**CHAPTER 2 Hydrology and Storm Water Management**

**2.1 Materials**

1. Within the right‐of‐way and/or easements, all structures and pipes shall be constructed of concrete. Any offsite drainage structure connecting directly into a structure, pipe or facility must be concrete.
2. If the applicant wishes to use any material besides concrete pipe and/or structures on the site, they may do so, as long as the final connection to the Town’s system is concrete. The Town will not accept responsibility for non‐concrete piping and/or structures, and a maintenance plan for the piping and structures will need to be executed with the Town prior to permits being issued.

**2.2 Easements**

1. Standard minimum easement width shall be determined as follows with minimum easement width to be based on the width of the trench necessary to unearth the pipe. The trench width shall be based on a 1:1 slope from the edge of the trench. Where multiple pipes or pipe sizes larger than 72 inches are installed, the edge of easement shall be a minimum of 5 feet clear of the outside edge of the outermost pipe. Criteria resulting in the greatest width shall be used.
2. For open channels, easement width shall generally be based on the width required to carry the design flow plus 5 feet on each side. Open channels will be in a minimum drainage easement of 15 feet.
3. Easements are required to completely encompass the 10‐year ponding area at all culverts and inlets, except that, where existing drainage structures are being improved, off‐site easements on property not owned or controlled by the applicant shall not be required. Where the storm drainage easement for such a culvert or inlet is a temporary easement, the ponding area easement may also be temporary.
4. Easements are required around permanent water detention/retention facilities and floodplains, which shall cover not less than the 100‐year ponding area, all access easements and downstream channels.

**2.3 Site Drainage**

1. All finished grading, seeding, sodding or paving shall be done in such a manner to preclude the ponding of water on the site, particularly adjacent to building and storm drain inlets, except as specifically noted. The site shall be sloped to drain at all times.

**2.4 Discharge of Foundation Drains, Sump Pumps, and Roof Drains**

Discharge piping for foundation drains, sump pumps and roof drains shall not connect to the Town’s stormwater piping system. All discharges shall terminate to daylight on the property in which the water is collected, or to an open ditch that is within an adjacent town easement and is utilized for stormwater runoff. Any discharge into a town easement shall obtain approval from Public Works.

**2.5 Erosion and sediment control during construction**

All Erosion and Sediment Control devices shall be constructed and maintained in accordance with the

current “Virginia Erosion and Sediment Control Handbook”.

**2.6 Location of SMW/BMP Facilities**

1. SWM and BMP facilities shall be located in conformance with the applicable sections of the Zoning Ordinance, this manual, and Shenandoah County and DEQ regulations.
2. Wet and dry (including extended detention) SWM and BMP facilities shall be set back at least forty feet from a dwelling unit.
3. 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 applicable buffer, or setback established in the applicable zoning district, or ten feet, whichever distance is greater.
4. In single family attached and detached developments, SWM and BMP facilities shall be located within easements in lots which shall be conveyed to and maintained by a homeowners’, condominium owners, or other property management association. In the absence of an association, for a single lot development, SWM and BMP facilities may be located in individual single-family detached 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 of the total area of the lot.
5. SWM and BMP facilities shall not be located within individual single-family attached lots.
6. SWM and BMP setback areas shall be stabilized and landscaped based on the type of facility. Access areas shall remain clear.
7. All measured distances of setbacks mentioned above shall be to the one-hundred-year ponding limits, except as identified in Table-2 - A.
8. SWM and BMP facilities shall not be located within Resource Protection Areas.

**2.7 Easements for SWM/BMP Facilities**

1. An easement around SWM and BMP facilities shall be in conformance with Table-A.
2. For wet and dry (including extended detention) SWM and BMP facilities, the easement shall be provided to adequately contain the one-hundred-year ponding level (plus required freeboard), embankment, outlet structures, and an appropriate width of maintenance area around the one-hundred-year ponding area the permits access to the dam, outlet structures and embankment.
3. For infiltration practices and underground systems, the easement shall include a ten-foot-wide strip outside the edges of the facility. A wider strip may be required per State design requirements. This width will be increased one foot for each foot that the depth of the structure exceeds six feet.
4. 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.
5. Easements for pipes shall be provided per Table-2 - B. Piping shall be placed in the middle third of the easement.
6. Retaining walls shall not be located within SWM and BMP easements located in residential subdivisions unless approved by the Director of Public Works.

**2.8 Access to SMW/BMP Facilities**

1. Access to SWM/BMP facilities shall be within an easement of not less than twenty feet in width and shall not exceed a grade of twenty percent. A curb cut from the road shall be provided.
2. The access easement and a minimum ten-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.

**2.9 Protection of SWM/BMP Facilities**

1. Dry ponds within or adjacent to a residential district shall provide warning signs in conjunction with SWM/BMP facilities. Signs shall be placed in four locations evenly spaced around the facility. Sign shall have four-inch-tall letters and state, “WARNING WATER RISES RAPIDLY WITHOUT WARNING IN DRY POND”

**2.10 Recording of Maintenance Agreements for SWM/BMP Facilities**

1. Prior to bond release, a copy of the recorded SWM/BMP agreement that indicates the facilities and easements have been conveyed to the property owner shall be provided.

