

1. It does not conflict with the Comprehensive Plan.

2. It complies with the performance criteria set forth in Section 741.01.

3. Any non-water dependent component such as, but not limited to parking, shall be located outside of RPAs.

4. Access to water dependent facility will be provided with the minimum necessary disturbance to the RPA. Where practicable, a single point of access will be provided.

B. Development or redevelopment within the designated Intensely Developed Area (IDA)

C. Regional SWM facility as defined in section 741.05.

D. Private roads or driveway crossings may be constructed in or across RPAs if the following conditions are met:

1. There are no reasonable alternatives to aligning the road or driveway in or across RPA.

2. The alignment and design of the road or driveway are optimized, consistent with applicable requirements, to minimize the encroachment in RPA and adverse effects on water quality.

3. The design and construction of the road or driveway satisfy all criteria of the Chesapeake Bay Preservation Area regulations including submission of a WQIA, as required by the director of Public Works.

4. A plan for the private road or driveway crossing is reviewed and approved by the County.

740.06 Exceptions for Encroachments into the RPA: Any proposed encroachment into the RPA area which is not exempt under section 740.04 or permitted under section 740.05 of this manual shall submit a request for an exception in writing to the director of Public Works. This request shall identify the impacts of the proposed exception on water quality and on lands within the RPA through the performance of a Water Quality Impact Assessment (WQIA) which complies with the provisions of section742.05.

An exception may be granted with such conditions and safeguards as deemed necessary to further the purpose and intent of Part 504 of Chapter 32 of the Prince William County Code and this section, provided that it is found that:

1. Granting the exception will not confer upon the applicant any special privileges that are denied to other property owners in the CBPA overlay district.

2. The exception request is not based on conditions or circumstance that are self-created or self-imposed, nor does the request arise from conditions or circumstances either permitted or nonconforming that are related to adjacent parcels.

3. The exception requested is the minimum necessary to afford relief.

4. The exception request will be consistent with the purpose and intent of the overlay district, and not injurious to the neighborhood or otherwise detrimental to the public welfare or water quality.

5. Reasonable and appropriate conditions are imposed which will prevent the exception request from causing a degradation of water quality.

A. Administrative exception: The director of Public Works shall review the request for an exception and associated WQIA and may grant an administrative exception with such conditions and safeguards as deemed necessary to further the purpose of this section of the manual. An administrative exception will be considered in the following situations:

1. Lots lawfully recorded prior to November 27, 1990 when the application of the RPA would result in the loss of buildable area, provided that:

a. Encroachments into the RPA shall be the minimum necessary to achieve a reasonable buildable area for a principal structure and necessary utilities; accessory structures shall not be allowed if their construction will further reduce the RPA width.

b. Where practicable, a vegetated area that will maximize water quality protection, mitigate the effects of buffer encroachment, and is equal to the area of encroachment into the buffer area, shall be established elsewhere on the lot or parcel

c. The encroachment into the RPA area shall not be greater than fifty (50) feet in width unless the encroachment is authorized by the Chesapeake Bay Preservation Area Review Board.

d. Where the necessary encroachment in the RPA is greater than 50 feet, such exception may be granted only following a public hearing conducted by the Chesapeake Bay Preservation Area Review Board.

2. Lots lawfully recorded between November 27, 1990 and March 1, 2002 which meet conditions 740.06A1a through 740.06A1c as listed above and the additional following conditions:

a. Conditions or mitigation measures imposed through a previously approved exception shall be met.

b. If the use of a best management practice was previously required, the BMP shall be evaluated to determine if it continues to function effectively and if necessary, the BMP shall be reestablished or repaired and maintained as required.

3. Lots for which encroachment into RPA is necessary to install septic drainfields and where no alternate percolation sites are available as verified by the Health Department**.**

4. Expansion of a non-conforming principal structure for minor alteration in conformance with Section 601.32 of the Zoning Ordinance. Expansion of any non-conforming accessory structure within RPA that proposes additional RPA disturbance shall be handled as an exception requiring a public hearing in conformance with Section 740.06 (C)

5. Waivers to the requirements of Section 741.01, General Performance Standards, may be granted, provided that the findings enumerated in Section 740.06, subsections 1 through 5 above, are made.

B. If the administrative exception request is denied, the director of Public Works shall provide the rationale for the decision to the applicant. The applicant may then appeal the decision to the Chesapeake Bay Preservation Area Review Board, within 30 days of denial.

C. Exceptions requiring a Public Hearing - The director of Public Works shall review and forward its recommendation on all other exception requests, with accompanying WQIA, to the Chesapeake Bay Preservation Area Review Board for consideration and action following a public hearing.

D. The Chesapeake Bay Preservation Area Review Board shall conduct a public hearing to review the request for an exception and the WQIA and may grant the exception with such conditions and safeguards as deemed necessary to further the purpose and intent of Part 504 of Chapter 32 of the Prince William County Code and this section.

E. If the exception request is denied, the Chesapeake Bay Preservation Area Review Board shall provide its written findings and rationale for the decision to the applicant. The decision of the Board is final and can be appealed by the applicant to the Circuit Court within 30 days of the denial.

741.00 CHESAPEAKE BAY PRESERVATION AREA – PLANNING AND DESIGN

741.01 General Performance Standards:

A. Land disturbance shall be limited to the area necessary to provide for the proposed use or development and shall comply with the following:

1. The proposed limits of disturbance shall be clearly shown on all plans. The limits shown on the approved plans shall be physically marked and protected on the development site.

2. No construction access should be permitted through an RPA unless specifically approved by the director of Public Works.

B. Indigenous vegetation shall be preserved to the maximum extent possible, consistent with the use and development proposed and in accordance with the Virginia Erosion and Sediment Control Handbook. All development or redevelopment shall conform to the requirements of Section 800.00 of this manual. Site design shall preserve existing tree cover to the greatest extent feasible. Diseased trees or trees weakened by age, storm, fire, or other injury may be selectively removed in accordance with the requirements of Section 800.00 of this manual.

C. In situations where it is likely that RPA buffer from adjacent offsite property may extend into subject property which is under review, the director of Public Works may require the developer to study the stream and wetlands in adjacent offsite properties within 100 feet of the boundary lines.

D. Land development shall minimize impervious cover to promote infiltration of storm water into the ground consistent with the proposed use or development, in accordance with Section 721.00 of this manual.

E. Any land disturbing activity cumulatively exceeding two thousand five hundred (2,500) square feet, including construction of single-family houses, shall comply with the requirements of Section 751.00 of this manual. Any disturbance within RPA, regardless of the size, requires a written approval from the County.

F. All on-site sewage disposal systems not requiring an National Pollutant Discharge Elimination System (NPDES) permit shall be pumped out at least once every five (5) years, in accordance with the provisions of Chapter 23 of the Prince William County Code.

G. A reserve sewage disposal site with a capacity at least equal to that of the primary sewage disposal site shall be provided in accordance with the requirement of Section 500.00 of this manual.

H. For any use or development, including redevelopment, storm water runoff shall be controlled by the use of best management practices in accordance with Section 721.00 of this manual.

I. Prior to issuing a permit that allows any type of land disturbance, related to a final site and subdivision plan all wetland permits required by federal, state, and local laws and regulations shall have been obtained and evidence of such submitted to the County.

741.02 Additional Performance Criteria for RPA

A. To minimize the adverse effects of human activities on the other components of RPA, state waters, and aquatic life, a one hundred (100) foot buffer area of vegetation that is effective in retarding runoff, preventing erosion, and filtering nonpoint source pollution from runoff shall be retained if present and established where it does not exist adjacent to water bodies with perennial flow.

B. In accordance with the regulations of this section, the one hundred (100) foot RPA buffer area of natural or established vegetation is deemed to achieve a forty percent (40%) reduction of nutrients provided that runoff is conveyed by sheet flow through the buffer area.

C. In order to maintain the functional value of the RPA buffer area, indigenous vegetation may be removed subject to written approval by the director of Public Works or approval of a plan to provide reasonable access paths, sight lines, general woodlot management, and best management practices, including those that prevent upland erosion and concentrated storm water flows, as follows:

1. Trees may be pruned or removed as necessary to provide for sight lines and vistas provided that where removed, they shall be replaced with other vegetation that is equally effective in retarding runoff, preventing erosion and filtering nonpoint source pollution from runoff.

2. Where indigenous vegetation is removed to create passive recreation trails, the path shall be constructed and surfaced so as to effectively control erosion.

3. Dead, diseased, or dying trees or shrubbery and noxious weeds may be removed and thinning of trees may be conducted based upon the best available technical information in conformance with section 800 of this manual and pursuant to sound horticultural practice as determined by the director of Public Works.

4. Where areas to be preserved in RPA are encroached upon, replacement of existing trees and other vegetation will be achieved in accordance with a site specific RPA restoration plan approved by the director of Public Works.

5. For shoreline erosion control projects, trees, and woody vegetation may be removed, necessary control techniques employed, and appropriate vegetation established to protect or stabilize the shoreline in accordance with the best available technical advice and applicable permit conditions or requirements. If the projects propose disturbance to RPAs, the disturbance within RPAs must be approved by the director of Public Works.

D. Where land uses such as agriculture or silviculture within the area of the buffer cease, and the land is proposed to be converted to other uses, the full 100-foot buffer area shall be reestablished. In reestablishing the buffer, management measures shall be undertaken to provide woody vegetation that assures the buffer functions as set forth in the Chesapeake Bay Regulations. (9VAC10-20-130)

741.03 RPA Buffers in Intensely Developed Areas (IDA): Development and redevelopment within intensely developed areas (IDA) and IDA infill shall be exempt from the provisions of Section 741.02, but only in accordance with the following**:**

A. The proposed development or redevelopment is permitted under the provisions of Part 601 of Chapter 32 of the Prince William County Code and Section 740.06 of this manual, as applicable.

B. Any proposed development or redevelopment shall not increase the areas of disturbed RPA, exclusive of RPA buffers, unless such disturbance is otherwise permitted by and consistent with the requirements of Part 504 of Chapter 32 of the Prince William County Code and all applicable requirements of this manual.

C. Development or redevelopment shall meet all RPA buffer standards established in Section 741.02, except that encroachment due to redevelopment may occur within the full width of the buffer.

D. Notwithstanding the provisions of subparagraphs A, B, and C above, the RPA buffer shall be established to the extent feasible consistent with the proposed development of redevelopment of the site.

E. All other requirements of this manual, the Prince William County Code and other applicable laws are met.

741.04 Minimum Lot Size in Relation to RPA:

A. All residential lots, of 20,000 square feet or less, shall not be platted incorporating land within an RPA, irrespective of zoning designation.

B. For all other residential lots, RPA land may be incorporated within the lots, when the following criteria are met:

1. Lots must have 20,000 square feet or more outside of the RPA.

2. All minimum required yard, setbacks and other applicable development standards have been met and shown on the plats.

3. A minimum distance of fifty (50) feet shall be between the principal structure, and any attachments thereto, and the RPA.

C. For lots two (2) acres or greater in size, RPA acreage may be used to calculate minimum lot size, provided that sufficient acreage lies outside that portion of the lot zoned RPA to permit reasonable use and enjoyment of any proposed use not permitted in the RPA.

D. Residential lots, 20,000 square feet or smaller, shall not be platted with jurisdictional wetlands. In addition and regardless of lot size the dwellings shall be at least forty (40) feet away from the wetlands. This requirement applies only to the wetlands for which an impact has not been authorized by the state and federal agencies.

741.05 Special Provisions for SWM Facilities: The SWM facilities, in general, must be located outside of RPAs. The SWM facilities may be allowed within RPAs under the following circumstances, subject to approval by the Chesapeake Bay Preservation Area Review Board.

A. Regional storm water management facilities, part of an approved watershed management plan or as hereafter provided, may be located in the RPA, provided that one of the following criteria is met:

1. They are part of an overall watershed management plan which considers environmentally sensitive features and minimizes negative impacts on them.

2. The SWM facility provides controls for a drainage area of 100 acres or more. The SWM facilities designed to provide BMP controls for offsite drainage areas, particularly those offsite drainage areas developed without BMP controls, are encouraged.

3. If the regional SWM facility is offsite, its location shall be in conformance with the Zoning Ordinance.

4. The director of Public Works may consider a SWM facility as regional, when the facility provides for the conservation and reuse of storm water runoff; such as an irrigation use within a golf course.

B. A water quality impact assessment is required for each SWM facility.

C. All performance criteria must be met, including wetlands permits, locating nonwater-dependent elements outside of RPAs, and minimum vegetative removal and access disturbances.

742.00 CHESAPEAKE BAY PRESERVATION AREA – SUBMISSION REQUIREMENTS

742.01 CBPA Overlay District: In addition to the requirements of chapters 25 and 32 of the Prince William County Code, the applicant shall submit the following prior to any development or redevelopment of lands within Chesapeake Bay preservation areas:

A. Perennial Flow Determination in accordance with section 742.02 of this manual.

B. Preservation Area Site Assessment (PASA), in accordance with Section 742.03 of this manual, as applicable. .

C. Water Quality Impact Assessment (WQIA) study, in accordance with sections 742.04and 742.05 of this manual, as applicable.

D. RMA limits study, if desired, in accordance with the provisions of Section 742.06 of this manual, as applicable.

E. Studies or plans as required by all applicable sections of this Design and Construction Manual. (Landscaping plan, Stormwater Management plan, E&S control plan, etc.)

742.02 Perennial Flow Determinations: A reliable, site-specific determination shall be conducted to determine whether water bodies within the development site have perennial flow. Such determination will be made using a scientifically valid system of in-field indicators acceptable to the director of Public Works.

The engineer must provide the drainage area for every stream for which a perennial flow determination study is submitted.

A. If water bodies exist on the development site and have a drainage area greater than 50 acres, a perennial flow determination study shall be submitted before or concurrently with the submission of a rezoning or a special use permit application, a preliminary, subdivision or a site plan, whichever occurs first. This determination shall identify all perennial streams located on the proposed development site using a method approved by the director of Public Works.

B. If water bodies exist on the development site and have a drainage area less than 50 acres, a perennial flow determination can be limited to a modified flow determination study of less detail which is acceptable to the director of Public Works. This simplified perennial stream documentation can be in the form of field notes, observed flow conditions, photos with short narrative or survey or other relevant observations. The dated pictures taken during field visit shall be submitted to the County.

C. The director of Public Works may require a detailed perennial flow determination for water bodies on the development site with a drainage area less than 50 acres under unique circumstances where field data is available from the Department of Public Works.

D. For development sites containing Resource Protection Areas (RPAs) as mapped on the County's Chesapeake Bay Preservation Area Overlay District Map, the director of Public Works may allow the applicant to use the Overlay Map as a representation of perennial flow for all water bodies mapped as RPA. However, the applicant is still required to determine the RPA width with site specific investigation and provide the 100-foot RPA buffer. The applicant is also required to establish whether all other water bodies within the development site not mapped as RPA exhibit perennial flow through site-specific determination.

E. If there are no water bodies on the site, as documented by digital pictures, topography, and other pertinent findings, the director of Public Works will not require a perennial flow determination study. The engineer/land surveyor must submit a statement or certification to justify that the study is not required.

742.03 Preservation Area Site Assessment (PASA):

A. A Preservation Area Site Assessment (PASA) shall be submitted for any proposed development site where RPA is located on the site based on Chesapeake Bay Preservation Area Overlay maps or on Perennial Flow Determination. This PASA shall be submitted to delineate the extent of wetlands on the site and to define RPA boundaries. The PASA shall be submitted in conjunction with a rezoning or special use permit application, preliminary subdivision plan or first plan submission.

B. A PASA study submission shall include a narrative report and associated plans which detail the field investigation done at the site to determine the extent of wetlands on the site at the time of investigation.

C. Wetland delineation shall be performed during field investigation of PASA and shall be in accordance with the United States Army Corps of Engineers "Wetlands Delineation Manual, Technical Report Y-87-1, January 1987, Final Report (Federal Manual) or latest effective edition.

D. The PASA shall clearly delineate RPA boundaries as defined in section 740.03 of this manual.

E. The PASA shall be drawn at the same scale as the preliminary site plan or subdivision plan, and plans shall be certified as complete and accurate by a licensed professional engineer, or a 3-B land surveyor. Alternatively, the accuracy of the wetlands delineation or perennial flow determination may be certified by a "Professional Wetlands Delineator".

F. Upon the submission by an applicant of the Preservation Area Site Assessment, the Department of Public Works shall verify the accuracy of and, may require adjustments to the boundary delineation shown therein**.**

742.04 Water Quality Impact Assessment: A Water Quality Impact Assessment (WQIA) is required for any proposed development in RPA or as determined by the director of Public Works, based on the unique characteristics of the site or intensity of the proposed use or development.

A. The purpose of the WQIA is as follows:

1. Identify the impacts of proposed development on water quality and lands within RPAs and other environmentally sensitive lands that have the potential to significantly affect water quality.

2. Ensure that, where development does take place within RPAs and other sensitive lands, it will be located on those portions of a site and in a manner that will be least disruptive to the natural functions of RPAs and other sensitive lands important to the natural functioning of RPA lands, consistent with the goals and objectives of the Chesapeake Bay Preservation Act, the regulations of Part 504 of Chapter 32 of the Prince William County Code, and this section of the manual.

B. The submission of a simplified WQIA may be accepted by the director of Public Works in conjunction with the processing of exceptions as identified in section 740.06A.

C. All information required for a WQIA in this section shall be certified as complete and accurate by a licensed professional engineer or a 3-B land surveyor.

D. Upon the completed review of a water quality impact assessment, the Department of Public Works will determine if the proposed development is consistent with the purpose and intent of Part 504 of Chapter 32 of the Prince William County Code and this section and make a finding based upon the following criteria:

1. The proposed development within any RPA is permitted pursuant to Section 32-504.06 of the Prince William County Code.

2. The disturbance of wetlands will be minimized.

3. The development will not result in significant disruption of the hydrology of the site.

4. The development will not result in significant degradation to aquatic vegetation or life.

5. The development will not result in unnecessary destruction of plant materials on-site.

6. Development is consistent with all applicable standards of the DCSM, including storm water, erosion and sediment control, drainfields, etc. and the intent of the Chesapeake Bay Preservation Act.

7. The cumulative impact of the proposed development, when considered in relation to other development of the vicinity, both existing and proposed, will not result in a significant degradation of water quality.

E. The director of Public Works shall require additional mitigation where potential impacts have not been adequately addressed. Evaluation of mitigation measures will be made by the Department of Public Works based on the criteria listed in this section.

F. The director of Public Works shall find the proposal to be inconsistent with the purpose and intent of this article when the impacts created by the proposal cannot be mitigated. Evaluation of the impacts will be made by the Department of Public Works, based on the criteria listed in this section.

G. Approval of the water quality impact assessment shall be conditioned upon review and approval of final design calculations which validate the design provisions of the plan.

742.05 Water Quality Impact Assessment Elements: A water quality impact assessment shall include a site drawing to scale which shows the following:

A. Location of the components of the RPA, including the one hundred (100) foot RPA buffer area.

B. Location and nature of the proposed encroachment into the RPA buffer.

C. Mitigation proposal to include:

1. Appropriate best management practice(s) at the right location to mitigate the impacts of the proposed encroachment.

2. Compensatory vegetation using the State's Riparian Buffers Modification and Mitigation Manual as a guideline.

D. A hydrogeological element that provides the following:

1. Existing topography, soils, hydrology and geology of the site and adjacent lands.

2. Description of the impacts of the proposed development on topography, soils, hydrology and geology on the site and adjacent lands.

3. Anticipated duration and phasing schedule of the construction.

4. Estimation of pre and post development pollutant loads in runoff.

5. Listing of all requisite permits from all application agencies necessary to develop the project.

6. Proposed mitigation measures for the potential hydrogeological impacts shown on the site plan or plat. Potential mitigation measures include:

a. Proposed erosion and sediment control concepts, which may include minimizing the extent of the cleared area, perimeter controls, reduction of runoff velocities, measures to stabilize disturbed areas, schedule and personnel for site inspection.

b. Proposed storm water management and BMP systems.

c. Creation of wetlands to replace those lost.

d. Minimizing cut and fill and land disturbance.

E. A wastewater element, where applicable, that provides the following:

1. Size and locations of anticipated drainfield or wastewater irrigation areas.

2. Justification for sewer line locations in environmentally sensitive areas, where applicable, and of construction techniques and standards.

3. Proposed on-site collection and treatment systems, their treatment levels, and impacts on receiving watercourses.

742.06 RMA Limits Study:

A. An applicant electing to establish the limits of RMA on the subject property shall submit an RMA limits study establishing concentrations of the following:

1. Floodplain.

2. Highly erodible soils, including steep slopes greater than twenty-five percent (25%).

3. Highly permeable soils.

4. Nontidal wetlands not included in the RPA.

B. Upon review of the RMA limits study, if the Department of Public Works is satisfied the applicant has established the absence of concentrations of land types protected as RMA on the entire property, the director of Public Works shall approve the exemption of such property area from the application of these provisions. The applicant shall cause a plat depicting the areas approved for exemption to be recorded among the land records of the County.

742.07 Final Site Plans: In addition to all other requirements applicable to site development plans such as a landscaping plan, a storm water management plan, and an erosion and sediment control plan, all projects within Chesapeake Bay preservation areas shall include the following additional information, in addition to showing the RPA boundaries with metes and bounds on the plan:

A. The delineation of the full width RPA boundary, a minimum of 100 feet, by metes and bounds on the plan and record plat with the following note: "No use shall be made of, nor shall any improvements or modifications be made in the resource protection area without specific written authorization from the director of Public Works."

B**.** Plat notation or stamp containing notification of 5-year septic pump out and 100% reserve drainfield requirements for onsite sewage treatment systems.

C. Wetlands permit submissions.

D. A maintenance agreement, as deemed necessary and appropriate by the director of Public Works to ensure proper maintenance of best management practices in order to continue their functions in accordance with the provisions of Section 722.00 and 100.00 of this manual.

A delineation of the RMA by metes and bounds description, if the director of Public Works has approved an RMA limits study, pursuant to Section 742.06.

743.00 CHESAPEAKE BAY PRESERVATION AREA – VIOLATIONS

743.01 Disturbance of RPA: If areas designated as RPA are encroached upon without prior approval in accordance with Sections 740.04, 740.05 and 740.06, they shall be restored in

accordance with a plan approved by the director of Public Works. Restoration of the disturbed areas shall be performed as necessary to meet the intent of the regulations and shall be in accordance with a site specific restoration plan detailing both any existing vegetation and all supplemental plantings to adequately reestablish the natural vegetative condition which existed previously on the site, including trees, shrubs and groundcover. The Virginia "Riparian Buffers Modification & Mitigation Guidance Manual" shall be used as a guide for preparing the restoration plan.

743.02 Violation of Chesapeake Bay Regulations: Any construction, vegetation removal or land disturbing activity in the Resource Protection Area contrary to permitted or allowable provisions of this Section shall be a violation and shall be enforced in accordance with Section 100.

General Provisions

A. Any construction, vegetation removal or land disturbing activity in the Resource Protection Area contrary to permitted or allowable provisions of this section shall be unlawful.

B. Any person, including, but not limited to, the owner, lessee, principal, agent, employee or an authorized agent of the owner, who violates any of the provisions of this section shall be subject to the enforcement provisions of this Section 743.04.

C. Upon becoming aware of any violation of any provisions of this Section, the director or his designee shall serve a written notice of violation on the property owner, the person committing or permitting the same, either in person or by registered or certified mail to the property or the owner's address. Such notice shall specify the provisions of the Section which have been violated, the measures needed to remedy the violation, and a reasonable time in which to remedy the violations. Failure to take steps to comply with such notice within the time provided for therein shall constitute a separate violation of this Chapter.

D. Restoration of Chesapeake Bay Preservation Areas shall be performed to meet the intent of this Section. Submission of an RPA Restoration plan detailing restoration plantings of tree and vegetation will be required. The RPA restoration plan shall detail both any existing vegetation and all supplemental plantings to re-establish natural vegetation of previous conditions.

743.03 RPA Restoration Plan:

A. The following information shall be included in the RPA Restoration Plan, unless the director of Public Works does not deem the information necessary.

1. Project Location / Vicinity Map.

2. Contours that adequately describe the existing topography and all proposed contour changes.

3. Field verified RPA and wetland limits on property.

4. Area of RPA (sf) which has been disturbed previously. If significant RPA area has been disturbed, it may be divided into segments which better identify the areas.

5. Planting or restoration measures which are proposed for the disturbed RPA and any adjacent areas. Number of overstory, understory and shrub trees shall be detailed for all restored areas. (Planting guidelines shall be taken from CBLAD Riparian Buffer Manual with preference given to native vegetation.)

6. Escrows for such planting and restoration measures.

7. RPA Buffer Restoration Narrative and Notes

8. Planting detail or other applicable detail (i.e. matting, techniques, etc.)

9. Erosion & Sediment controls to be used with RPA Restoration.

10. Escrows for such Erosion and Sediment controls

11. Landscape escrows which will be posted with permit.

12. A date by which the plan will be implemented and completed.

13. The director of Public Works may require different information depending upon the type of violation.

B. An escrow in the form of cash, letter of credit or bond, as provided for in the Administrative and Procedures Manual, shall be posted in an amount sufficient to cover the costs to implement the approved plan. This escrow shall also be used to correct violations for failure to comply with any requirements of this section or with the approved plan.

743.04 Criminal Violations and Penalties:

A. Violators of this Chapter shall be guilty of a Class 1 misdemeanor.

B. Each day any violation of this Chapter shall continue shall constitute a separate offense.

C. In addition to any criminal penalties provided under this Article, any person who violates any provision of this Chapter may be liable to the County in a civil action for damages, or for injunctive relief.

743.05 Civil Penalties.

A. Any person who violates any provision of 740.00 et seq., as it relates to disturbance in RPA, or who violates or fails, neglects, or refuses to obey notice, order, rule, regulation, or variance or permit condition authorized under this Chapter shall, upon such finding by an appropriate circuit

court, be assessed a civil penalty not to exceed $5,000 for each day of violation. Such civil penalties may, at the discretion of the court assessing them, be directed to be paid into the treasury of the county for the purpose of abating environmental damage to or restoring Chesapeake Bay Preservation Areas therein, in such a manner as the court may direct by order, except that where the violator is the county itself or its agent, the court shall direct the penalty to be paid into the state treasury.

B. With the consent of any person who (1) violates any provision of any local ordinance related to the protection of water quality in Chesapeake Bay Preservation Areas or (2) violates or fails, neglects, or refuses to obey any local governmental body's or official's notice, order, rule, regulation, or variance or permit condition authorized under such ordinance, the local government may provide for the issuance of an order against such person for the payment of civil charges for each violation in specific sums, not to exceed $10,000 for each violation. Such civil charges shall be paid into the treasury of the county for the purpose of abating environmental damage to or restoring Chesapeake Bay Preservation Areas therein, except that where the violator is the county itself or its agent, the civil charges shall be paid into the state treasury. Civil charges shall be in lieu of any appropriate civil penalty that could be imposed under subsection A above. Civil charges may be in addition to the cost of any restoration required or ordered by the local government body or official.

750.00 EROSION AND SEDIMENT CONTROL – POLICY

750.01 Definitions: For the purpose of this section, the following words and phrases shall have meanings respectively ascribed to them as follows:

A. Applicant - A person or persons required herein and hereby to accept legal responsibility for the land disturbing activity for which a permit is requested, namely the owner of the property on which such land disturbing activity is proposed to be accomplished as well as any contractor, agent, or other person who, by virtue of contractual employment or other relationship to the owner of the property of which such land disturbing activity is proposed to be accomplished, is or will be in actual or effective control of all or a substantial portion of the land disturbing activity for which the application is or has been made.

B. Conservation Plan, Erosion and Sediment Control Plan - A document containing material for the conservation of soil and water resources of a parcel or parcels of land. It may include appropriate maps, an appropriate soil and water plan inventory and management information with needed interpretations, and a record of decisions contributing to conservation treatment. The plan shall contain all major conservation decisions to assure that the entire parcel or parcels of land will be so treated to achieve the conservation objectives.

C. Soil and Water Conservation District - A political subdivision of the commonwealth organized in accordance with the provision of Section 10.1-506 of the Code of Virginia, 1950, as amended.

D. Erosion Impact Area - An area of land not associated with current land disturbing activity but subject to persistent soil erosion resulting in the delivery of sediment onto neighboring properties

or into drainageways. This definition shall not apply to any lot or parcel of land of two thousand five hundred (2,500) square feet or less used for residential purposes.

E. Land Disturbing Activity - Any land change which may result in soil erosion from water or wind and the movement of sediments into drainageways or state waters, or onto lands in the commonwealth, including but not limited to, clearing, grading, excavating, transporting, and filling of land. The term shall not include those activities identified in Section 750.05 of this manual.

F. Local Erosion and Sediment Control Program - An outline of the various methods employed by a program authority to regulate land disturbing activities and thereby minimize erosion and sedimentation in compliance with the state program, and may include such items as local ordinances, policies and guidelines, technical materials, inspection, enforcement, and evaluation.

G. Owner - The owner or owners of the freehold of the premises or lesser estate therein, a mortgagee, or vendee in possession, assignee of rents, receiver, executor, trustee, lessee, or other person, firm, or corporation in control of a property.

H. Permittee - The person to whom the permit authorizing land disturbing activities is issued or the person who certifies the approved erosion and sediment control plan will be followed.

I. Person - Any individual, partnership, firm, association, joint venture, public or private institution, utility, cooperative, county, city, town, or other political subdivision of the commonwealth, any interstate body, or other legal entity.

J. Plan Approving Authority - The director of Planning or the director of Public Works or either of their designees.

K. State Erosion and Sediment Control Program - The program administered by the Virginia Soil and Water Conservation Board, pursuant to Article 4, Chapter 5, Title 10.1 of the Code of Virginia, 1950, as amended, including regulations designed to minimize erosion and sedimentation.

L. Program Authority - The director of Public Works of Prince William County.

M. Certified Inspector - An employee or agent of the program authority who holds a certificate of competence from the Virginia Soil and Water Conservation Board in the area of project inspection, or is enrolled in the Board's training program for "certified inspector" and successfully completes such program within one year after enrollment..

N. Certified Plan Reviewer - An employee or agent of the program authority who holds a certificate of competence from the Virginia Soil and Water Conservation Board in the area of plan review or enrolled in the Board's training program for "certified plan reviewer" and successfully completes such program within one year after enrollment. A licensed professional engineer or land surveyor pursuant to Article 1 of Chapter 4 of Title 54.1 of the Code of Virginia can also serve as a certified plan reviewer.

O. Certified Program Administrator - An employee or agent of the program authority who holds a certificate of competence from the Virginia Soil and Water Conservation Board in the area of program administration, or is enrolled in the Board's training program for "certified program administrator" and successfully completes such program within one year after enrollment.

P. Responsible Land Disturber (RLD) - RLD is the individual holding a valid RLD Certificate who will be in charge of and responsible for carrying out a regulated "land-disturbing activity."

750.02 General Policy:

A. The purpose of this section is to protect the soil and water resources of Prince William County through a coordinated program to minimize soil erosion and sediment deposits caused by land disturbance actives related to urban development.

B. The County accepts and shall enforce all provisions of the Virginia Erosion and Sediment Control Law (Title 10.1 Chapter 5, Article 4 (Section 10.1-560 et seq.of the Code of Virginia). In addition, the County shall enforce the state's current erosion and sediment control regulations. Additional County requirements are described in sections 751.00 and 752.00 of this manual.

C. Whenever a land disturbing activity is proposed to be conducted by a contractor performing construction work pursuant to a construction contract, the preparation, submission, and approval of the required erosion and sediment control plan shall be the responsibility of the owner of the land.

D. Any erosion and sedimentation plan submitted under the provisions of this section will be acted on within forty-five (45) days from receipt by either approving or disapproving in writing and, if disapproved, giving specific reasons for such disapproval. If no formal action has been taken within forty-five (45) days after receipt of a plan, the plan shall be deemed approved. An erosion and sediment control plan submitted as part of a final subdivision or site plan will be reviewed within the time specified in the Administrative Procedures Manual. Where land disturbing activities involve lands under the jurisdiction of more than one local program, an erosion and sediment control plan may, at the option of the applicant, be submitted to the Board for review and approval, rather than to each jurisdiction. However, the applicant shall still be required to obtain appropriate permits from the County.

750.03 Permits:

A. No person shall engage in land disturbing activities of more than two thousand five hundred (2,500) square feet until the appropriate type of permits have been acquired. However, any land disturbance within a floodplain or a Resources Protection Area (including vegetation removal) requires authorization and approval from the director of Public Works, regardless of the size of disturbance.

The permit application for the land disturbance activity must clearly provide the name of the individual holding a valid Responsible Land Disturber (RLD) certificate, who will be in charge of the land disturbing activity, to the County.

B. An approved erosion and sediment control plan and certification that this plan will be carried out is required for issuance of site development, grading, building, or other permits.

C. Erosion and sediment control measures shall be installed, inspected, and approved prior to the initiation of construction.

750.04 Erosion and Sedimentation Control Management:

A. An agreement and/or permit shall be required on all projects which will obligate the developer to construct and maintain required erosion and sediment control devices, as specified on approved site development plans.

B. The agreement and/or permit shall be between the developer and the Board of County Supervisors. It shall ensure that measures could be taken by the Department of Public Works, at the applicant's expense, should erosion and sediment control devices fail. Such action shall occur after proper notice and within the time specified to initiate or maintain appropriate conservation action, which may be required by the approved plan as a result of land disturbing activity.

C. The agreement and/or permit document shall provide for a right-of-entry by representatives of the County, for purposes of inspection, reinstallation, maintenance, or any conservation practices as may be necessary.

D. If the Department of Public Works takes conservation action, upon failure of the erosion and sediment control devices from the applicant, it may collect the difference between the amounts of the reasonable cost of such action which exceeds the amount of the security held.

750.05 Exceptions: Although the state agency projects are not required to submit an erosion and sediment control plan to the County for approval, the plans must be approved by the Virginia Department of Conservation and Recreation. Also, linear utility and railroad projects shall have their specifications approved annually by the Virginia Soil and Water Conservation Board.

A. The following activities shall not be required to provide erosion and sediment control unless subject to the requirements of the Chesapeake Bay regulations:

1. Minor land disturbing activities of less than 2,500 square feet, such as home gardens, individual home landscaping, repairs, and maintenance.

2. Individual service connections of telephone, cable, and electricity.

3. Installation, maintenance or repair of any underground public utility lines when such activity occurs on an existing hard surface road, street, or sidewalk, provided the land disturbing activity is confined to the area of the road, street, or sidewalk, which is hard surfaced.

4. Septic tank lines or drainage fields, unless included in an overall plan for land disturbing activity relating to construction of the building to be served by a septic system.

5. Surface or deep mining.

6. Exploration or drilling for oil and gas including well site, feeder lines, and off-site disposal areas.

7. Tilling, planting, harvesting of agricultural, horticultural or forest crops, or livestock feedlot operations, including engineering, operating as follows: Construction of terraces, terrace outlets, check dams, desilting basins, dikes, ponds, ditches, strip cropping, lister furrowing, contour cultivating, contour furrowing, land drainage, and land irrigation. However, this exception shall not apply to harvesting of forest crops unless the area on which harvesting occurs is reforested artificially or naturally in accordance with the provisions of Virginia Code Section 10.1-1100 et seq. or is converted to bona fide agricultural or improved pasture use as described in subsection B of Virginia Code Section 10.1-1163.

8. Repair or rebuilding of the tracks, right-of-way, bridges, communication facilities, and other related structures and facilities of a railroad company.

9. Agricultural engineering operations including, but not limited to, the construction of terraces, terrace outlets, check dams, desilting basins, dikes, ponds not required to comply with the provisions of the Dam Safety Act (Section 10.1-604 et seq. of the Code of Virginia, as amended), ditches, strip cropping, lister furrowing, contour cultivating, contour furrowing, land drainage, and land irrigation. The construction of agricultural buildings is not exempt and shall conform to the requirements of Section 710 and 712 of the DCSM.

10. Preparation for single-family residences separately built and with land disturbance less than two thousand five hundred (2,500) square feet in size.

11. Disturbed land areas of less than two thousand five hundred (2,500) square feet in size.

12. Installation of fence and sign posts or telephone and electric poles and other kinds of posts or poles.

13. Shore erosion control projects on tidal waters when the projects are approved by the local wetlands board, the Marine Resources Commission or the United States Corps of Engineers. However, shoreline erosion control projects involving land disturbances outside of the authority of the environmental review agencies shall require approval from the County.

14. Emergency work to protect life on property and emergency repairs. However, if the land disturbing activity would have required an approved erosion and sediment control plan, had there not been an emergency, then the land disturbed shall be stabilized in accordance with this section.

750.06 Monitoring, Reports, and Inspections:

A. The Department of Public Works shall provide for periodic inspections of the land disturbing activity and may require monitoring and reports from the person responsible for carrying out the plan. The purpose of the periodic inspections is to ensure compliance with the approved plan and to determine whether the measures required in the plan are effective in controlling erosion and sediment. The County's inspection includes an inspection during or immediately following the installation of erosion and sediment controls, at least once every two-week period, within 48 hours following any rainstorm event, and the completion of the project prior to the release of any performance bonds. The owner, permittee, or person responsible for carrying out the plan shall be given notice of the inspection.

B. If a County inspector determines that there is a failure to comply with the plan, a notice to comply shall be served upon the permittee or person responsible for carrying out the plan by registered or certified mail to the address specified in the permit application, or by delivery at the site of the land disturbing activity to the agent or employee supervising such activities. The notice shall specify the measures needed to comply with the plan and shall specify the time within which such measures shall be completed. Upon failure to comply within the time specified, the permit may be revoked; the permittee or person responsible for carrying out the plan and the applicant shall be deemed in violation of this section. Upon conviction, the applicant shall be subject to the penalties provided in sections 750.07, 750.08, and 750.09 of this manual.

C. After land clearing operations have begun, no area shall be denuded for more than fourteen (14) days, except that portion of the site in which work will be continued beyond fourteen (14) days. All trenches for storm, sewer, water, and gas lines are to be backfilled, compacted, seeded, and mulched within seven (7) days of backfill.

D. A County inspector may ask the person responsible for carrying out the approved plan to change it in accordance with the following:

1. Where inspection has revealed that the plan is inadequate to satisfy applicable regulations.

2. During construction, the person responsible for implementing the approved plan may request a deviation for the erosion and sediment controls, in writing, to the director of Public Works, based on the actual site conditions. The director of Public Works or his designee shall promptly respond to this request in writing.

750.07 Violations:

A. If, after written notification, in accordance with sections 10.1-566 and 10.1-569 of the Code of Virginia, erosion and sediment control compliance is not obtained, appropriate administrative/legal action will be initiated which shall include authorizing the Department of Public Works to take erosion control escrow funds to correct the deficiencies listed on the violation in the event the suspense date is not met.

B. In the event that a violation of sections 10.1-563 or 10.1-566 of the Virginia Code is observed, a stop work order may be sought, pursuant to Section 10.1-566 C of the Code of Virginia, to prevent the unreasonable degradation of properties, stream channels, waters, and other natural resources.

C. The director of Public Works shall not begin any legal action to enforce the provisions of this section, unless notice has been given to the applicant of a violation of this section. Such notice shall give the applicant a reasonable opportunity under particular circumstances to correct the situation before enforcement action.

D. Violators of sections 10.15-563 and 10.1-566 of the Code of Virginia shall be guilty of a Class I misdemeanor.

E. Any person who violates this section may be liable to the County in a civil action for damages, as appropriate.

F. Any person violating or failing, neglecting, or refusing to obey any injunction, mandamus, or other remedy obtained pursuant to this section shall be subject, in the discretion of the court, to a civil penalty not to exceed two thousand dollars ($2,000) for each violation. A civil action for such violation or failure may be brought by the Board of County Supervisors. Any civil penalties assessed by the court shall be paid to the County.

G. Violation of any regulation or provision of the erosion and sediment control program and condition of a permit shall be subject to the following:

1. The civil penalty for commencement of land-disturbing activities without an approved plan, as provided in Section 750.03 of this manual, shall be one thousand dollars ($1,000).

2. Violation of any of the minimum standards, which are set forth in the erosion and sediment control regulations, as codified at 4 VAC 50-30-40 et seq., as amended, and which are incorporated herein by reference, shall be subject to a civil penalty of one hundred dollars ($100).

a. Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within seven (7) days to denuded areas that may not be at final grade but will remain dormant for longer than fourteen (14) days. Permanent stabilization shall be applied to areas that are to be left dormant for more than six (6) months.

b. During construction of the project, soil stockpiles and borrow areas shall be stabilized or protected with sediment trapping measures. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles on site as well as borrows areas and soil intentionally transported from the project site.

c. A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until ground cover is achieved that is uniform, mature enough to survive, and will inhibit erosion.

d. Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.

e. Stabilization measures shall be applied to earthen structures such as dams, dikes and diversions immediately after installation.

f. Sediment traps and sediment basins shall be designed and constructed, based upon the total drainage area to be served by the trap or basin.