**2.11 Required Permits**

1. For projects with 2500 square feet or more of disturbed area, a Land Disturbance permit through Shenandoah County shall be issued prior to the commencement of work. This permit shall only be issued to a Registered Land Disturber.
2. For projects with 1 acre of greater in disturbed area, a permit through the Virginia Department of Environmental Quality shall be issued prior to the commencement of work.
3. A Storm water permit (SWPPP) from the Department of Conservation and Recreation will be required and provided prior to plan approval for developments over 1 acre in size. A copy of the permit must be posted onsite for inspection at all times.
   1. **Riparian Protection Areas**
4. Riparian Protection Areas (RPA) are measured from each defined edge of an identified watercourse or surface water body at bankfull flow or level or shall equal the extent of the 100-year floodplain, whichever is greater. All Site Plans, plats and development plans shall reserve the following riparian protection areas:
   1. Along an ephemeral stream - 25’;
   2. Along an intermittent or perennial stream - 50’;
   3. Along the Shenandoah River - 100’.
5. Boundary Expansion. While the buffer is considered the general standard, there are situations where the presence of an ecologically sensitive area shall require a modification to this buffer width. In order to ensure the protection of stream integrity, the Zoning Administrator may require buffer expansions to accommodate wetlands and areas of steep slope.
6. Activity Within RPA.
   1. Development may occur with an RPA upon receiving Special Use Permit approval.
   2. Existing vegetation within the riparian protection area should be retained to the greatest extent possible.
   3. Best Management Practices should be incorporated into all development proposals.
7. Boundary Interpretation and Appeals Procedure
   1. When an Applicant disputes the boundaries of the riparian buffer or the defined edge of a watercourse or surface water body, the Applicant shall submit evidence to the Zoning Administrator that describes the boundary, presents the Applicant's proposed boundary, and presents all justification for the proposed boundary change.
   2. The Zoning Administrator shall evaluate all material submitted and shall make a written determination within 30 days, a copy of which shall be submitted to the Town Council and Applicant.
   3. Any party aggrieved by any such determination or other decision or determination under this section may appeal to the Town Council under the provisions of this ordinance. The Applicant shall have the burden of proof in case of any such appeal.

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| TABLE – 2 – A  BMP LOCATION AND EASEMENT | | | | | | | | | |
|  | BMP Type | Non-Residential | Residential | | Setback | Minimum Lot Requirement | Easement | | BMP Sign Required |
| Individual Lot | Common Area |  | BMP | Access |
| 1 | Rooftop (Impervious Surface) Disconnection | A | A | A | 10’ from Foundation | Allowed on SF Detached | Y | Y | N |
| 2 | Sheet Flow to Filter or Open Space | A | A | A | 10’ from Structure |  | Y | Y | N |
| 3 | Grass Channels | A | R | A | 20’ from Structure | 20,000 sf on SF Detached Lots | Y | Y | N |
| 4 | Soil Compost Amendment | A | R | A | 20’ from Structure if located on SF detached lot | 20,000 sf on SF Detached Lots | N | N | N |
| 5 | Vegetated Roof | A | A | R |  |  | N | N | N |
| 6 | Rainwater Harvesting | A | R | A | Residential – Case Basis |  | Y | Y | N |
| 7 | Permeable Pavement | A | A | R |  |  | N | N | Y |
| 8 | Infiltration | A | R | A | 20’ Dwelling  5’ from ROW |  | Y | Y | Y |
| 9 | Bio-retention | A | A | A | 20’ Dwelling  5’ from ROW | 20,000 sf on SF Detached Lots | Y | Y | Y |
| 10 | Dry Swales | A | R | A | 25’ from Dwelling | 20,000 sf on SF Detached Lots | Y | Y | Y |
| 11 | Wet Swales | A | A | A | 10’ from Property Line  40’ from Dwelling |  | Y | Y | Y |
| 12 | Filtering Practices | A | A | R | 10’ from Property Line |  | Y | Y | Y |
| 13 | Constructed Wetland | A | R | A | 10’ from Residential Property Line  40’ from Dwelling | Minimum 2 Acres | Y | Y | Y |
| 14 | Wet Pond | A | R | A | 40’ from Dwelling  10’ from Residential Property Line | Minimum 2 Acres | Y | Y | Y |
| 15 | Detention Pond | A | R | A | 40’ from Dwelling  10’ from Residential Property Line |  | Y | Y | Y |
| 16 | Manufactured BMP | A | A | R |  |  | Y | N | Y |

A – Accepted, R – Restricted, N – Not Permitted, N/A – Not Applicable

Non-Residential includes apartments, condominiums, and similar residential uses under single management

Residential includes single-family detached and single-family attached (townhouse, duplex)

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| TABLE – 2 - B  PIPE SIZE AND EASEMENT WIDTH | |
| Pipe Size in inches | Width of Easement in feet |
| Up to 18 | 15 |
| 21 – 33 | 20 |
| 36 – 48 | 25 |
| 54 – 72 | 30 |