1) The minimum storage capacity of a sediment trap shall be one hundred thirty-four (134) cubic yards per acre of drainage area and the trap shall only control drainage areas less than three (3) acres.

2) Surface runoff from disturbed areas that is comprised of flow from drainage areas greater than or equal to three acres shall be controlled by a sediment basin. The minimum storage capacity of a sediment basin shall be one hundred thirty-four (134) cubic yards per acre of drainage area. The outfall system shall, at a minimum, maintain the structural integrity of the basin during a twenty-five (25) year storm of twenty-four (24) hour duration. Runoff coefficients used in runoff calculations shall correspond to a bare earth condition or those conditions expected to exist while the sediment basin is utilized.

g. Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilization measures until the problem is corrected.

h. Concentrated runoff shall not flow down cut or fill slopes, unless contained within an adequate temporary or permanent channel, flume or slope drain structure.

i. Whenever water seeps from a slope face, adequate drainage or other protection shall be provided.

j. All storm sewer inlets that are made operable during construction shall be protected so that sediment-laden water cannot enter the conveyance system without first being filtered or otherwise treated to remove sediment.

k. Before newly constructed stormwater conveyance channels or pipes are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and receiving channel.

l. When work in a live watercourse is performed, precautions shall be taken to minimize encroachment, control sediment transport and stabilize the work area to the greatest extent possible during construction. Nonerodible material shall be used for the construction of causeways and cofferdams. Earthen fill may be used for these structures, if armored by nonerodible cover materials.

m. When a live watercourse must be crossed by construction vehicles more than twice in any six-month period, a temporary vehicular stream crossing constructed of nonerodible material shall be provided.

n. All applicable federal, state and local regulations pertaining to working in or crossing live watercourses shall be met.

o. The bed and banks of a watercourse shall be stabilized immediately after work in the watercourse is completed.

p. Underground utility lines shall be installed in accordance with the following standards, in addition to other applicable criteria:

1) No more than five hundred (500) linear feet of trench may be opened at one time.

2) Excavated material shall be placed on the uphill side of trenches.

3) Effluent from dewatering operations shall be filtered or passed through an approved sediment trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property.

4) Materials used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization.

5) Restabilization shall be accomplished in accordance with these regulations.

6) Applicable safety regulations shall be complied with.

q. Where construction vehicle access routes intersect paved or public roads, provisions shall be made to minimize the transport of sediment by vehicular tracking onto the paved surface. Where sediment is transported onto a paved or public road surface, the road surface shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to individual development lots, as well as to larger land disturbing activities.

r. All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed, unless

otherwise authorized by Public Works. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

s. Each day, during which any violation above is found to have existed, shall constitute a separate offense. In no event shall a series of specified violations arising from the same operative set of facts result in civil penalties which exceed a total of three thousand dollars ($3,000), except that a series of violations arising from the commencement of land-disturbing activities without an approved plan for any site shall not result in civil penalties which exceed a total of ten thousand dollars ($10,000). The specification of civil penalties for the civil violations set forth in this subsection 750.07.G. shall be in lieu of criminal sanctions and shall preclude the prosecution of the violations specified in this subsection as a misdemeanor. However, violations not specified in this civil summons violation still are subject to prosecution as a misdemeanor under Section 10.1-569 (A), Virginia Code Ann.

750.08 Stop Work Order:

Upon receipt of a sworn complaint of a violation of this section, or Virginia Code § 10.1-563 or § 10.1-564 from a County inspector, the director of Public Works or his designee, may, in conjunction with or subsequent to a notice to comply pursuant to Virginia Code § 10.1-566(A), issue an order requiring that all or part of the land-disturbing activities permitted on the site be stopped until the specified corrective measures have been taken or, if land-disturbing activities have commenced without an approved plan, requiring that all of the land-disturbing activities be stopped until an approved plan or any required permits are obtained.

Where the alleged noncompliance is causing or is in imminent danger of causing harmful erosion of lands or sediment deposition in waters within the watersheds of the Commonwealth, or where the land-disturbing activities have commenced without an approved plan or any required permits, such an order may be issued whether or not the alleged violator has been issued a notice to comply pursuant to Virginia Code § 10.1-566(A). Otherwise, such an order may be issued only after the alleged violator has failed to comply with a notice to comply. The order shall be served in the same manner as a notice to comply pursuant to Virginia Code § 10.1-566(A), and shall remain in effect for seven days from the date of service pending application by the enforcing authority or alleged violator for appropriate relief to the circuit court of the jurisdiction wherein the violation was alleged to have occurred.

If the alleged violator has not obtained an approved plan or any required permits within seven days from the date of service of the order, the director of Public Works or his designee may issue an order to the owner requiring that all construction and other work on the site, other than corrective measures, be stopped until an approved plan and any required permits have been obtained. Such an order shall be served upon the owner by registered or certified mail to the address specified in the permit application or the land records of the locality in which the site is located.

The owner may appeal the issuance of an order to the circuit court of the jurisdiction wherein the violation was alleged to have occurred. Any person violating or failing, neglecting or refusing to obey an order issued by the director of Public Works or his designee may be compelled in a proceeding instituted in the circuit court of the jurisdiction wherein the violation was alleged to have occurred to obey same and to comply therewith by injunction, mandamus or other appropriate remedy.

Upon completion and approval of corrective action or obtaining an approved plan or any required permits, the order shall immediately be lifted. Nothing in this section shall prevent the director of Public Works or his designee from taking any other action specified in pursuant to Virginia Code § 10.1-569.

750.09 Injunctions and Other Relief:

A. Notwithstanding any other relief or remedy available under this section, the director of Public Works may apply to the Circuit Court of Prince William County for injunctive or such other equitable relief as may be appropriate in the case of a violation or threatened violation of any of the provisions of this section, without the necessity of showing that there does not exist an adequate remedy at law.

B. The remedies provided for in this section shall be cumulative in the sense that the imposition of, or attempt to, impose one remedy shall not act as a restriction of any right to impose, or attempt to impose, any other remedy authorized by this section.

C. With the consent of any person who has violated, failed, neglected, or refused to obey any regulation or order of the director of Public Works of a permit or any provision of this section, the director of Public Works may provide, in an order issued by the BOCS against such person, for payment of civil charges for violations in specific sums, not to exceed two thousand ($2,000.00) dollars for each violation. Such civil charges shall be instead of any appropriate civil penalties which could be imposed as outlined in Section 750.07 of this manual.

750.10 Appeals: Final County decisions are subject to review by the Prince William Circuit Court, provided an appeal is filed within thirty (30) days of the date of written decision.

750.11 Escrows for Site Development Projects:

A. Prior to issuance of a soil erosion control permit, an escrow shall be required to be posted in one of the following forms:

1. Deposited with the Prince William County director of Finance.

2. Deposited in an appropriate financial institution. The agent shall be a permanent resident of, and shall be bonded in, the state of Virginia, for an amount in excess of the aforementioned amount of deposit.

3. Letter of Credit. The institution must be FDIC or FSLIC insured.

B. The minimum acceptable amount for the erosion control escrow shall be one thousand ($1,000.00) dollars, other than for detached single family dwellings, which shall conform to section 750.12. It shall include an amount sufficient for the County, should the applicant fail to perform in accordance with the agreement required in Section 750.03 of this manual, to implement and maintain the following:

1. Conservation measures.

2. Stabilization of all denuded areas through seeding, landscaping, and/or ground cover.

3. Cleaning of sediment from sediment basins, traps and SWM ponds which function as sediment traps.

4. The total amount of the escrow shall be inclusive of fifteen percent (15%) of the above costs for supervision, administration, and inflation.

C. The escrow shall be released when the site is adequately stabilized and all requirements have been completed, inspected and accepted, to include compliance with County administrative release requirements.

D. A one-time reduction of a maximum of fifty percent (50%) of the escrow amount may be approved when work has satisfactorily progressed to the stage where sufficient escrow monies would remain to ensure the installation, maintenance, and performance of erosion and sediment control measures.

750.12 Erosion Control Escrow for Building Single-family Detached Dwellings:

A. Amount of Guarantee. The escrow amount required for erosion control for each disturbed lot will be two thousand dollars ($2,000.00), but will not exceed fifty thousand dollars ($50,000.00) per builder per section of project.

B. Form or Guarantee same as in Section 750.11A of this manual.

C. Subdividers who are Homebuilders: Homebuilders who have posted an escrow pursuant to 750.11 shall not have to post an additional escrow for individual lots. In this instance, deposits shall be retained until the “on-lot” work has been completed as well as the subdivision construction plan work pursuant to 750.11D.

751.00 EROSION AND SEDIMENT CONTROL - PLANNING AND DESIGN

751.01 General Requirements: Conservation standards shall be the state minimum criteria, standards and specifications as contained in the current Virginia Erosion and Sediment Control Handbook, with modifications as follows:

A. Standard and Specification #3.02, Temporary Gravel Construction Entrance. The minimum length for the temporary gravel construction entrance shall be seventy (70) feet. Wash racks shall be required with an appropriate water source to wash the mud off the tires before entering the public road. The source of the water shall be stated on the plans. The wash water must be carried away from the entrance to a settling area to remove sediment. In addition, a construction entrance pad shall be provided for each detached single-family dwelling unit. The construction entrance shall be a minimum of thirty (30) feet long, twelve (12) feet wide, and a minimum of four (4) inches thick. VDOT #1 coarse aggregate (2 to 3 inch) stone shall be used. The pads shall be located at the proposed location of the individual driveways so that the coarse aggregate could be used as subgrade for the driveways.

B. Standard and Specification #3.04, Straw Bale Barriers. Straw bales shall be used only for sheet flow application; they shall not be used for any drainageway or channel flow applications or as perimeter controls for the site to be developed.

C. Standard and Specification #3.05, Silt Fence. Manufacturer's certification shall be required to meet the physical properties given for synthetic filter fabric per the construction specifications as noted in the current Virginia Erosion and Sediment Handbook. Prince William County shall maintain a list of acceptable materials.

D. Standard and Specification #3.06, Brush Barrier. This practice shall not be used without the specific authorization of the director of Public Works.

E. Standard and Specification #3.07, Storm Drain Inlet Protection. Any storm drain inlet protection measure which completely blocks the drain throat or entrance shall not be used. Straw bales and cinder block wrapped with filter fabric shall not be used for curb inlet protection. Block and gravel sediment filters are to be used for curb or drop inlet protection. Inlet protection devices are for drainage areas of less than one acre. Runoff from larger disturbed areas should be routed through a temporary sediment trap (Standard and Specification #3.13).

F. Standard and Specification #3.09, Temporary Diversion Dike. The maximum allowable drainage area is five (5) acres. The dike should be located to minimize damage by construction operations and traffic. It should be adequately compacted to prevent failure and stabilized with temporary or permanent seeding and mulch immediately after construction. Dikes shall not be used to break up drainage divides to support the use of sediment traps in place of sediment basins where it will inhibit the constructability of the site. Construction of the dikes shall be in accordance with Standard and Specification #3.09 of the Virginia Erosion and Sediment Control Handbook.

G. Standard and Specification #3.13, Temporary Sediment Trap: One hundred thirty-four (134) cubic yards per acre of the total contributing drainage area shall be required for the storage volume. One half of the design volume shall be in the form of permanent pool or wet storage and the remaining half in the form of drawdown or dry storage. Construction of the sediment trap shall be in accordance with Standard and Specification #3.13 of the Virginia Erosion and Sediment Control Handbook. The dimensions (length, width, and depth) for each trap shall be clearly labeled on the erosion and sediment control plans.

H. Standard and Specification #3.14, Temporary Sediment Basin. A designed basin shall be provided where the total contributing drainage area exceeds three (3) acres. One hundred thirty-four (134) cubic yards per acre of total contributing drainage area shall be required for the storage volume. The design of the sediment basin shall be in accordance with Standard and Specification #3.14 of the Virginia Erosion and Sediment Control Handbook. One half of the design volume shall be in the form of permanent pool or wet storage and the remaining half in the form of drawdown or dry storage. Construction of the sediment trap shall be in accordance with Standard and Specification #3.14 of the Virginia Erosion and Sediment Control Handbook. The dimensions (length, width and depth) for each basin shall be clearly labeled on the erosion and sediment control plans.

I. Permanent or temporary soil stabilization shall be applied to denuded areas within seven (7) days after final grading is reached on any portion of the site. Temporary soil stabilization shall be applied within seven (7) days to denuded areas that may not be at final grade but will remain dormant for longer than fourteen (14) days, except for that portion of the site on which work will be continuous beyond fourteen (14) days. Permanent soil stabilization shall be applied to areas that are to be left dormant for more than six (6) months. For winter stabilization, any area denuded for more than fourteen (14) days after November 1 and before March 1 shall be mulched and seeded appropriate to the season and site conditions. Preparation of areas for permanent stabilization shall be performed in accordance with standard specification #3.32 of the Virginia Erosion and Sediment Control Handbook.

J. The developer shall provide safety fence around sediment traps and sediment basins immediately after these facilities are constructed.

K. When the proposed development is located in or adjacent to environmentally sensitive areas, the director of Public Works shall require more stringent erosion and sediment control measures. In addition, the director of Public Works may also require additional storage volume to be provided for the sediment basins and traps.

751.02 Two-Layer Perimeter Erosion Control Measures:

A. To protect adjacent properties and to limit erosion and to control sediments, two layered erosion control measures shall be installed under the following conditions:

1. Slopes of fifteen percent (15%) or greater with soils showing severe erodibility as per Prince William County soils classifications.

2. Tidal and nontidal wetlands.

3. Expected detrimental impact on adjacent properties, waterways, or water courses.

4. Resource Protection Areas

B. Two-layered erosion control measures shall consist of diversion dikes (Standard and Specification #3.09) with adequate gravel outlet structures, and silt fence (Standard and Specification #3.05. The measures shall be placed approximately parallel to each other and no closer than ten (10) feet. The outer layer shall be placed within the limits of the disturbance area identified on the approved plans. Both layers shall remain in place and functional until all disturbed areas which contribute runoff towards these measures are properly stabilized.

751.03 Sedimentation and Debris Basins:

A. In some locations, as may be allowed by Section 740.00 of this manual, sedimentation basins or debris barriers may be situated in the watercourses for the control of silt or debris while upstream construction is taking place.

B. The planning of these basins should include consideration of the necessity to remove these basins and the trapped materials when the construction process is completed. The effects of these facilities on the surrounding environment shall also be considered (i.e., the deposition of silt over root systems, the preservation of existing woodland, etc.).

C. Sedimentation basins are not normally acceptable as permanent facilities due to maintenance problems and the long term desirability of eliminating erosion rather than merely trapping a percentage of the eroded material.

D. The installation of permanent debris barriers may be desirable in particular instances. The desirability of permanent debris barriers shall be assessed on an individual basis.

E. Permanent debris barriers, if approved, should be in a location accessible to heavy equipment and trucks and would primarily be for the purpose of trapping large debris such as dead tree limbs before such material could float downstream to block a culvert system. Location of such debris barriers should include consideration of flood water levels that could occur if the barrier had trapped a considerable amount of such debris.

F. A final step in the construction process should include the removal of any debris, rubbish, trash and waste construction material in a similar manner to that done for other portions of the development.

752.00 EROSION AND SEDIMENT CONTROL SUBMISSION REQUIREMENTS

752.01 General Requirements:

A. An erosion and sediment control plan shall be required for all land disturbing activity that exceeds two thousand five hundred (2,500) square feet. The erosion and sediment control plan shall detail those methods and techniques to be utilized in the control of the erosion and sedimentation.

B. The erosion and sediment control plan shall follow the format as set forth in the Virginia Erosion and Sediment Control Handbook, which is adopted as part of this section.

C. The checklist contained in Chapter 6 of the Virginia Erosion and Sediment Control Handbook shall be used by site planners to determine if all of the major items are included in the erosion and sediment control plan.

D. In order to prevent further erosion, the Department of Public Works may require the submission and approval of a conservation plan for any land identified by the Department as an erosion impact area.

752.02 Phased Plan:

A. A two-phased plan for the control of erosion and sedimentation, with a detailed narrative explaining each phase, is required to be submitted to address the topographical and site drainage features of a development site.

B. The narrative portion of the phased plan shall indicate at which stage of construction the transition is to be made from the initial plan to the secondary plan. This two-phased plan is designed to ensure adequate erosion and sediment control protection from the beginning of a project until its completion.

C. The phased plan shall consist of two (2) independent plans. The first plan shall describe the conservation measures required during the initial land clearing and rough grading phase. The second plan shall specify the conservation measures required once the storm sewer system is installed and operational and the roads are near completion. The plans must clearly state when a storm water management facility is to be constructed, if it is not a sediment basin.

770.00 SOIL TESTING (GEOTECHNICAL) POLICY

770.01 General Purpose: The purpose of this policy is to promote safety and protect property through a coordinated program of adequate soil testing and approval in the early stages of site development. This policy is required by the Uniform Statewide Building Code.

770.02 Engineering Soils Categorization:

A. The only comprehensive source of information about soils in the County is the Soil Survey of Prince William County, Virginia, 1989, published by the Soil Conservation Service of the United States Department of Agriculture. This survey is useful for agricultural, planning, engineering and environment enhancements.

1. The survey referenced above describes fifty-six (56) different kinds of soils, numbered one (1) through fifty-six (56). Each of these soils carry a suffix of A through E, representing the class of slope, and a final number indicating the degree of erodibility. This results in a total of ninety-one (91) soil units.

2. The survey has some limitations, e.g., the depth of exploration does not exceed seventy-two (72) inches, and the areas already developed at the time of survey have not been studied

B. For the purpose of implementation of this policy, the engineering information contained in the above soil survey has been utilized for expedient and dependable engineering evaluation. Based on the engineering characteristics of the type of soil, the ninety-one (91) units are divided into three (3) categories:

1. Category I Soils: Good soils. (No engineering difficulties anticipated.)

2. Category II Soils: Potential problem soils (Some engineering difficulties anticipated which may require special engineering solutions.)

3. Category III Soils: Problem soils. (Significant engineering difficulties anticipated which may require special engineering solutions.)

C. The following criteria were utilized to determine the soil categories:

1. Category I Soils: Soils that are not anticipated to represent any engineering problems that are associated with category II and III soils are listed below.

2. Category II Soils: Any of the following conditions will cause an area to be designated as Category II soil:

a. High groundwater table (seasonal or perched).

b. Shallow rock.

c. Natural asbestos formations.

d. Areas located in the western coastal plain (soil unit Neabsco-Quantico-Dumfries).

3. Category III Soils: Any of the following conditions will cause an area to be designated as a Category III soil:

a. High shrink/swell potential.

b. Compressible soils.

c. Existing uncontrolled or undocumented fills.

d. Flood plain and perennial high groundwater table.

e. Eastern coastal plain/marine clay soils (soil unit Dumfries-Lunt-Marr).

D. Based on the above criteria, all ninety-one (91) soils in PWC have been categorized and the results presented in a table and a digitized map available at the Department of Public Works.

770.10 Soils Report Requirement:

A. A soils report shall be prepared and submitted for approval at the time of first site plan submission. The report shall be prepared, sealed and signed by a professional engineer, registered in the Commonwealth of Virginia, qualified and experienced in geotechnical engineering and approved by the County, known as the geotechnical engineer of record (GER). The geotechnical recommendations made in the report shall be transposed in the form of construction drawings and specifications onto the project site/subdivision plan. The GER shall review, sign, date and seal these plans with an original signature.

B. A soils report shall be required to be submitted, depending on the type of project and the types of soils encountered within the project, in accordance with Section 770.11 to 770.13 below.

770.11 Commercial Structures: All commercial structures will be governed by the provisions of the latest revision of the IBC adopted by the uniform statewide building code and special inspection program of Prince William County.

The County's requirement for a geotechnical study for the entire project in Category II and III soils is in addition to the provisions in the IBC Code.

770.12 Residential Project:

A. Limited Geotechnical Study: Any of the following conditions will warrant a limited geotechnical study to be conducted, followed by the submission of a geotechnical report. However, based on reconnaissance of the site and literature review, performed for the limited geotechnical report, the GER may decide that a detailed geotechnical investigation and report is required.

1. Category II soils.

2. Unmapped areas outside eastern coastal plain (soil unit Dumfries-Lunt-Marr).

3. Disturbed areas, defined as those areas that have been altered by mankind without the availability of compaction or other disturbance record.

B. Detailed Geotechnical Study: Any of the following conditions will warrant a detailed geotechnical study to be conducted, followed by the submission of a detailed geotechnical report:

1. Category III soils.

2. Specialty engineering solutions expected (reinforced slope/deep foundations/ground improvement, etc.).

3. Retaining walls - Refer to Section 710.06 of the DCSM and special inspection program.

4. Ponds/dams higher than ten (10) feet.

770.13 Additional Requirements: If necessary, the director of Public Works may require a geotechnical study for special situations not foreseen by this policy. Likewise, if the director of Public Works determines that problem soils are not located adjacent to or within the construction areas and that the proposed construction on a site with problem soils will not adversely impact either the subject property or adjoining properties, the director of Public Works may exempt the project from the requirement of a soils report upon submission of a letter of exception by the developer.

770.20 Guidelines for the Preparation of Geotechnical Studies: The required soils report and associated plans, specifications and other documentation must be prepared in accordance with the Prince William County Guidelines for Soils (Geotechnical) Studies (Appendix A).

770.30 Soils Report Review by Third Party:

A. After a soils report on the proposed work has been submitted, the director of Public Works may refer the report to a third party for review, analysis, advice and recommendations. Referral to a third party could be to supplement the County staff technical expertise, or when the recommendations of the GER are not satisfactory to the County.

B. The recommendations of the third party shall not be binding to the director of Public Works. However, if the director makes a finding contrary to the third party recommendations, the director shall file a written statement of reasons for such finding.

770.40 Soils Report Approval:

A. No work shall be commenced until approved by the County. Approval as to soil conditions shall not relieve any person from obtaining all other approvals and permits necessary for the proposed work.

B. The review and approval plans, specifications and reports by the County, with or without the recommendations of a third party, shall in no way relieve the developer of the responsibility for the design, construction and performance of the structures, pavement and slopes on the project and any damage to surrounding properties.

770.50 Additional Requirements for Slopes:

The GER shall provide a written certification on the constructed (graded) slopes under the following conditions:

A. For as-built slopes in coastal plain areas, steeper than 6:1 and have an elevation difference of 10 ft.

B. For all other as-built slopes, in other areas, steeper than 3:1 and have an elevation difference of 15 Ft.

The written certification shall include, but is not limited to, the type of material, gradient, compaction, depth and spacing of piles/piers, location, length, spacing, strength and type of geogrid, and ground cover to protect the slope as specified, and any other stabilization measures as recommended in the approved geotechnical report. The GER shall verify and certify that the final slope is in accordance with the slope approved in the geotechnical report at the time of as-built plan submission.

770.60 Requirements for Structural Fill:

Soils used in compacted structural fills shall be free of debris and organic material, root mat, top soil, highly plastic silts or clays and other unsuitable material. Surface material containing organics shall not be used in either treated or in untreated condition. Suitable structural fill material shall classify as SM, SM-SP, SP, SW, GM, GM-GP, GP, GW, ML, or CL using the Unified Soil Classification System. The liquid limit and the plasticity index of the minus 40 sieve fraction shall be less than 45 and 20, respectively. Medium to high plasticity soils (LL>45, PI>20) shall not be used in controlled structural fill areas.

In addition, the structural fill material for the building pads shall be tested in accordance with the requirements of IBC and IRC, as applicable to determine whether the proposed structural fill material is expansive. Fill material comprised of expansive soils as determined by the tests stipulated in IBC and IRC shall not be used under the building pads.

If chemical or other type of stabilization is proposed, the specification to alter the performance and behavior of plastic silts and clays shall be submitted to the County for review and approval.

780.00 TABLES

TABLE 7-1 RATIONAL METHOD
$Q = C_f C I A$
Q = peak discharge in C.F.S. C = runoff coefficient (Exhibit 1) based on the ultimate densities and intensities of the drainage area as shown on the Long Range Future Land Use Plan Map of the Comprehensive Plan. C_f = Correction Factor for ground saturation I = Rainfall intensity (Exhibit 5) A = Drainage area, acres C_f vs. Frequency (Recommended Values) 1.0 10 yr. or less 1.1 25 yr. 1.2 50 yr. 1.25 100 yr.

TABLE 7-2 PIPE SIZE AND EASEMENT WIDTH	
Pipe Size in inches	**Width of Easement in feet**
Up TO 18	15
21 to 33	20
36 to 48	25
54 to 72	30

TABLE 7-3 PIPE ROUGHNESS COEFFICIENT	
Pipe Material	**Coefficient**
Concrete	0.013
Corrugated Metal with Paved Invert	0.021
Plain Corrugated Metal	0.024
Field Bolted Arch	0.030
HDPE	0.012

TABLE 7-4 GRADING PLAN LEGEND	
Existing contour:	_____ _____ 300 _____ _____
Proposed contour:	——— 300 ———
Existing spot elevation:	90.5
Proposed spot elevation:	+ 90.5
Proposed clearing limit:	----------
Silt fence:	——x——x——x——x——
Temporary diversion dike:	
Yard Light:	 **YL-1**

TABLE 7-5
PRO RATA COST SHARING FORMULA

LESS THAN OR EQUAL TO FORTY PERCENT (40%) IMPERVIOUS

$/Acre = A x I

GREATER THAN FORTY PERCENT (40%) IMPERVIOUS

$/Acre = $B + I^2 \times C$

I = Impervious represented as a fraction, based on current zoning (see Exhibit 12)

A = 3,400 x D
B = 400 x D
C = 6,000 x D
D = Current ENR Construction Cost Index ÷ 3,726

ENR Construction Cost Index for Jan. 1982 = 3,726

APPENDIX A
GUIDELINES FOR SOILS (GEOTECHNICAL) STUDIES

1.00 Purpose: The purpose of any geotechnical investigation is to determine the character and physical properties of soil deposits for use as foundation support or material for earthwork construction purposes. The type of structure to be built and anticipated geologic and field conditions has a major bearing on the extent of investigation to be conducted.

The investigation must, therefore, be planned with knowledge of the intended project size, land utilization and a broad knowledge of the geologic history of the area. The geotechnical report will be submitted for review with the site plan.

2.00 Scope: Experience has shown that in many areas of the County, there are potential problems including ground slippage and instability of Cretaceous Age deltaic clays, often called marine clays, shrinking and swelling of certain clays, high water table, shallow rock, etc. The extent of such soils has been approximately delineated on the County soils map.

These guidelines present minimum requirements, and every effort should be made to meet these requirements. However, depending on the site conditions, the geotechnical engineer of record (GER) may propose an alternate program for the approval of the director of Public Works. The final responsibility for adequate planning of exploration, sampling and testing programs and close supervision of the work, shall be vested in a competent professional engineer, registered in the Commonwealth of Virginia, qualified and experienced in geotechnical engineering, and approved by the County.

3.00 General Guideline:

3.01 Limited and Detailed Geotechnical Studies: The Design and Construction Standards Manual (DCSM) envisions two levels of geotechnical studies; namely, limited geotechnical study and detailed geotechnical study. The DCSM also discusses the conditions that will warrant each type of study. Related to those conditions is attached Table I, titled Prince William County Soils Categories. The extent of the two studies is described below.

The limited geotechnical study shall include, but may not be limited to, a site visit and literature search. The detailed geotechnical study shall include field exploration and laboratory testing, in addition to the requirements for the limited geotechnical study. The reports for both limited and detailed geotechnical studies shall address all pertinent geotechnical issues concerning the project, as discussed later. However, as the name implies, the limited report may not be as detailed and most often a letter report will be acceptable.

3.02 Site Investigation: The site and soil investigation should include, but not be limited to, the following factual information, analysis and recommendations:

A. Identification of surface features should include, but not be limited to, old construction, rock outcrops, water course, swamps, ditches, ponds, wooded areas, and filled-in areas. Particular emphasis must be given to identification of possible old slide areas. This should include a

thorough surface reconnaissance of the site being developed and the surrounding area. Consideration should be given to reviewing aerial photographs of the area.

B. Field exploration methods shall follow the applicable standards and recognized procedures of geotechnical engineering, as set forth by ASTM, ASCE, AASHTO, AEG and other recognized standards.

C. The spacing and depth of borings must be based on the site conditions and the proposed construction. Borings shall extend sufficiently into an underlying material of adequate bearing capacity and below the depth of a possible slope failure.

D. The interval of soil sampling shall be determined on the basis of soils encountered, the type of structure and other conditions. Continuous sampling may be required. Test procedures utilized shall be identified.

E. Information on the degree of compactness of granular soils and on the consistency of cohesive soils should be obtained.

F. The presence of seepage zones, depth to groundwater and the possible fluctuations with seasons should be investigated. Water tables should be determined at least twenty-four (24) hours after completing the boring. Perforated casings or piezometers may be required in selected bore holes, satisfactory to the director of Public Works, to obtain long-term water level readings. The bore holes must be plugged after completion and after taking twenty-four (24) hour water level readings.

Direct observation of soil samples from various depths and locations shall be required for correlation with the known geology of the area. Classification and description of soils shall be done by the USCS (ASTM specification D2487), and by the visual manual identification procedure (ASTM D2488). All terms and nomenclatures used for textural description of the soils must be clearly defined. Complete soil descriptions must also include in-place conditions, geologic names, local names and any other information that is pertinent to the interpretations of the subsoil characteristics.

3.03 Laboratory Testing: The nature and extent of laboratory testing deemed necessary shall depend upon, but not be limited to, the characteristics of the soils, the type and size of the proposed structure, and the anticipated geotechnical problems. The following are the minimum items to be considered:

A Gradation tests and water content determinations on representative samples of granular soils are often adequate.

B. Testing of cohesive soil samples may include, but not be limited to, determination of water content, Atterberg limits, dry density and unconfined compressive strength.

C. In stiff, fissured clays such as the Cretaceous marine clays, the results of unconfined compression tests alone cannot be used to assess the structural strength of the soil in-situ.

Atterberg limit and hydrometer analysis tests aid in classification and also in predicting certain properties.

D. Consolidation tests should be performed on samples from relatively soft soils which may underlie the foundations. Expansive pressure of the clays should also be determined for foundation design.

E. For the deltaic clays, which have undergone relatively large strains in the past, the important properties for predicting long-term behavior are the residual effective friction angle and the residual cohesion intercept (the absolute minimum strength of clay material). These parameters should be determined by appropriate laboratory tests (drained direct shear tests using sufficient stress reversals to obtain large strains). Many reversals are required to reach residual strengths. Some references suggest using a pre-split sample (Ref. Engineering Properties of Clay Shales Report No. 1, by W. Haley and B. N. MacIver). For less complex situations, subject to approval of the director of Public Works, the required parameters may be estimated by comparison of other index properties (particularly the Atterberg limits) with those of similar soils for which test results are reported in the published literature and on the basis of past experience. Documentation shall be furnished when shear strength parameters are based on results other than laboratory tests. Such documentation must set forth the reasoning by which parameters were determined.

3.04 Geotechnical Report: All the information and data obtained from literature search, site surface observations, explorations and laboratory testing must be recorded properly in the soils report. Where applicable, the following information should be provided:

A. A plotted record of the stratification of the soil deposits, both horizontal and vertical, shall be included in the soils report. This record should indicate, in the soil profile, the surface elevation of all borings and test pits, and should also indicate the thickness and character of the soils encountered. The profiles should reach to such a depth as may be required, and are to include twenty-four (24) hour water level readings.

B. Information on groundwater elevations must be provided, including depth of permanent and perched water tables.

C. The report of the soil studies shall include sufficient analytical foundation and slope stability studies to allow a reviewer to follow the logic and assumptions on which the analysis was based and conclusions reached. Recommendations and advice concerning pavement design, foundation design, earthwork, site grading, drainage, slope stabilization and construction procedures must be included in the report. The report shall include a complete record of the field and laboratory findings, information concerning structures to be built (types and elevations of basements), the conclusions reached from the study, and the recommendations for use by the designer and the owner. Probable total and differential settlement of foundations, special basement problems and retaining wall design must be discussed and recommendations set forth.

D. In areas that are susceptible to high water table (permanent, perched and/or seasonal) the engineer shall provide pavement design and measures to assure dry basements and to preclude wet yards, etc.

E. Where marine clays are found, an engineering analysis of the short- and long-term stability of existing and planned slopes must be made, including a careful evaluation of potential adverse effects on nearby properties. The stability analysis shall be made by acceptable methods of analysis. The long-term stability shall be based on the residual shear strength parameters for the marine clays.

F. The report shall include a discussion on the problems of expansive soils. High shrink/swell soils have been found in a wide variety of locations in Prince William County and are concentrated in the north and west of Manassas and in the eastern coastal plain (generally east of I-95). It is suggested that the design recommendations in such soils be based on expansive properties of the clay, unless it is shown otherwise by X-ray diffraction studies or other appropriate laboratory tests.

4.00 Specific Guidelines

4.01 The site and soil exploration should be tailored to gather reliable information for making design and construction recommendations concerning the following structures and conditions, where applicable:

A. Foundations/slabs.

B. Proposed slopes or existing slopes affected by construction.

C. Ponds/dams.

D. Retaining walls.

E. Pavements.

F. Existing fills.

G. Shrink/swell soils.

H. Marine clays.

I. Soil types within limits of disturbance.

J. Asbestos formations.

K. Groundwater.

L. Presence of rock.

M. Structural Fill

N. Special conditions.

4.02 Frequency and Depth of Exploration:

The number and depth of borings shall be based on the following criteria:

A. Dwelling units: The GER shall decide on the number and location of borings such as to develop adequate characterization of the site subsurface conditions.

Borings shall be extended below the ground surface to the most stringent of the following:

1. Two times the footing width, or five (5) feet below bottom of footing elevation, whichever is greater, unless refusal is encountered earlier.

2. A minimum of five (5) feet into competent virgin soils.

3. A minimum of five (5) feet below the bottom of undocumented fill soils into competent virgin soils.

B. Slopes: All of the slopes that are located in the coastal plain and are steeper than six-to-one (6:1), and have an elevation difference of five (5) feet, shall be explored with a minimum of one cross-section per slope and two borings per cross-section.

The GER will decide on the number of borings needed for slopes located in other areas of the County.

Borings shall extend below the bottom elevation of the slope to a minimum depth of half times the height of slope and shall provide a continuous vertical soil profile from the top of slope to the termination depth of exploration. Where deep-seated failures are anticipated, such as the eastern coastal plain, consideration should be given to drill to an elevation of the full height of the slope below the level of the bottom of the slope.

C. Ponds/dams: When the dam exceeds ten (10) feet height, a minimum of three (3) borings shall be drilled; one boring in the pond basin, one (1) boring in the embankment, and one (1) boring in the principal spillway area. If necessary, the GER may choose to drill additional borings.

The GER shall decide on the depth of boring for adequate evaluation of seepage and embankment stability.

D. Retaining Walls: Up to eight (8) feet exposed height, the GER shall decide on the number of borings, from eight (8) feet to sixteen (16) feet exposed height, one (1) boring per two hundred (200) feet length of wall, higher than sixteen (16) feet exposed height, one (1) boring per one

hundred (100) feet length of wall. The depths of boring to be drilled shall be decided by the GER, based on the soil conditions and type of retaining structure.

4.03 Accuracy of Boring Placement/Elevation: The elevation of all explorations shall be determined and noted on their respective logs to within + one (1) foot accuracy, relative to a known datum. Similarly, the location of all explorations shall be determined and shown on a plan to within + five (5) feet laterally. Depending on the purpose for which the boring is being drilled, the County may agree to relax these limits, upon submission of reasonable grounds by the GER.

TABLE I
PRINCE WILLIAM COUNTY SOIL CATEGORIES

SYMBOL	SOIL NAME	SOIL CATEGORY
1A	Aden	III
2B	Airmont-Weverton Cx	II
2C	Airmont-Weverton Cx	II
2D	Airmont-Weverton Cx	II
2E	Airmont-Weverton Cx	II
3A	Albano	III
4B	Arcola	II
5C	Arcola Nestoria Cx	II
5D	Arcola Nestoria Cx	II
6A	Baile	III
7A	Bermudian	III
8C	Braddock	I
9B	Brentsville	II
9C	Brentsville	II
10B	Buckhall	I*
10C	Buckhall	I*
11B	Calverton	II
12D	Catlett	I
13B	Catlett-Sycoline Cx	II
13C	Catlett-Sycoline Cx	II
14A	Codorus	III
15A	Comus	III
16A	Delanco	III
17A	Dulles	III
18C	Dumfries	I*
18D	Dumfries	I*
18E	Dumfries	I*
19B	Elloak	I
19C	Elloak	I
20B	Elsinboro	III
21B	Fairfax	I
21C	Fairfax	I
22A	Featherstone	III
23C	Gaila	I
23D	Gaila	I
23E	Gaila	I
24B	Glenelg-Buckhall Cx	I
24C	Glenelg-Buckhall Cx	I
24D	Glenelg-Buckhall Cx	I

SYMBOL	SOIL NAME	SOIL CATEGORY
25A	Glenville	II
26A	Halboro	III
27A	Halboro-Codorus Cx	III
28B	Haymarket	III
28C	Haymarket	III
29B	Hoadly	II
30B	Jackland	III
31B	Jackland-Haymarket Cx	III
31C	Jackland-Haymarket Cx	III
32A	Kelly	III
33B	Legore-Oakhill Cx	II
33C	Legore-Oakhill Cx	II
33D	Legore-Oakhill Cx	II
34B	Lunt	III
34C	Lunt	III
34D	Lunt	III
35B	Manassas	III
36D	Marr	I*
36E	Marr	I*
37A	Marumsco	III
38B	Meadowville	III
39B3	Minnieville	I
39C3	Minnieville	I
40B	Montalto	III
40C	Montalto	III
41B	Neabsco	II*
41C	Neabsco	II*
42B	Neabsco-Quantico Cx	II
43D	Nestoria	II
43E	Nestoria	II
44D	Occoquan	II
44E	Occoquan	II
45C	Orenda	I
46B	Panorama	II
46C	Panorama	II
47B	Quantico	I*
47C	Quantico	I*
47D	Quantico	I*
48A	Reaville	III
49A	Howland	III
50D	Spriggs	II
50E	Spriggs	II

SYMBOL	SOIL NAME	SOIL CATEGORY
51D	Stumptown	II
51E	Stumptown	II
52B	Sudley-Oatlands Cx	II
52C	Sudley-Oatlands Cx	II
53B	Sycoline-Kelly Cx	III
53C	Sycoline-Kelly Cx	III
54B	Urban Land/Udorthents	II*
55D	Watt	II*
55E	Watt	II*
56A	Waxpool	III

*When these soils are located in the western and eastern and coastal plains, they will be considered as category II and III soils, respectively.

APPENDIX B
PRINCE WILLIAM COUNTY TABULAR RATING SYSTEM FORM
FOR E & S FOR INDIVIDUAL SINGLE FAMILY LOTS

Plan Name: _____ Plan #: _____
GPIN #: _____ Engineer: _____ Date: _____

Distance to Watercourse	**Rating**
Less than 50 feet	5
50-150 feet	3
Greater than 150 feet	0
Buffer	**Rating**
0-50 feet	5
50-100 feet	3
150-300 feet	1
Greater than 300 feet	0
Distance from Disturbance to Downstream Adjacent Property	**Rating**
Less than 50 feet	5
50-150 feet	3
Greater than 150 feet	0
Crossing Water Course	**Rating**
YES	No rating
- MUST inspect at a minimum 2-week frequency	
NO	0
Soil Erodibility (based on K factor)	**Rating**
Low (0.23 and lower)	1
Moderate (0.24-0.36)	3
High (0.37 and higher)	5

Buffer Vegetation Condition		**Rating**
Very good Dense grass, hay field		0
Good Avg. grass, forest, good pasture		1
Fair Poor grass, fair pasture		3
Poor Bare soil, pavement, poor grass		5
Critical Slope		**Rating**
Is the slope - 0-7%, greater than or equal to 300' slope length **or**	If YES	3
7-15%, greater than or equal to 150' slope length **or** greater than 15% and greater than or = to 75' slope length?	If NO	0
Approximate Disturbed Acreage		**Rating**
< ½ acre		0
½ to 1 acre		3
1 to 2 acres		5
> 2 acres		No rating
- MUST inspect at a minimum 2-week frequency		

OVERALL RATING
(Total of the above 8 categories)
If ____ is 26-33, then
If ____ is 20-26, then
If ____ is 13-19, then
If ____ is 12 or less, then

INSPECTION RETURN FREQUENCY
- Once every 2-Weeks*
- Once every 4-Weeks*
- Once every 8-Weeks*
- None - refer to Building Inspectors for Building Inspection & Monitoring

* - In addition, inspection will be provided at the beginning and completion of projects.

Note: The INSPECTION RETURN FREQUENCY is not limited to the above schedule and may increase in frequency due to documented violations or runoff-producing storm events.

APPENDIX C

LOW IMPACT DEVELOPMENT

The Low Impact Design (LID) techniques may be used in lieu of, or in combination with traditional SWM techniques to manage the storm water runoff from a development. The County encourages the use of these techniques; however, the use of LID practices is only an alternative to other SWM practices.

LID is a design strategy with the goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques to create a functionally equivalent hydrologic site design. Hydrologic functions of storage, infiltration and ground water recharge, as well as the volume and frequency of discharges are maintained through the use of integrated and distributed micro-scale storm water retention and detention areas, reduction of impervious surfaces, and the lengthening of runoff flow paths and flow time. Other strategies include the preservation/protection of environmentally sensitive site features such as riparian buffers, wetlands, steep slopes, valuable (mature) trees, flood plains, woodlands, and highly permeable soils.

LID introduces new approaches to SWM by providing micromanagement and multifunctional landscape features (bioretention areas, swales and conservation areas) that help replicate hydrologic functions and maintain the integrity of receiving streams.

The focus of LID is to replicate the predevelopment hydrology to the extent practicable by using environmentally sound land development practices. LID, if properly designed, can mimic the predevelopment hydrology by minimizing storm water runoff (reducing impervious surfaces) and by maximizing the groundwater infiltration potential (retaining pervious surfaces such as open spaces as much as practicable) so that the runoff peak and volume before and after the development remains about the same.

Integrated Management Practice (IMP) means low impact development micro-scale and distributed management techniques used to maintain the predevelopment site hydrology. IMPs are basically specific small LID controls that reduce runoff by integrating storm water controls throughout the site in small discrete units. IMPs focus on source controls, and may include, but not limited to, dry wells, filter/buffer strips, grass swales, infiltration trenches and amended soils as specified in the Low-Impact Development Design Manuals. IMPs are distributed throughout the site to retain, detain, and filter the storm water runoff closer to the site it originates, to the maximum extent practicable.

Bioretention Facilities also known as rain gardens treat storm water runoff by using a conditioned planting soil bed and planting materials to filter runoff stored in shallow depression. Bioretention facilities are one of the most commonly used practices for controlling storm water runoff using LID approach.

A. LID PRINCIPLES

The following principles may be applied, wherever feasible in LID designs:

1.Minimize impervious areas and clearing and grading to the maximum extent practicable. Wherever practicable, clearing and grading should be limited to build lots, allow access and provide fire protection.

2. Consider alternatives in street layout planning to decrease street lengths and increase the preservation of open space areas.

3. Limit the number of parking spaces closer to the minimum. Under-utilized and spill over parking spaces should incorporate alternative pervious paving surfaces, such as, porous pavements, wherever soil and ground water table conditions are suitable.

4. Wherever feasible, treat the parking lot runoff using bioretention areas, filter strips and/or other practices that can be integrated into required landscaping areas and parking islands.

5. Decrease the driveway lengths by locating the houses closer to the front to decrease the impervious areas associated with driveways.

6. Where practical, direct rooftop runoff to pervious areas, such as yards, open swales, or vegetated areas and avoid routing rooftop runoff to the roadway and the storm drainage system. Provide infiltration and filtration in a manner that ensures adequate drainage while utilizing landscapes to diffuse, filter and infiltrate storm water runoff.

7. Disconnect impervious cover areas and disperse storm water runoff to pervious areas to the maximum extent practicable.

8. Conservation: Conservation of any natural lands within a development site may have a direct effect on the site hydrology of minimizing impervious cover that would otherwise generate higher rates and volume of runoff. Indirect benefits of conservation can be derived by locating and protecting certain hydrologic features such as drainage paths, permeable soils, steep slopes, etc.; and, in accordance with zoning and subdivision requirements, strategically locating setbacks, easements, woodland conservation zones, buffers, utility corridors, and other permanent site features to enhance the overall goals of maintaining the pre-development hydrology.

9. Minimization of Impacts: Minimization of impacts refers to reducing the extent of construction and development practices that adversely impact the hydrologic conditions of the site. This includes limiting the clearing and grading of land to the minimum needed to construct a development and associated infrastructure, as well as locating the land disturbances so as to avoid impacting hydrologically sensitive areas. The designer must conduct a thorough analysis of the existing topography and site geometry when locating fixed improvements such as roads, houses or buildings, sanitary and storm sewer utility

corridors, etc., in order to minimize unnecessary grading and/or compaction of the natural soil horizon, clearing of trees, and creating of impervious surfaces.

10. Preserve Pre-development Runoff Rate and Pattern: Preserving the site pre developed runoff rate and patterns are two of the overall objectives in replicating the pre-developed hydrology (other objectives include maintaining the pre-developed volume, frequency, and duration of runoff). Effectively implementing conservation practices and minimizing impacts, as described above, represent the first steps in achieving these objectives. Further steps involve evaluating how certain design choices can influence the post-developed hydrologic processes to reduce the rate and volume of runoff. These design choices include disconnecting impervious cover in order to maintain sheet flow conditions, lengthening the developed condition time of concentration (Tc), etc. Ideally the post-development drainage divides should replicate those of the pre-developed condition.

11. Integrated Management Practices (IMPs); IMPs refer to decentralized small\ scale (source control) storm water retention and detention structural BMPs integrated uniformly throughout the site or drainage area. These practices can be integrated into the landscape, buildings, and overall development infrastructure to reduce the volume and rate of storm water runoff. These systems are designed to emulate the natural processes of detention, retention, interception, evaporation, transpiration, and groundwater recharge, in order to replicate the pre-developed hydrology. Common examples of IMPs include: bioretention cells (or rain gardens), water quality swales, green roofs, and other small scale runoff attenuation practices.

B. GENERAL GUIDELINES FOR USING LID PRACTICES

1. If bioretention facilities are proposed in residential areas, the facilities shall be located in common areas unless the minimum lot size is 20,000 square feet or more and the facility is serving one lot only. LID designs are relatively more difficult to implement in higher density areas. If only LID practices are used as a stand alone approach to meeting the SWM requirements, the County recommends that in residential subdivisions, LID be applied only if the lot sizes are 20,000 square feet or more.

2. LID practices may be used to meet the SWM requirements in any nonresidential development.

3. LID practices may be used in any development, if used in combination with the conventional SWM practices. However, bioretention facilities shall not be located within residential lots less than 20,000 square feet in size.

5. Stand alone LID techniques shall not be applied to satisfy the SWM requirements in critical watershed areas or for developments which are upstream of existing residential developments with required minimum lot sizes less than one acre and located adjacent to special flood hazard areas, as delineated in County's FIRM. Stand alone LID techniques shall not also be used for SWM in areas identified by the County with known flooding and erosion problems, unless LID technique is used in combination with other conventional SWM

techniques. The engineer should consult with the Department of Public Works for information.

6. Due consideration towards the on-going maintenance of bioretention facilities must be given while designing a site with bioretention facilities.

7. A LID Concept Plan must be submitted to the Department of Public Works for approval, prior to the final plan submission, if stand alone LID practices are predominantly proposed to meet the SWM requirements in residential subdivisions.

C. DESIGN GUIDES AND MANUALS FOR LID

The following documents and manuals may be used for the design of LID practices. Other available design documents may also be used as a reference, subject to approval of the director of Public Works.

1. Prince William County's DCSM.

2. The Virginia Storm Water Management Handbook, Volumes I and II.

3. Low-Impact Development Design Strategies: An Integrated Design Approach, United States Environmental Protection Agency, Office of Water, EPA 841-B-00-003 dated June1999 and subsequent modifications and updates thereof.

4. Low-Impact Development Hydrologic Analysis, United States Environmental Protection Agency, Office of Water, EPA 841-B-00-002 dated June 1999 and subsequent modifications and updates thereof.

5. Northern Virginia BMP Handbook.

D. LID DESIGN

This Section applies only to the design of SWM facilities, such as, bioretention, filter strips and other LID practices. When a site is designed in combination with conventional SWM practices, this Section applies only to the design of LID practices.

1. The post development peak rate of runoff for a 2-year 24 hour duration storm event shall be controlled to predevelopment levels.

2. The post development runoff volume for a 2-year 24 hour duration storm event shall be controlled to predevelopment levels.

3. In some watersheds, the director of Public Works may only require the peak rate and the volume of runoff to be controlled for a one-year 24-hour duration storm event only. This design issue will be evaluated during the concept plan stages of plan submission.

4. The receiving channels should be adequate in accordance with Section 700 of DCSM.

5. All storm sewers shall be designed to convey the storm water runoff from a 10-year storm event, with the exception of road culverts that must be designed for the appropriate storm frequency.

6. The DCSM requirement for 10-year detention may be met alternatively in developments using LID techniques only, subject to the written approval of the director of Public Works. One such alternative could be to satisfy the adequate outfall requirement by improving the receiving channel to handle the10-year post development flows. In some situations, the director may waive the 10-year detention requirement when the receiving streams/channels are subject to 100-year flood hazard area requirements for the ultimate development conditions, and when other factors justify the request.

7. Low impact development storm water management design plans developed consistent with the requirements of this LID Section shall be considered as satisfying the water quality and quantity performance criteria.

8. Planting for bioretention facilities in parking lot islands may be credited towards meeting the interior parking lot landscaping requirement in nonresidential areas, subject to approval of the director of Public Works.

9. The key factor in LID design is to increase the time of concentration. The following approaches may be employed, as applicable, to increase the time of concentration:

a. Open Drainage
b. Use Green Space
c. Disperse Drainage
d. Lengthen Flow Paths
e. Save Headwater Areas
f. Use vegetated Swales
g. Maintain Natural Flow Paths
h. Increase Distance From Streams
i. Maximize Sheet Flow
j. Use Multifunctional Landscape
k. Hydraulically Disconnect Impervious Areas
l. Use Micro-Management Techniques to Micro-Manage Runoff
m. Create Depression in around Trees and Shrubs
n. Control Runoff at the Source
o. Reduce Impervious Cover
p. Disconnect roof drains and directing flows to vegetated areas
q. Break up Flow Directions from large Paved Areas.

10. The applicability and effectiveness of LID practices on development projects will be influenced by physical site characteristics such as:

a. Soil suitability
b. Depth to water table
c. Tidal effects
d. Topography
e. Karst topography
f. Drainage area size
g. Maintenance Considerations
h. Expansiveness of impervious cover
i. Density/Intensity of use
j. Overall spatial constraints
k. Downstream drainage and runoff conveyance infrastructure

D. HYBRID DESIGN

When the use of LID practices on a particular site is limited by physical constraints or other factors, or if the storm water requirements cannot be satisfied solely with the use of LID design techniques, then a "hybrid" design may be employed. A hybrid design employs both LID and conventional BMPs or detention practices (centralized BMPs) to meet storm water requirements. Such a design might conserve specific natural features and provide open space to the greatest extent possible, while detention practices or centralized BMP's are also implemented to provide peak rate or quantity control beyond the site-specific capabilities of the LID strategy. Another example of a hybrid design is one that incorporates LID for both the attenuation and infiltration of small storm events, and centralized BMP's to provide storage for larger storm events. Once LID site design strategies and practices have been evaluated and employed to the greatest extent practicable, and, where needed, additional SWM controls have been added, the engineer shall provide computations for the target performance of the design in satisfying DCSM requirements.

E. DESIGN CONSIDERATIONS FOR BIORETENTION FACILITIES

1. If bioretention facilities are proposed, the underlying soils at the bottom of the facility must have a minimum saturated permeability rate of 0.5 inch per hour, unless an under drainage system that discharges the runoff away from the foundation is proposed. The under drainage system proposed shall be of approved material and have a hydraulic capacity greater than the planting soil infiltration rate. An under drainage systems must be built with a cleanout well.

2. The location of bedrock and seasonal high groundwater table shall not conflict with the functionality of bioretention facilities. The bottom of the bioretention facility should be located at least 24 inches above the observed high groundwater table.

3. Ponding water within bioretention facilities should be designed to infiltrate the runoff within the 4-6 hour period.

4. Ponding depth within a bioretention facility shall be 8 inches or less.

5. The drainage area for the bioretention facility shall be 1 acre or less.

6. The bioretention facility should be constructed in an offline configuration, unless appropriate measures are proposed to divert excess runoff away from bioretention facility.

7. The bioretention facility shall have a non-erosive outfall.

8. Open swales carrying runoff (from more than one lot) for drainage areas up to 1 acre may be located within individual lots, subject to approval of the director of Public Works, as long as the reasonable usability of the lot is ensured based on the location of the swale (and 100-year overland relief per DCSM is complied with). The minimum setback from the structure shall be 40 feet.

9. When designing a landscaping plan for bioretention facilities, select plant materials that can tolerate extreme hydrologic changes, pollutant loading, and highly variable soil mixture conditions.

10. Excess runoff shall be diverted away from bioretention facility.

11. A safe overland flow path for the excess runoff and use of erosion control techniques are required.

12. Sloped areas exceeding 20 percent shall not be used for locating bioretention facilities.

F. GENERAL CONSIDERATION DURING CONSTRUCTION

1. An interim sediment control facility may be situated in the same location as that of the bioretention facility, if precautions are taken not to hamper the effectiveness of bioretention facilities when they are constructed. In such situations, the proposed invert of bioretention facility must be at least 1 foot below the invert of the sediment control facility at that location. During the construction of the bioretention facility, the runoff must be directed away from the facility, and this shall be identified in the sequence of construction.

2. The engineer shall specify on the plan to avoid excessive compaction that can hamper the performance of the proposed bioretention facility, around bioretention facilities.

3. The plan should show that erosion controls around bioretention facilities are maintained with measures such as super silt fence until the drainage areas to these facilities are stabilized.

4. The notes on the final plan should indicate that a preconstruction meeting shall be held between the developer/contractor and the County's site inspector to determine the inspection points needed.

5. The notes on the final plan should indicate that the contractor shall leave the tags on bioretention plantings to facilitate inspection.

G. LID PLAN ELEMENTS AND SUBMISSION REQUIREMENTS

1. Concept Plan

Before submitting a LID plan, the engineer shall submit a storm water management concept plan describing, in general, how storm water runoff through and from the development will be conveyed and controlled.

The storm water management concept plan must be approved prior to the submission of a final plan for the subject development, or for portions of the development when LID is proposed predominantly to satisfy the SWM requirements.

During the concept phase, the site is first being evaluated to investigate the feasibility of LID practices. The engineer shall submit a concept plan to Public Works, to demonstrate conceptually how the integrated management practices (IMPs) with bioretention and/or other environmentally sensitive site design practices will be incorporated into the Plan. The engineer shall evaluate the feasibility of creating a hydrologically functional site design that satisfies the overall objective by completing the checklist at the end of this Chapter. The procedures in the checklist are aimed at disconnecting and minimizing the impervious areas and planning drainage flow paths so that the post development time of concentration of runoff can be maintained as close as possible to the predevelopment conditions. Maximizing the runoff travel time to closely approximate the predevelopment conditions is among the very first steps in LID design.

The concept phase should occur concurrently with the preliminary plan submission, when applicable.

The engineer should provide general information on preliminary soil test results to confirm the suitability of onsite soils for LID practices with the Concept Plan. Prince William County's Soil Survey may be used during the conceptual stages, with other supplemental information as needed.

2. Final Plan

Once the LID SWM concept has been approved by the County, the engineer may submit a final plan to address SWM. In this phase, the engineer will determine how to distribute the bioretention and other environmentally sensitive design practices uniformly across the site by emphasizing on a source control approach. In this iterative phase, the engineer shall develop a plan to meet the SWM requirements. A detailed geotechnical report is performed at this

time, or earlier, to evaluate the on-site soils for LID suitability. The engineer may conduct a "flood test" or similar percolation tests. In this test, the entire soil medium is first saturated, followed by a flood test within 24 hours to determine the drawdown rate.

In situations where the bioretention facilities are proposed within individual lots, the engineer shall describe the coordination process between the developer and the builder in reference to the construction of bioretention facilities within individual lots. For properties with bioretention facilities and LID components within individual lots, the County will not issue the building occupancy permits until these facilities and any other LID or IMP components shown on the plan within the lots are constructed.

The LID storm water management plan shall include a hydrologic/hydraulic analysis of the downstream watercourse for all concentrated surface waters that will be discharged from a developed property.

The LID storm water management design plan shall contain charts, graphs, tables, photographs, narrative descriptions, explanations, and citations to supporting references as appropriate to communicate the information required by the Low-Impact Development Design Manuals. At a minimum, the final LID plan shall contain the following:

a. Comprehensive hydrologic and hydraulic design calculations, including all assumptions and criteria, for the pre-development and post-development conditions for the design storms. The Virginia SWM Handbook shall be used as a reference for the design of bioretention facilities.

b. Delineate watersheds and microwatershed areas.

c. Clearly define design storms controlled by LID.

d. Compile information on predevelopment conditions such as soils, slopes, land use, and imperviousness (connected and disconnected).

e. Evaluate predevelopment conditions and develop baseline measures.

f. Evaluate site planning alternatives, the locations of bioretention facilities, if applicable and compare with baseline predevelopment conditions.

g. Evaluate Integrated Management Practices. The location of IMPs should be identified on the site. Compare with the baseline by accounting for the hydrologic mitigation from IMPs.

h. Evaluate what supplemental measures are needed to control peak or volume of runoff.

H. LOCATION OF BIORETENTION FACILITIES

1. Bioretention facilities shall be setback at least 40 feet from the building foundation in residential developments.

2. It is recommended that the bottom of the bioretention facility be located at least 12 inches below the bottom of the building footing, wherever feasible. In situations where the underlying soils are relatively less pervious, but still meets the permeability criterion for bioretention facilities, the engineer shall propose an under drainage system which daylights the runoff away from the foundation.

3. Bioretention facilities shall not be installed between two properties.

4. Bioretention facility shall be located down-gradient from the home or building location.

5. In commercial or industrial settings, design for overflow is more critical. The paved surfaces flowing into the facilities that are incorporated in the parking lot landscaping islands can generate large quantities of runoff. Therefore, overland conveyance of overflow water and flow-through bioretention facility designs is discouraged.

6. When the discharge flows exceeds 3 cfs, the engineer shall evaluate the potential for erosion to stabilized areas in and around bioretention facilities.

I. EASEMENTS FOR BIORETENTION FACILITIES

1. Storm drainage easements shall be recorded to identify the location of integrated management practices and bioretention facilities on lots or parcels. Some IMPs may not require an easement as identified by the County during plan review. The property owner shall not remove or structurally alter or allow the removal or the alteration of these facilities without prior written authorization of the director of Public Works.

2. For bioretention facilities, the easements shall correspond to the 8" ponding elevation over these facilities plus a width of 10 feet around the facilities.

3. A 10 foot-wide access easement, clear of any obstructions, shall be provided for the maintenance of bioretention facilities.

4. The director of Public Works may require provisions within the Home Owners' Association (HOA) document to facilitate the County's inspection of in-lot bioretention facilities. The homeowners will be required to conduct minor maintenance of bioretention and associated drainage areas leading into or out of bioretention areas. Also, specific language needs to be incorporated into HOA document that identifies an approach to encourage the homeowners to adhere to minor maintenance of bioretention facilities. The County may seek periodic assistance from HOA to notify homeowners of County's inspection dates for the bioretention facilities.

J. BIORETENTION FACILITY CONSTRUCTION NOTES

1. To the extent possible, bioretention facility shall be constructed after the site is stabilized.

2. When sediment traps are converted into bioretention facilities at the end of construction, the sediments must be removed and remaining surface scarified prior to constructing a bioretention facility. Wide-track equipment or light equipment with turf-type tires shall be used for the excavation to minimize unwanted compaction of on-site soils.

3. Bioretention facilities constructed prior to site stabilization shall be protected from sedimentation by the installation of silt fence around the facility. The sediment laden runoff shall be directed away from the facility where possible.

4. Stockpiled onsite topsoil to be used for bioretention planting soil shall consist of materials suitable for planting and shall be verified for an appropriate percolation rate by the geotechnical engineer of record. In addition to percolation rate, the planting soil for bioretention must be checked for pH, organic matter, magnesium, phosphorous, potassium and soluble salts. The standards are described under the state minimum standard 3.11 in the Virginia SWM Handbook. The engineer shall pick representative samples from the stockpile to conduct these tests.

5. Planting soil medium must have a percolation rate greater than 1.5 inches per hour. If native soil is not suitable, contractor shall install typical soil medium consisting of 20-30 percent top soil, 20-30 percent leaf compost, and 50 percent construction sand (coarse grained). Other alternative soil mixes may be approved by the director of Public Works.

6. Prior to backfilling of the facility with gravel and soil, rototilling 2-3 inches of sand into the bottom of the facility is recommended. Installation of the planting soil medium shall be in 12-18 inches depths.

7. When deemed necessary by the geotechnical engineer, planting soil shall be amended with construction sand (ASTM C-33 Concrete Sand) or leaf compost.

8. Mulch may be provided by onsite vegetation which has been shredded, stockpiled and aged for approximately 14 days. If green mulch is used, the contractor shall supplement green mulch with nitrogen fertilizer.

9. The developer shall warrant the plant materials for a minimum period of one year.

K. MAINTENANCE NOTES FOR BIORETENTION FACILTIES MAINTAINED BY THE COUNTY

The following notes shall be on the plan to indicate the responsibilities of the fee title owner of the property where a bioretention facility is located and when the facility is County maintained.

1. Mulch should be applied at least once a year uniformly for 2-3 inches depth. Grass clippings are unsuitable as mulch.

2. Fee title owner is responsible for the periodic visual inspection, hand weeding, trimming, removal of trash and debris and informing the County for maintenance beyond his responsibility, if the bioretention facility is located on individual lot. HOA will be responsible for these items, if the bioretention facilities are located in common areas.

3. The County is responsible for periodic monitoring, replacement of landscaping within the facility (as determined by County inspector), facility repair and responsibility beyond the ability of the fee title owner.

L. BIORETENTION CONSTRUCTION SEQUENCING

The following items shall be included in the construction notes on the plan:

Prior to the construction of bioretention facilities, a meeting shall be scheduled between the contractor or his representative, and the County inspector to discuss construction sequencing in detail and to go over the inspection requirements for these facilities.

1. On-lot bioretention facilities shall be protected from sedimentation during individual lot grading and house construction.

2. Bioretention area shall not be placed in service, unless protected, until the contributing drainage area has been stabilized and approved by the County site inspector.

M. BMP EFFICIENCY

LID structural and non-structural practices can protect downstream waterways by reducing the post-developed pollutant loading through storm water runoff volume reduction and/or the filtering and settling of pollutants. Storm water volume reduction and the corresponding reduction in the peak rate of discharge can also serve to reduce water quality impacts associated with channel erosion.

The BMP efficiency for LID techniques, porous pavement and bioretention facilities will be in accordance with the Virginia SWM Handbook. The Virginia SWM handbook shall be referred to for the design of porous pavement, filter strips, grassed swales and other environmentally sensitive BMPs.

Site Design Checklist
And
LID Calculations Worksheet

SITE DESIGN CHECKLIST

Prior to developing any structural storm water practices on a site, significant reductions in storm water quantity and quality impacts can be made through enhancements to site design. Below is a checklist of site design and planning practices that can be used to minimize storm water impacts. Please check the practices that you are applying to your development, and note the extent to which each selected practices was implemented.

Site Design Technique 1:
Minimize direct storm water impacts to streams and wetlands to the maximum extent practicable. This can be accomplished by siting storm water facilities outside of streams and wetlands, maintaining natural drainages, and preserving riparian buffers.

Achieved	Not Achieved	**Practice**
		Storm water facilities located outside of streams and wetlands
		Natural drainage routes maintained on site.
		Riparian buffers preserved
		Distributed "Integrated Management Practices" used in lieu of centralized ponds

Describe actions taken:

_____
_____
_____
_____

Site Design Technique 2:
Preserve the natural cover on as much of the site as possible, especially for areas located on hydrologic soil groups (HSG) A and B.
Natural vegetation helps maintain and preserve predevelopment hydrology on a site, thereby reducing the reliance on large-scale storm water ponds. Natural cover on highly permeable soils increases filtration and infiltration.

Achieved	Not Achieved	**Practice**
		Utilize development designs that preserve a portion of the site in a natural state.
		Utilize "fingerprint" clearing…limit the clearing and grading of forests and native vegetation to the minimum area needed for the construction of the lots, the provision of necessary access, and fire protection.
		Avoid impacts to wetlands or vegetated riparian buffers
		A & B Soils preserved in natural cover .

Describe actions taken:

_____
_____
_____
_____

Site Design Technique 3:
Minimize the overall impervious cover.
Roadways, sidewalks, driveways and parking areas are the greatest sources of site imperviousness. Impervious areas alter runoff and recharge values and site hydrology. For LID sites, managing the imperviousness contributed by road and parking area pavement is an important component of the site planning and design process. There are several methods that can be used to achieve a reduction in the total runoff volume from impervious surfaces.

Achieved	Not Achieved	**Practice**
		Utilize street layouts that reduce impervious areas.
		Minimize excess parking space construction, utilize porous pavers in low-use or spill over parking areas
		Minimize driveway lengths.
		Substitute pervious surfaces for impervious wherever possible
		Where permitted, avoid the use of curb and gutter. Utilize vegetated open swales, preferably "engineered swales" with a permeable soil base.

Describe actions taken:
_____
_____
_____

Site Design Technique 4:
Locate infiltration practices on HSG A and B soils wherever possible.
HSG A & B soils are valuable resources on a site for facilitating infiltration of the increased runoff volume. Every effort should be made to utilize areas with these soils for IMPs that promote infiltration.
□ Achieved
□ Not Achieved:
Describe actions taken:
_____
_____
_____
_____
_____

Site Design Technique 5:
Locate impervious areas on less permeable soils (HSG C and D).
Placement of impervious areas on lower permeability soils minimizes the potential loss of infiltration/recharge capacity on the site.
□ Achieved
□ Not Achieved
Describe actions taken:
_____
_____
_____

Site Design Technique 6:
"Disconnect" impervious areas.

"Disconnecting" means having impervious cover drain to pervious cover, i.e. downspouts draining to the yard, not the driveway. This decreases the runoff volume and increases the Time of Concentration. Disconnected parking lots, for example, can provide sheet flow into bioretention areas or engineered infiltration swales.

□ Achieved
□ Not Achieved

Describe actions taken:

_____
_____
_____

Site Design Technique 7:

Increase the travel time of water off of the site (Time of Concentration)

Replicating the pre-development Time of Concentration is a key aspect in maintaining pre-development flow regime, and minimizing downstream impacts.

Achieved	Not Achieved	**Practice**
		Flatten grades for storm water conveyance to the minimum sufficient to allow positive drainage.
		Increase the travel time in vegetated swales by using more circuitous flow routes and rougher vegetation in swales.
		Utilize "engineered" swales in lieu of pipes or hardened channels. These swales will have shallow grades and will have a sand or gravel substrate below the sod to promote infiltration.

Describe actions taken:

_____
_____
_____

Site Design Technique 8:
Utilize soil management/enhancement techniques to increase soil absorption

Achieved	Not Achieved	**Practice**
		Delineate soils on site for the preservation of infiltration capacity. Mark these areas in the field and restrict heavy equipment access.
		Require compacted soils in areas receiving sheetflow runoff (such as yards, downslope of downspouts) will be "disked" and amended with loam or sand prior to seeding/sodding.

Describe actions taken:

_____
_____
_____

`Site Design Technique 9:
Revegetate all cleared and graded areas.
Revegetating graded areas, planting, or preserving existing vegetation can reduce hydrologic impacts by creating added surface roughness as well as providing for additional volume storage.
□ Achieved
□ Not Achieved
Describe actions taken:

_____
_____
_____

Site Design Technique 10:
Use "engineered swales" for conveyance in lieu of curb and gutter wherever possible. Engineered swales utilize a sand substrate to maximize infiltration. Maintaining the predevelopment time of concentration (Tc) minimizes the increase of the peak runoff rate after development by lengthening flow paths and reducing the length of the runoff conveyance systems.
□ Achieved
□ Not Achieved
Describe actions taken:

_____
_____
_____

Site Design Technique 11:
Utilize level spreading of flow into natural open space. Wherever buffers or other areas of open space are preserved, ensure that they are made hydrologically functional by making them receiving areas for sheet flow, not concentrated flow. Use level spreaders on lot or pavement edges to help spread water into the preserved areas. Ensure that flow volumes do not cause channelized flow and erosion in receiving buffers.

□ Achieved
□ Not Achieved
Describe actions taken:

_____
_____
_____

EXHIBIT 1

COEFFICIENTS OF RUNOF TO BE USED WITH THE RATIONAL FORMULA		
LAND USE	**COEFFICIENT**	**To (Minutes)**
Residential Single use a. 10,000 to 20,000 square feet b. Over 20,000 square feet	 0.35 – 0.45 0.30 – 0.40	 10 - 15 10 - 15
Townhouse and Condominiums	0.65 – 0.75	5 -10
Aparments	0.65 – 0.75	5 - 10
Commercial or Industrial	0.80 – 0.90	5
Parks or Agriculture	0.25 – 0.35	***
Cemeteries	0.25 – 0.35	***
Schools	0.50 – 0.60	10 - 15
Residential Mobile Homes	0.50 – 0.60	5 - 10
Open Space	0.25 – 0.35	10 - 15
Gravel Lots	0.65 – 0.75	5 - 10
Asphalt or Concrete Parking , Roofs	0.90 – 0.95	5
Grass Areas	0.30 – 0.40	5 - 10
*** to be computed		

Notes: 1. When calculating flow to a structure if all runoff to the structure is from impervious areas (pavement and roofs), the C to be used is 0.90.

2. The lowest range of runoff coefficients may be used for flat areas (where the majority of the grades and slopes are 2% and less).

3. The average range of runoff coefficients should be used for intermediate areas (areas where the majority of the grades and slopes are from 2% to t 5%)

4. The highest range of runoff coefficients shall be used for steep areas (areas where the majority of the grades are greater than 5%), for cluster areas, and for development in clay soil areas.

EXHIBIT 2

STORMWATER MANAGEMENT/BMP FACILITIES MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 20_____ by and between _____, hereinafter called the "Landowner(s)", and Prince William Board of County Supervisors, hereinafter called the "County". "Landowner(s)" also includes its (their) successors and assigns.

WITNESSETH, that

WHEREAS, the Landowner owns certain real property described (Insert Parcel Identification Number) as recorded by deed in the land records of Prince William County, Virginia, Deed Book _____ at page _____, hereinafter called the "Property"; and

WHEREAS, the Landowner is proceeding to build on and develop the property; and

WHEREAS, Site/Subdivision Plan (PWC File Number) hereinafter called the "Plan", which is expressly made a part hereof, as approved or to be approved by the County, provides for detention of stormwater within the confines of the property; and

WHEREAS, the County and the Landowner, agree that the health, safety, and welfare of the residents of Prince William County, Virginia, require that on-site stormwater management/BMP facilities be constructed and maintained on the property; and

WHEREAS, the County requires that on-site stormwater management/BMP facilities as shown on the Plan be constructed and adequately maintained by the Landowner:

NOW THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site stormwater management/BMP facilities shall be constructed by the Landowner, in accordance with the Prince William County Design and Construction Standards Manual (DCSM) and the plans and specifications identified in the Plan.

2. The Landowner, shall maintain the stormwater management/BMP facilities in good working condition, acceptable to the County, so that they are performing their design functions.

3. The Landowner shall provide an annual inspection to be performed by a Virginia registered professional engineer. The report of inspections, along with a schedule for repair when needed, will be furnished to the Department of Public Works, Watershed Management Division by June 30 each year.

4. The engineer will check the facility for obvious malfunctions and make the following measurements: (To be completed by the designer: Example #1: Depth to water in BMP monitoring well72 hours after rain – Trigger less than or equal to 6 feet. Example #2: Elevation at reference point(s) in pond bottom – Trigger greater than or equal to 272.0'; the trigger will signal a requirement for maintenance.)

5. The Landowner will perform all maintenance, repairs, cleaning, and reconstruction specified in the inspection report. Such maintenance will be completed under the direction of a professional engineer within six months.

6. Should a County engineer perform an inspection, in addition to the Landowner's and deficiencies are found, the County may direct the Landowner to make repairs and may set time for the repairs to be completed.

7. All repairs will meet the original planned function, meet the standards set forth in the DCSM and may be inspected by County forces to assure compliance.

8. In the event the Landowner, fails to inspect or perform the required maintenance for the stormwater management/BMP facilities and to charge the costs of the repairs to the Landowner. The provision shall not be construed to allow the County to erect any structure of a permanent nature on the land of the Landowner, outside of an easement belonging to the County. It is expressly understood and agreed that the County is under no obligation to maintain or repair said facilities, and in no event shall this agreement be construed to impose any such obligation on the County.

9. The Landowner, hereby, grants permission to the County, its authorized agents and employees, to enter upon the Property, and to inspect the stormwater management/BMP facilities whenever the County deems necessary. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structures, pond areas, access roads, etc. When deficiencies are noted, the County shall give the Landowner, copies of the inspection report with findings and evaluations.

10. In the event the County, pursuant to this Agreement, performs work of any nature or expends any funds in the performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the County upon demand within ten (10) days of receipt thereof for all costs incurred by the County hereunder.

11. The Landowner shall indemnify and hold harmless the County and its agents and employees for any and all damages, accidents, casualties, occurrences or claims which might arise or be asserted against the County for the construction, presence, existence or maintenance of the stormwater management/BMP facilities by the Landowner.

In the event a claim is asserted against the County, its agents or employees, the County shall defend, at their own expense, any suit based on such claim. If any judgment or claims against the County, its agents or employees shall be allowed, the Landowner, shall pay all costs and expenses in connection therewith.

12. This agreement shall be recorded among the land records of Prince William County, Virginia, and shall constitute a covenant running with the land, and shall be binding on the Landowner, its administrators, executors, assigns, heirs and any other successors in interests.

WITNESS the following signatures and seals:

_____
Landowner (Seal)

By: _____

_____
Type Name

_____
Type Title

ATTEST:

_____

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, whose commission expires on the _____ day of _____, 20____, do, hereby, certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day of _____, 20____, has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS _____ day of _____, 20 ____.

_____
NOTARY PUBLIC

THE PRINCE WILLIAM COUNTY
BOARD OF SUPERVISORS

By: _____
Director of Public Works

ATTEST:

_____

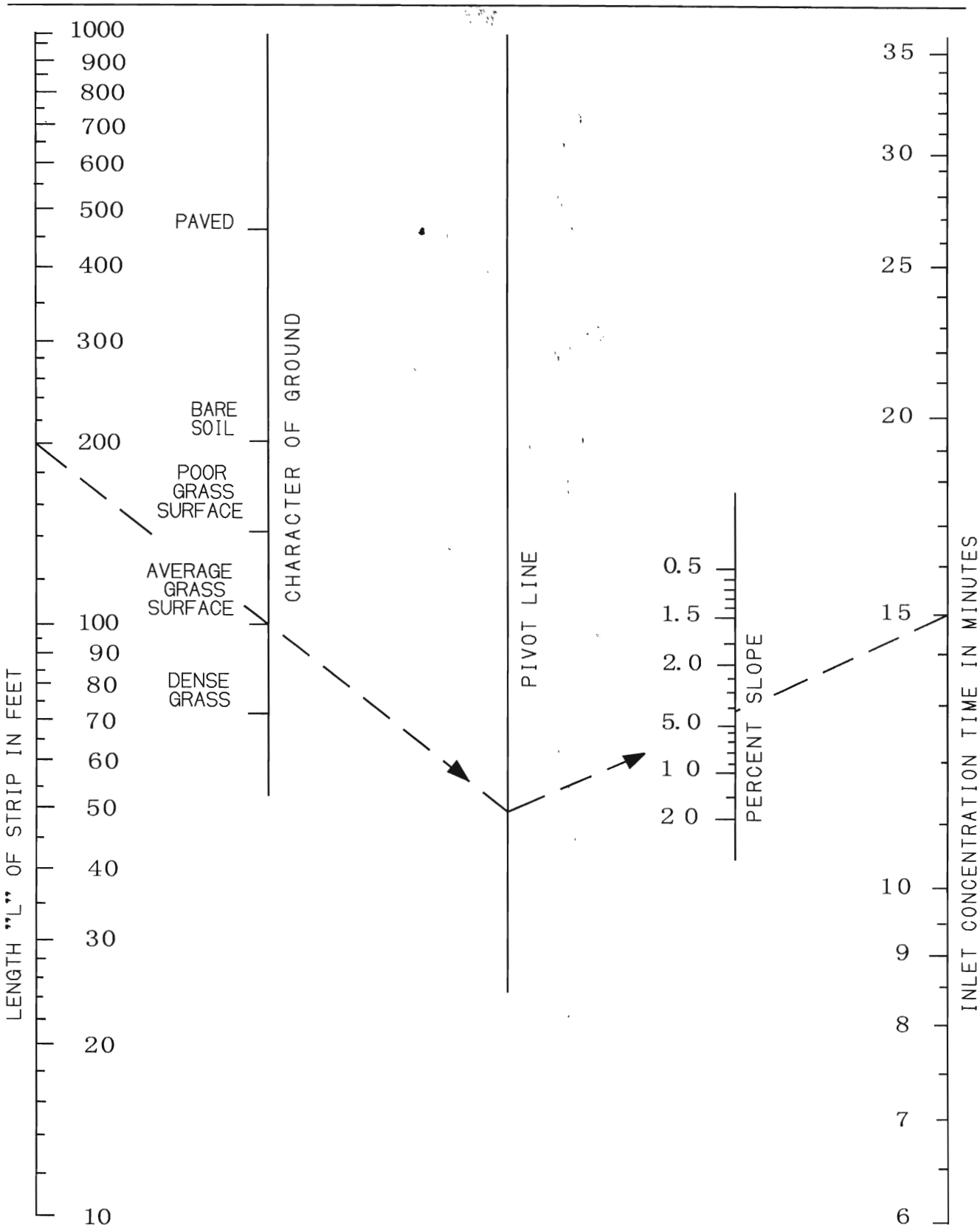
STATE OF _____

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, whose commission expires on the _____ day of _____, 20 _____, do hereby, certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing the date of the _____ day of _____, 20 _____.

_____
NOTARY PUBLIC

EXHIBIT 3



OVERLAND FLOW TIME

(USED WITH THE RATIONAL FORMULA)

RAINFALL FREQUENCY – DURATION – DEPTH RELATIONSHIPS

(Rainfall Depth in Inches, Rainfall Frequency in Years)

DURATION	5-MIN	15-MIN	1-HOUR	2-HOUR	3-HOUR	6-HOUR	12-HOUR	24-HOUR
FREQUENCY								
2	0.46	0.90	1.50	2.00	2.10	2.60	3.10	3.40
5	0.54	1.11	1.91	2.50	2.70	3.30	3.80	4.50
10	0.59	1.26	2.20	3.00	3.20	3.90	4.70	5.30
25	0.68	1.47	2.61	3.50	3.70	4.30	5.20	6.00
50	0.74	1.63	2.93	4.00	4.30	5.10	6.00	7.00
100	0.81	1.80	3.25	4.40	4.80	5.80	6.40	7.80

Sources:

- NOAA Technical Memorandum, NWS HYDRO-35
  Five to 60-Minute Precipitation Frequency for the Eastern and Central U.S., 1977

- U.S. Department of Commerce, Weather Bureau, Technical Paper No. 40
  Rainfall Frequency Atlas of the United States, 1961

EXHIBIT 4

CURVES SHOWING RAINFALL INTENSITY VS. DURATION FOR VARIOUS FREQUENCES OF OCCURRENCE (Used with the Rational Formula)

	5 min	10 min	15 min	30 min	60 min	120 min
100	9.842	8.1012	7.0548	5.222	3.6535	2.1848
60	9.242	7.593	6.6	4.871	3.386	2.2017
50	9.0576	7.4364	6.46	4.7632	3.3038	1.9716
30	8.4876	6.954	6.0276	4.4296	3.0496	1.8167
25	8.268	6.7674	5.8606	4.3008	2.9514	1.7569
20	8.0112	6.5502	5.6664	4.1508	2.8371	1.6872
15	7.6726	6.2628	5.4092	3.5926	2.686	1.5952
10	7.2744	5.9236	5.1033	3.7144	2.5012	1.4821
5	6.6144	5.357	4.5901	3.312	2.1846	1.2876
2	5.7481	4.6016	3.8962	2.7567	1.7322	1.0084
1	4.88	3.91	3.31	2.34	1.47	0.86

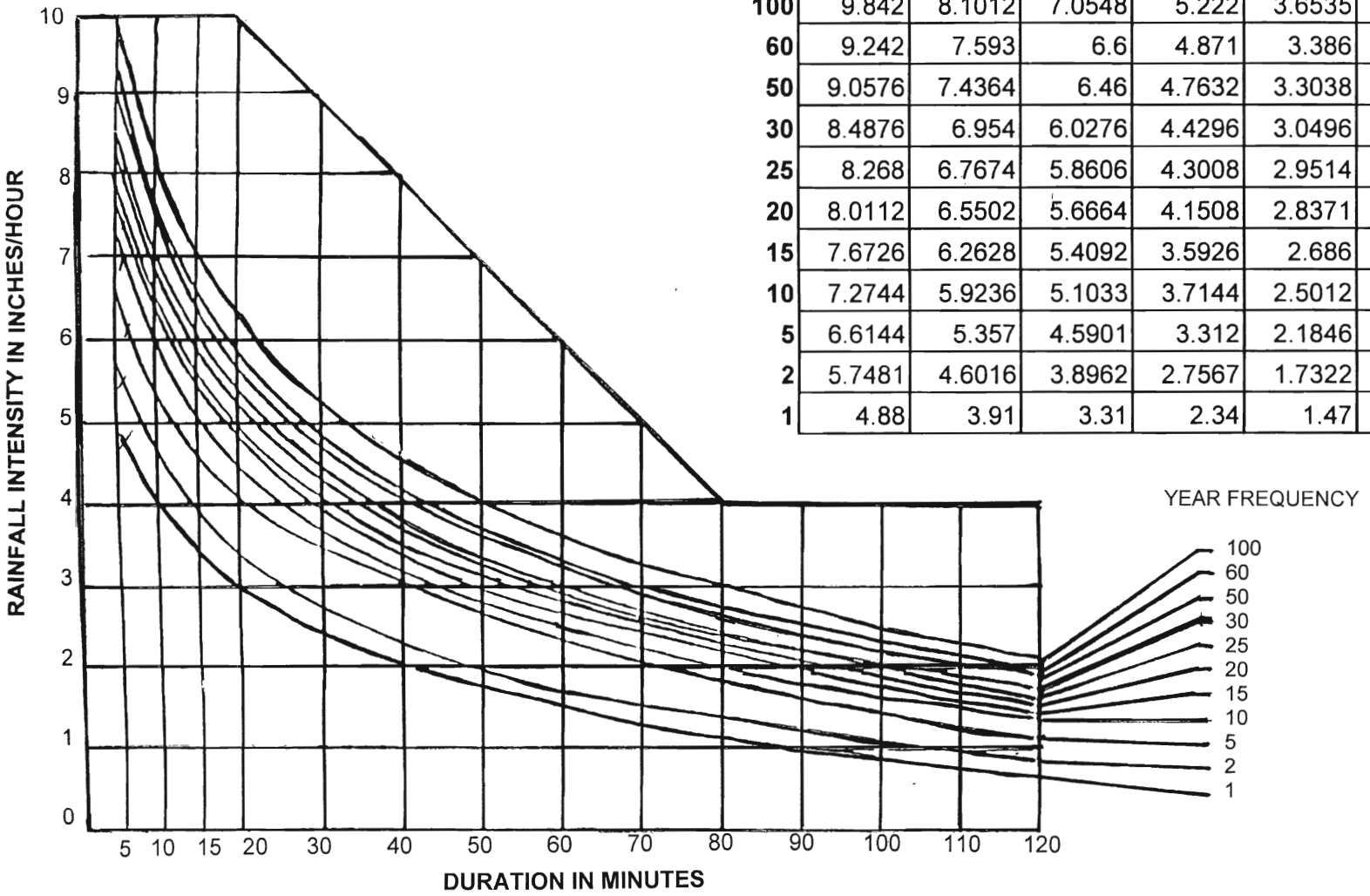
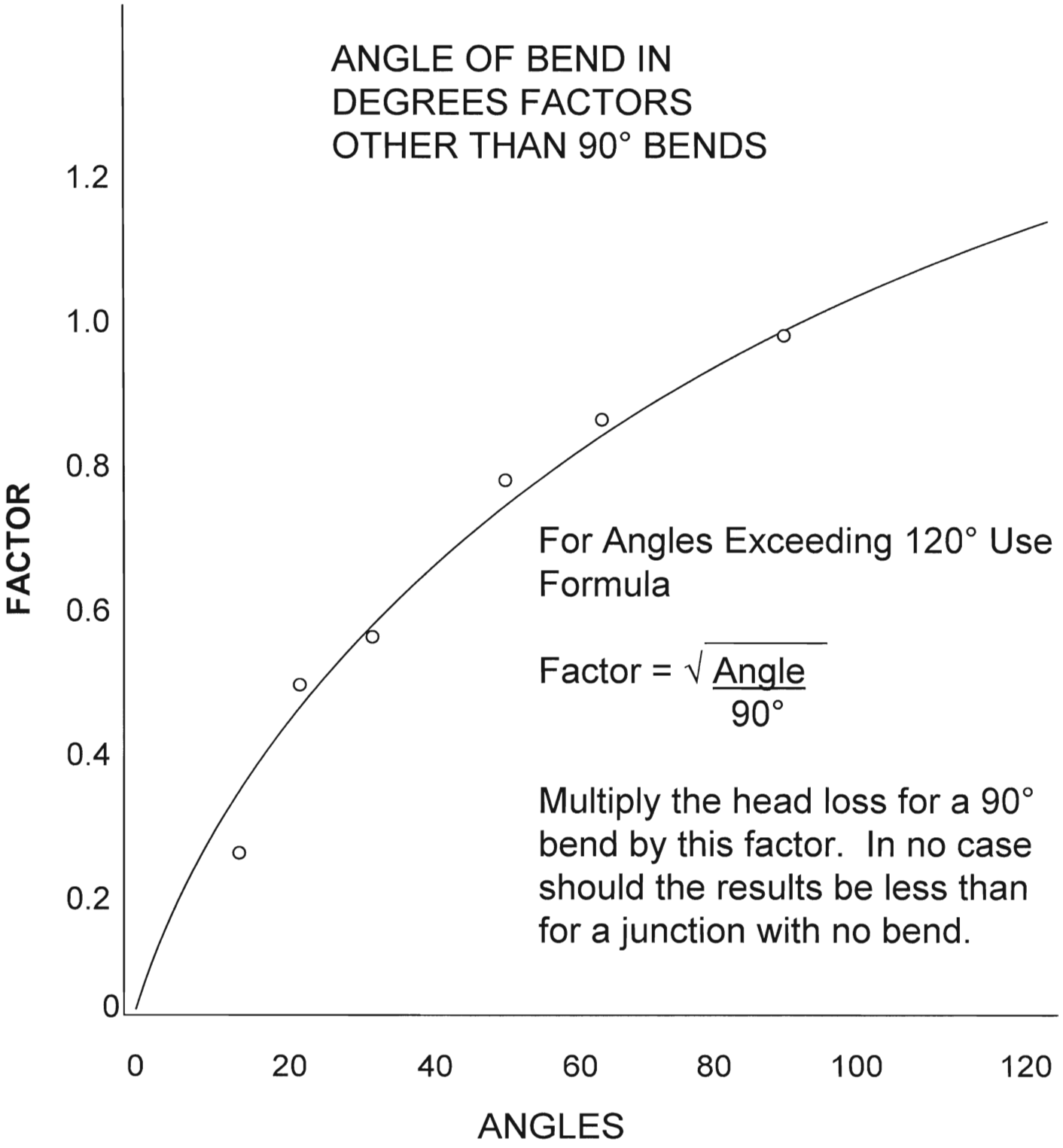


EXHIBIT 5

EXHIBIT 6


ANGLE OF BEND IN
DEGREES FACTORS
OTHER THAN 90° BENDS
1.2
1.0
0.8
0.6
0.4
0.2
0
FACTOR
For Angles Exceeding 120° Use Formula
Factor = √ Angle / 90°
Multiply the head loss for a 90° bend by this factor. In no case should the results be less than for a junction with no bend.
0
20
40
60
80
100
120
ANGLES

Basis of Design	Storm Water Inlet Computations	Prince William County Standard Form
Impervious Area _____% Formula Q = C. I. A. Impervious Area _____% DES Frequency _____	Engineer _____ Address _____ Date _____	Subdivision _____ Section _____ Date _____

No.	Std. Intel Type	Side	Station	Drain-age Area	C	I	C I	Q	Carry Over Q_c	Gutter Flow Q_o	Street Slope %	Spread	Intercepted		Carryover		Spread At Low Point	Street Name
													%	Q	Q	To Inlet		

EXHIBIT 7

Project _____ Designer _____

Date _____

Hydrologic And Channel Information

0_1 = _____

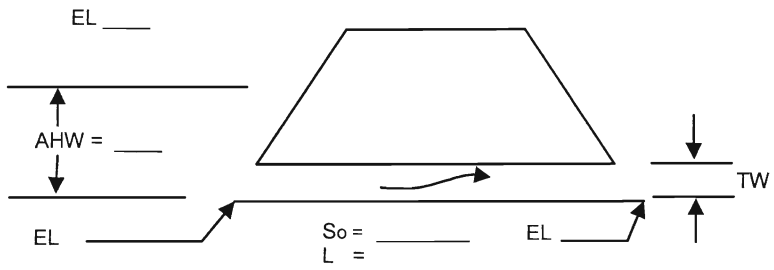
0_2 = _____

TW_1 = _____

TW_2 = _____

SKETCH

Station _____



Allowable Outlet Velocity= _____

Culvert Type	O	Size	Headwater Computation									Controlling HW	Outlet Velocity	Cost	Comments
			Inlet Control		Outlet Control										
			$\frac{HW}{D}$	HW	K_c	d_c	$\frac{d_c + 0}{2}$	h_o	H	LS_o	HW				

Summary and Recommendations:

EXHIBIT 8

STORM SEWER DESIGN

Basis of Design		
Formula Q C I A	Assumed Avg. Vel _____	
Impervious Area _____ %	DES Frequency _____	
Previous Area _____ %	Min. Velocity _____	

Engineer	_____
Address	_____
Date	_____

Subdivision	_____
Section	_____
Date	_____

From	To	Area	C	I	C. I.	Q (INC)	Q	Grade	Pipe Size	Effect Velocity	Length Of Flow	Time of Con-centration	Capacity of Pipe	Invert Elevation	
														Upper End	Lower End
		Acres	Coef-ficient	Intensity		C F S	FT^3/Sec	%	In.	Ft/Sec	Feet	Min	FT^3/Sec		

EXHIBIT 9

EXHIBIT 10

IMPERVIOUS AREA SURVEY FORM

Site Name: _____

Address: _____

GPIN: _____

Tax Map Number: _____

Development Plan Number: _____

The newly added impervious area (footprint) within the site (outside of any public right-of-ways) is _____ square feet. This includes all **new** paved areas such as driveways, parking areas, roofs, buildings, sidewalks, etc. This does not include areas with dirt or gravel surfaces and previously existing impervious area. This area will be used to assess storm water fees.

Certified by:

_____ _____

Print Name of P.E. or L. S. Date

_____ _____

Signature VA License #

Return this for to:

Watershed Management Branch
Department of Public Works
4379 Ridgewood Center Drive
Prince William, VA 22192

Telephone: (703)792-7070, Fax: (703)792-7012

For Office Use: _____
Account Number: _____
Information Recorded: _____
Recorded by: _____

EXHIBIT 11

REQUEST FOR WAIVER FOR ON-SITE DETENTION

Four (4) copies of the following information should be submitted to the Department of Public Works.

Subdivision (Record Plat Title) _____

Owner _____

Address _____

Engineer _____

Address _____

Size of Tract _____ (Gross Ac.) No. of Lots _____ Zone _____

Watershed _____

Plat No. _____ Date _____

I hereby request that Prince William County waive the requirement for on-site detention for the above-named site. I understand that I will receive written notification from Prince William County informing me of the status of this request within 30 days of receipt by the Department of Public Works.

_____ _____

Date Owner's Signature

I believe that this request is justified based upon the attached information which I hereby certify as being accurate.

_____ _____

Date Professional Engineer's Signature

EXHIBIT 12

PERCENT IMPERVIOUS FOR VARIOUS ZONING CLASSIFICATIONS*

Business and Commercial.....85%

Industrial.....72%

Schools and Churches.....50%

Residential

Apartments, Townhouses, Mobile Homes.....75%

1/8 Acre or Less (R-10 Cluster, RPC).....65%

1/4 Acre(R-10).....38%

1/3 Acre (R-20 Cluster).....30%

1/2 Acre (R-20).....25%

1 Acre (R-1-1).....20%

5 Acres and over.....10%

*Table may be used in lieu of computation of actual area of imperviousness.

Incremental Unit Hydrograph Values

	Time / Tc	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
10-Year	5 min.	7.27	4.68	3.46	2.77	2.29	1.94	1.68	1.47	1.31	1.18	1.08	.99						
	10 min	3.25	5.92	4.53	3.14	2.43	1.99	1.67	1.41	1.21	1.04	0.92	0.80						
	15 min	2.20	4.24	5.10	4.36	3.08	2.34	1.89	1.56	1.29	1.07	0.89	0.73						
	20 min	1.98	3.37	4.20	4.56	4.16	3.02	2.22	1.83	1.58	1.41	1.27	1.17						
	25 min	1.28	2.40	3.25	3.83	4.03	3.89	3.35	2.68	2.05	1.58	1.29	1.12						
	30 min	0.80	1.57	2.32	3.00	3.52	3.71	3.48	3.03	2.49	1.97	1.58	1.32	1.11	0.97				
100-Year	5 min	9.84	6.37	4.73	3.74	3.13	2.65	2.33	2.07	1.88	1.69	1.55							
	10 min	3.68	8.10	6.47	4.44	3.50	2.86	2.43	2.17	1.93	1.78	1.67	1.58						
	15 min	2.81	5.99	7.05	5.69	3.89	3.17	2.73	2.40	2.16	1.98	1.83	1.68						
	20 min	1.43	3.36	5.33	6.32	5.15	3.78	3.03	2.55	2.23	2.00	1.87	1.75						
	25 min	0.98	2.26	3.79	5.05	5.75	5.17	3.99	2.90	2.28	1.96	1.77	1.65	1.53	1.43	1.39			
	30 min	0.97	1.88	2.80	3.79	4.73	5.22	4.78	3.92	3.04	2.52	2.20	1.97	1.81	1.65	1.55	1.51	1.49	1.45

EXHIBIT 13

EXHIBIT 14

Location ______________________________ Engineer ______________________________ n= ________

STA	WS	BTM	DEPTH	AREA	CFS	WP	R = A / W P	S*	V = Q / A	V2 / 2g V2 / 64.4	AVG. S	L	H_f Lx Avg. S	h_t**	Σh h_t h_f	ENERGY UPSTREAM		ENERGY BALANCE		
																		DNST	EN	Σh

* $S = N^2 V^2 \left(\frac{1}{2.2082 \quad R^{4/3}} \right)$

** Contraction = 0.1 (Difference in Velocity Head)
Expansion = 0.2 (Difference in Velocity Head)

PRINCE WILLIAM COUNTY

STORMWATER MANAGEMENT FACT SHEET

Date _____

SWM FACILITY INFORMATION

Basin Name _____

Subbasin # _____

Stream Name _____

Drainage Area (acres)
Draining to the facility _____

Avg. Basin Slope (ft/ft) _____

Type of Facility: _____

(a) Dry pond _____
(b) Wet pond _____
(c) Infiltration trench _____
(d) Parking lot storage _____
(e) Underground storage _____
(f) Porous pavement _____
(g) Grass swales _____
(h) Land cover control _____
(i) Other _____

Is the Facility ON – SITE _____

Is the Facility OFF – SITE _____

PWC File # _____

Development Name _____

GPIN _____

Magisterial District _____

Was a Floodplan Study Prepared Yes _____ No _____

If yes, File # _____

Facility Designed by : _____
(Engr. Firm)

DESIGN INFORMATION (*)

Were hydrologic & hydraulic models developed _____ Yes _____ No

(a) Hydrologic Models (b) Hydraulic Models

HEC – 1 _____ TR – 20 _____ HEC - 2 _____ WSP-2 _____

Other _____ Other _____

Method used to develop hydrographs _____

Hydrographs routing methodology _____

Reservoir routing methodology _____

If the facility was not modeled, were Elevation – Discharge - Storage tables

Developed _____ Yes _____ No

Outlet structure type _____

Emergency spillway type _____

Were Elev. – Disch. Tables for the emergency spillway developed ___ Yes ___ No

Dam height (ft) _____, Invert Elev UPST _____ DWNST _____

Rainfall Depth (Inches) 2 – yr _____, 10 – yr _____, 100 - yr _____

Rainfall Duration (hrs) _____, Rainfall Distribution _____

Exist Peak Inflows (cfs) 2 – yr _____, 10 –yr _____, 100 - yr _____

Devlp Peak Inflows (cfs) 2 – yr _____, 10 –yr _____, 100 – yr _____

Devlp Peak Outflow (cfs) 2 – yr _____, 10 –yr _____, 100 - yr _____

Water Surface Elev. (ft) 2 – y r _____, 10 –yr _____, 100 – yr _____

Reservoir Storage (ac – ft) 2 – y r _____, 10 –yr _____, 100 - yr _____

Surface Area (acres) 2 – y r _____, 10 –yr _____, 100 – yr _____

Normal Pool – Elevation (ft) _____, Storage (ac - ft) _____, Area (ac) _____

BMP – Elevation (ft) _____, Storage (ac - ft) _____, Area (ac) _____

*For facilities type (a) and (b). For other types, provide rainfall (Intensities) data, storage, volume, and discharges, if applicable.

MISCELLANEOUS

Is additional storage capacity necessary to correct an existing problem _____ Y _____ N

Does the facility incorporate BMP structural controls

_____ Y _____ N

If no, does the facility regulate the 2 – yr storm
_____ Y _____ N

Is a description of the operation and maintenance needs of the facility included in the plans _____ Y _____ N

Back up data location:

plan _____ ,sheets _____

report _____, pages _____

SWM Bond Estimates ($) _____

TO BE COMPLETED BY COUNTY STAFF

Facility # _____ - _____ - _____

Upstream POI _____

Downstream POI _____

Do the County H & H models need to be updated

_____ Yes _____ No

Model updated ____/____/____

Fac. Accepted by DPW _____

DPW Inspector _____

DPW Inspector

EXHIBIT 15

ROUGHNESS COEFFICIENT, "n" value computation

Description of Reach, Station or X - Section	Basic "n" (1)				Surface I .rregularity (2)				Variations in X-Section Size and Shape (3)			Obstructions (4)				Vegetation (5)				Meandering (6)			Total "n" Sum (1-5) x6
	.020 Earth	.025 Rock	.024 Fine Gravel	.028 Coarse Gravel	.000 Smooth	.005 Minor	.010 Moderate	.020 Severe	.000 Straight Gradual	.005 Occasional Shifting	.010 .015 Frequent Shifting	.000 Negligible	.010 .015 Minor	.020 .030 Appreciable	.040 .060 Severe	.005 .010 Low	.010 .025 Medium	.025 .050 High	.050 .100 Very High	1.00 Minor 1.0 g to 1.22	1.15 Appreciable 1.2 to 1.52	1.30 Severe 1.52+	

EXHIBIT 16

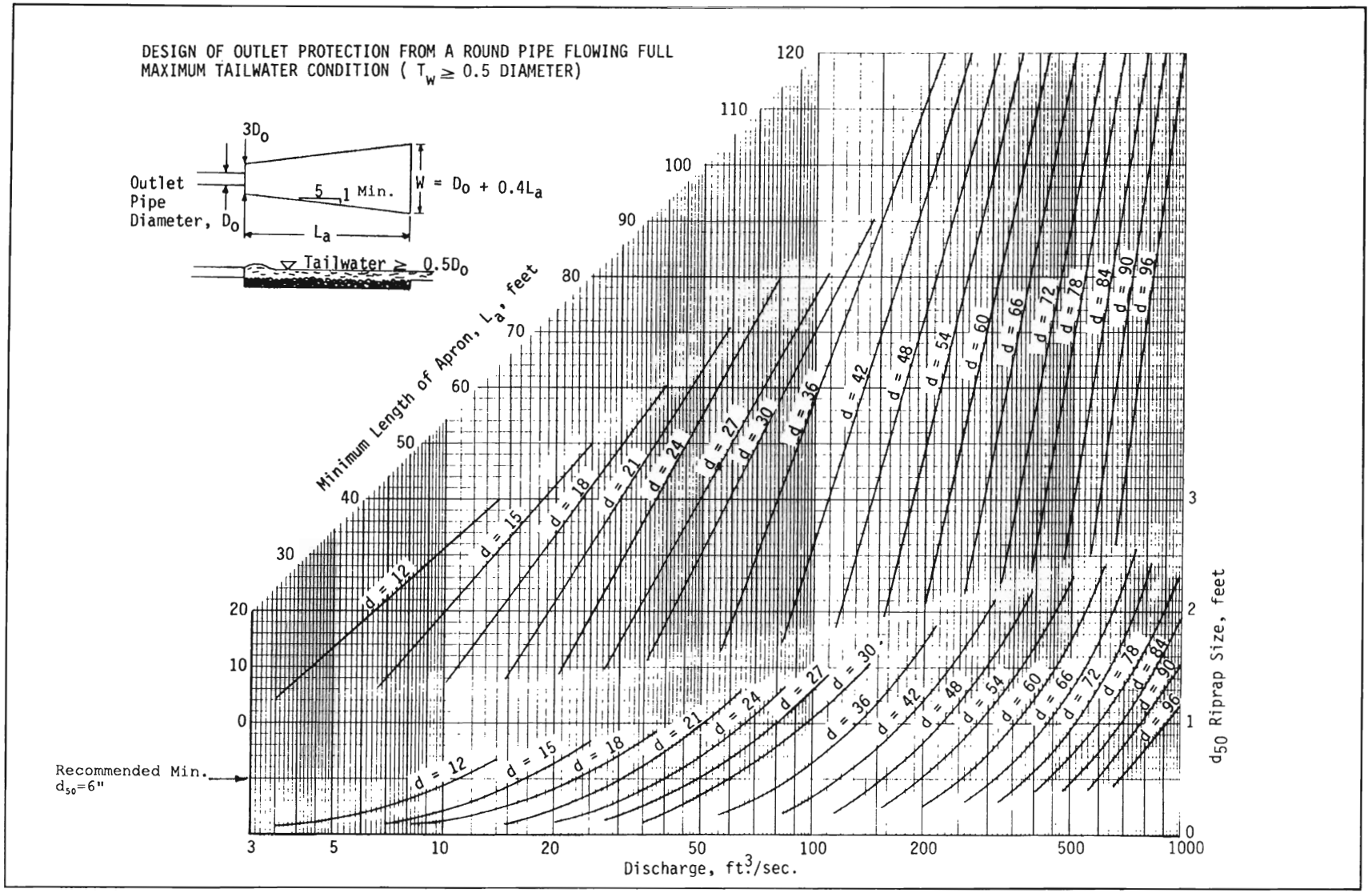

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MAXIMUM TAILWATER CONDITION ($T_w \geq 0.5$ DIAMETER)
$3D_o$
Outlet Pipe Diameter, D_o
5
1 Min.
$W = D_o + 0.4L_a$
L_a
Tailwater $\geq 0.5D_o$
Minimum Length of Apron, L_a, feet
d_{50} Riprap Size, feet
Discharge, $ft^3/sec.$
Recommended Min. d_{50}=6"
d = 12
d = 15
d = 18
d = 21
d = 24
d = 27
d = 30
d = 36
d = 42
d = 48
d = 54
d = 60
d = 66
d = 72
d = 78
d = 84
d = 90
d = 96

EXHIBIT 17

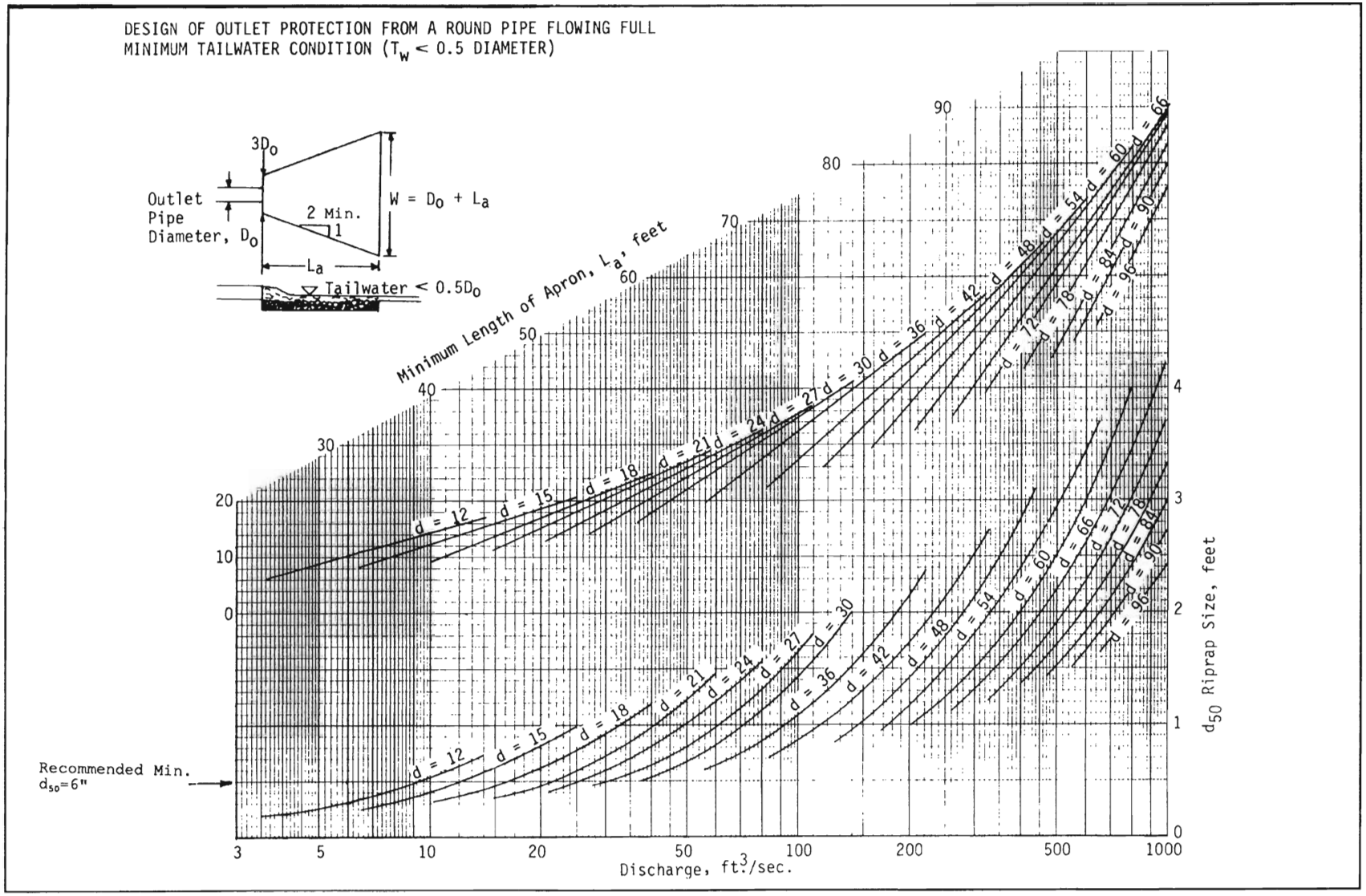
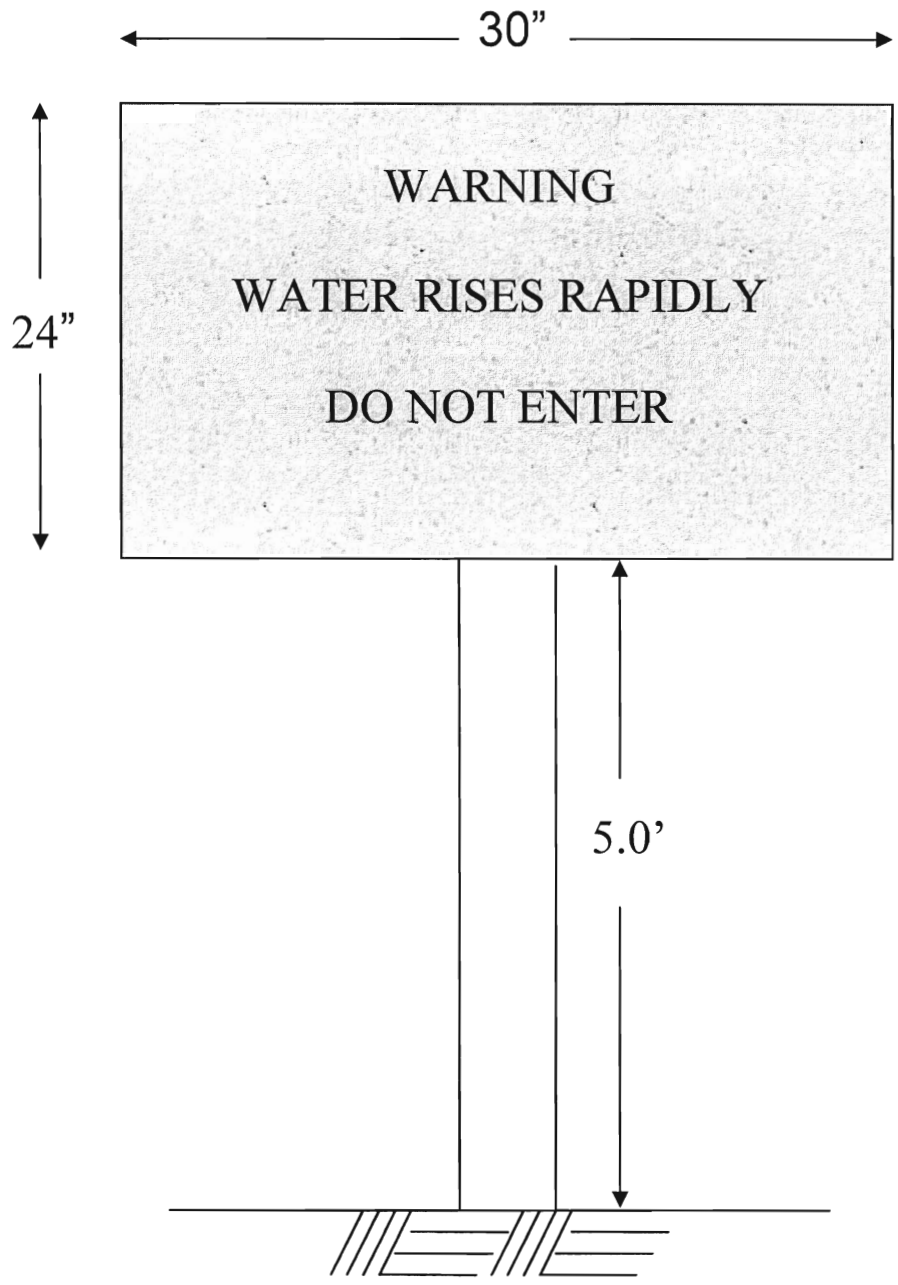
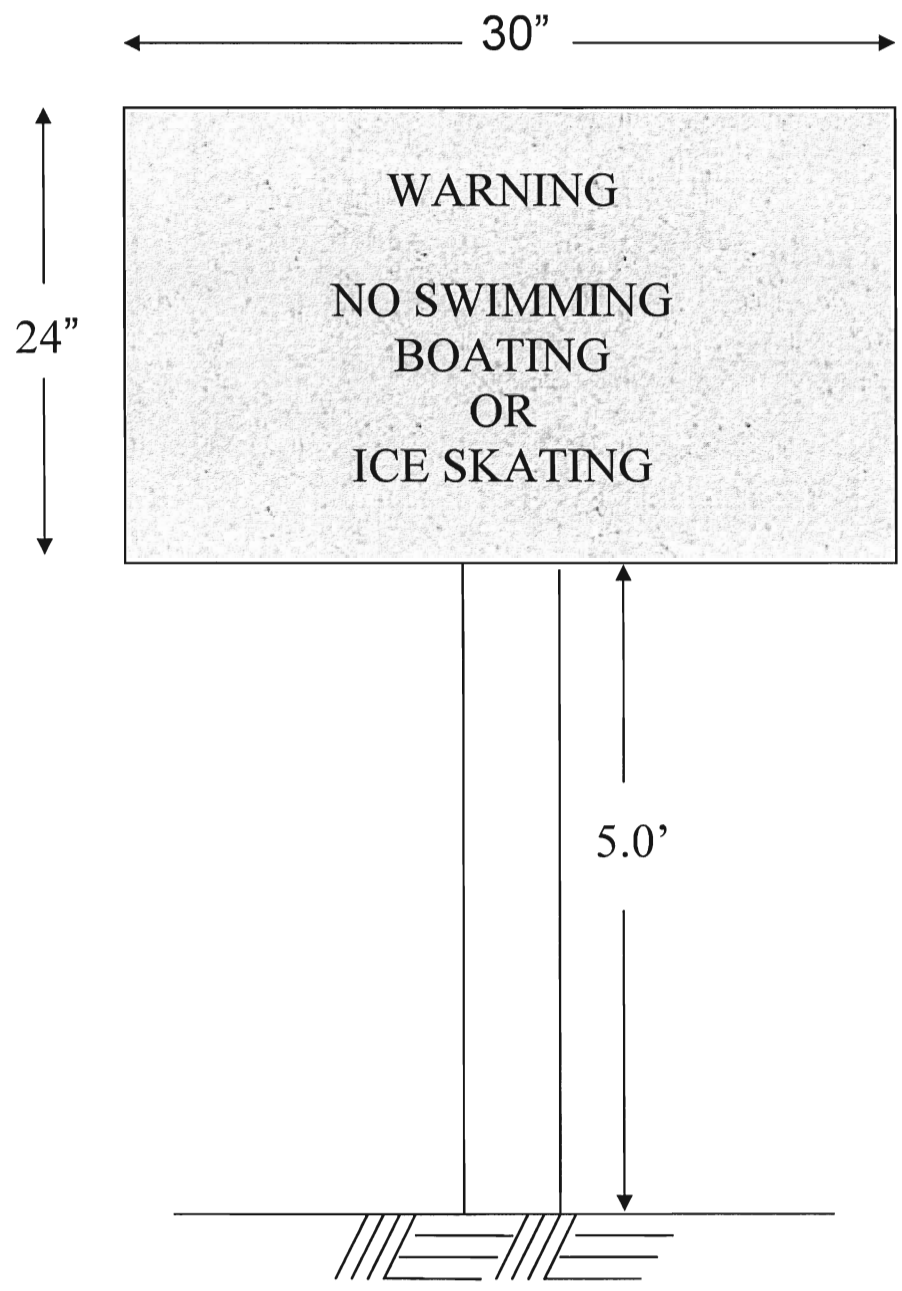

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION (T_w < 0.5 DIAMETER)
3Do
Outlet Pipe Diameter, Do
2 Min.
1
W = Do + La
La
Tailwater < 0.5Do
Minimum Length of Apron, La, feet
Recommended Min. d50=6"
Discharge, ft3/sec.
d50 Riprap Size, feet

EXHIBIT 18



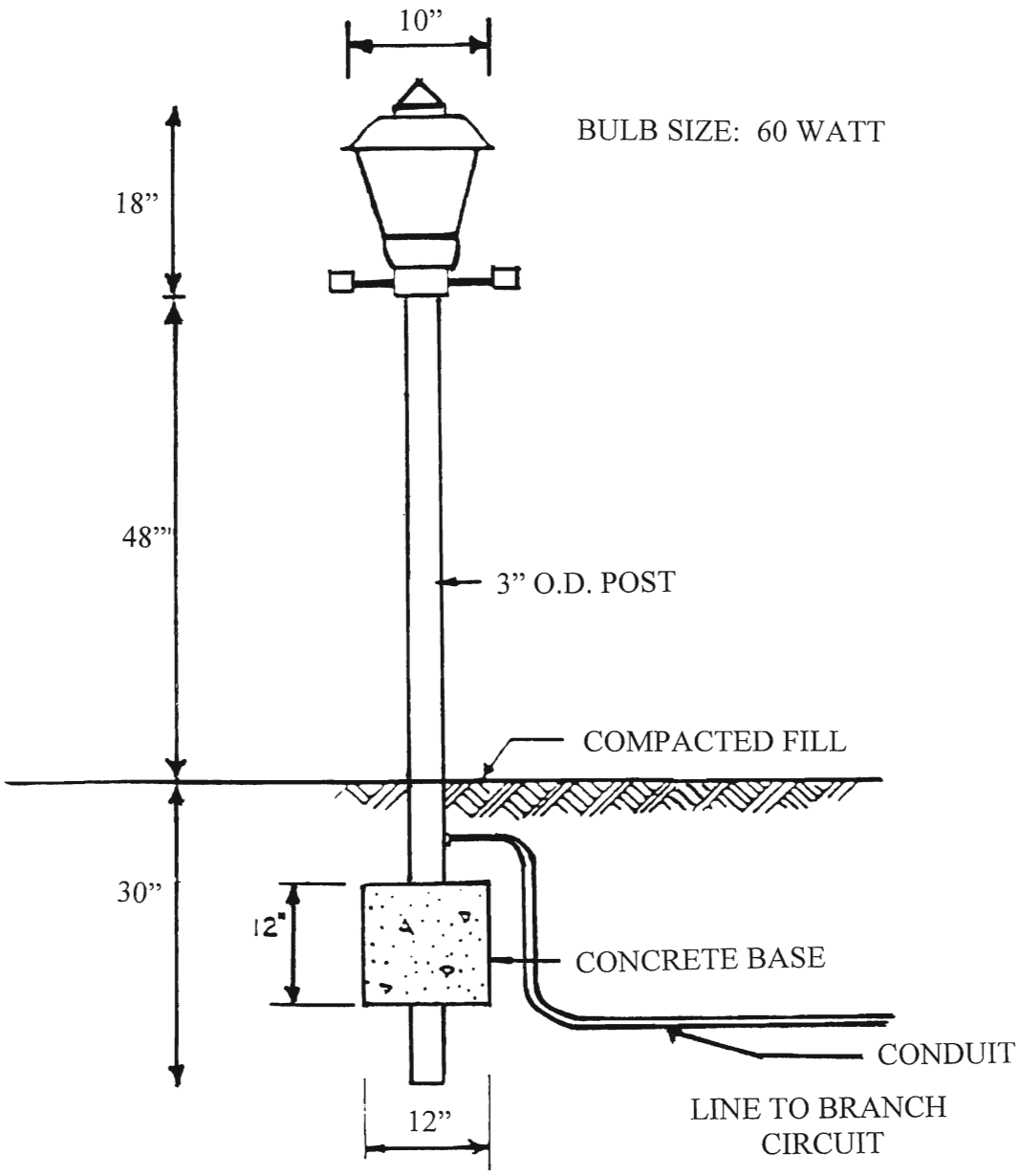
SIGNAGE FOR DRY SWM/BMP FACILITIES

EXHIBIT 20



SIGNAGE FOR WET SWM/BMP FACILITIES

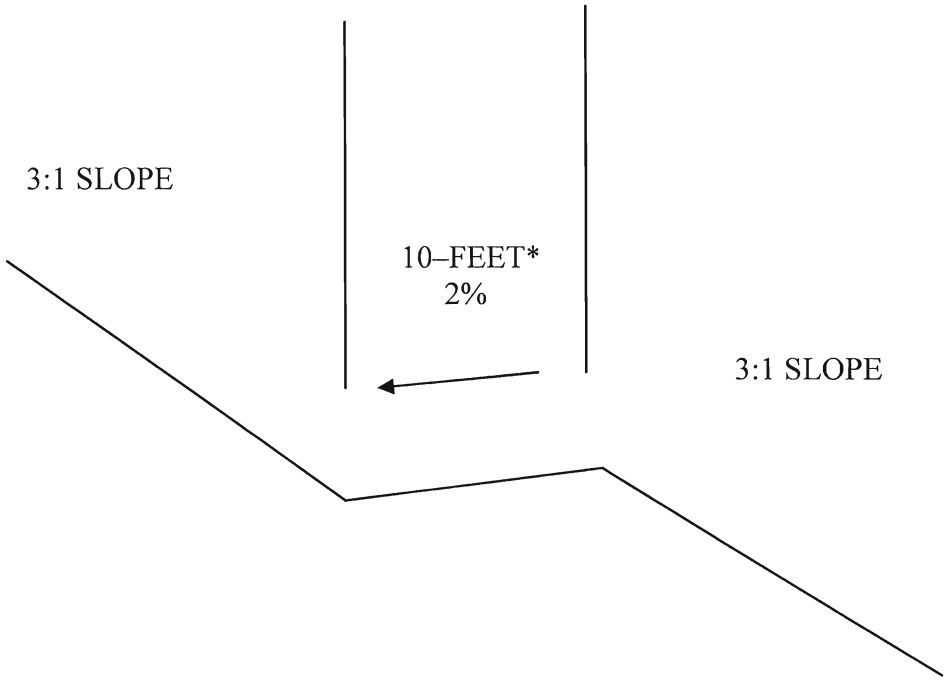
EXHIBIT 21



PHOTOELECTRIC YARD LIGHT
Typical Light Dimensions
Equivalent or Better Lights May Be Used

EXHIBIT 22

BENCH DETAIL



*The width of benches may be dcreased to four (4) feet if runoff is diverted away from the top of the bench into a defined drainage system.