Dorchester County

Stormwater Management

Design Manual

Dated: February 2009
Revised: November 2014
Revised: November 2020
Revised: May 2022
Revised: October 2023
Revised: January 2024

The following list summarizes the major changes that were made to the design manual content in the May 2022 update.

Chapter 1

- 1.4.4.3 – Added reference to traffic study requirements.
- 1.4.5 – Updated applicability standards as they apply to projects that are a part of or constitute a Larger Common Plan. Clarified that residential subdivisions with ten or fewer lots are not considered LCPs and do not require CAA submittals. Removed Minor Subdivision definition.
- 1.4.10.15 – Added definition for Larger Common Plan. Abbreviated Subdivision definition.

Chapter 2

- 2.2.1 – Clarified project criteria that constitute a submittal for an EPSC Certification or Stormwater CAA. Incorporated LCP language.
- 2.2.2.1 – Clarified criteria for exemption of single-family structures from CAA submittal.
- 2.5.2 – Incorporated LCP language into CAA applicability.
- 2.5.2.4 – Updated dewatering times for wet vs dry sediment basins and traps.

Chapter 3

- 3.2.2.2 – Removed line stating that tailwater conditions must be approved by Dorchester County Public Works prior to CAA submittal.
- 3.2.2.4 – Added reference to 3.2.3.9 for forebay design criteria.
- 3.2.2.6, 3.2.2.7 – Clarified dewatering times for wet vs dry ponds. Removed line with blanket statement of 72-hour dewatering time for all water quantity control structures.
- 3.2.3 – Added "retention" to section title.
- 3.2.3.9 – Added forebay design criteria.
- 3.2.3.10 – Added note that all ponds should be designed to prevent short circuiting and maximize flow length between pond inlets and outlets. Included design recommendations.
- 3.4.4.5 – Added note that all sediment traps and basins should be designed to prevent short circuiting. Included design recommendations.
- 3.4.4.6 – Added forebay design criteria for sediment basins and traps.
- 3.4.4.7 – Added porous baffle requirement for sediment traps and basins if forebays are infeasible.
- 3.4.4.12 – Added note that concrete washouts must be at least 50 feet from stormwater facilities, and all concrete washouts must be lined.
- 3.5.1.4 – Clarified that private commercial sites can have additional tie-ins to submerged pipe systems, provided that a waiver request and explanation of design choice are submitted.
- 3.5.3 – Clarified what types of headwalls are permitted, depending on pipe diameter.
- 3.8.2 – Added line that Dorchester County will not maintain grassed swales or their easements, and all swale easements shall be labeled as private easements.

Other Comments

- Added all references used as sources for the above information to the reference list.
- Construction Approval Application updated to reflect design manual updates

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Chapter 1. General

1.1 Purpose

It is the purpose of this Manual and the Stormwater Management Ordinance to protect, maintain, and enhance water quality and the environment of Dorchester County and the short-term and long-term public health, safety, and general welfare of the citizens of Dorchester County. This Manual and the Stormwater Management Ordinance are also designed to minimize property damage by establishing requirements and procedures to control the potential adverse effects of increased stormwater runoff and related pollutant loads associated with both future development and existing developed land. Proper management of stormwater runoff shall further the purpose of this Manual and the Stormwater Management Ordinance to ensure a functional drainage system, reduce the effects of development on land and stream channel erosion, attain and maintain water quality standards, enhance the local environment associated with the drainage system, reduce local flooding, maintain where necessary pre-developed runoff characteristics of the area in terms of flow rate, volume and pollutant concentration, and facilitate economic development while mitigating associated pollutant, flooding, erosion, and drainage impacts.

This Manual is for stormwater management purposes only, and the requirements herein are specific to the County's stormwater management program and do not preclude the Planning, Zoning and Building Departments from performing their permitting, plan review, inspection or other related duties and collecting applicable fees. Should there be conflicting requirements, the more restrictive shall apply.

This Manual describes the policies and procedures used by Dorchester County Public Works to implement the Stormwater Management Ordinance and the Stormwater Management Program (SWMP). These standards and procedures shall:

1. Clearly describe the construction approval process as it relates to stormwater management;
2. Convey the technical design standards to the engineering community, to include standards which address flow rates, runoff volume, and pollutant load/concentration, as well as specific standards during construction and for long-term performance;
3. Provide general information on approaches to improve water quality, prevent illicit discharges, and minimize stormwater runoff impacts due to development and redevelopment;
4. Convey other protection provisions related to stormwater discharges such as wetlands and watercourse conservation.

Developments may also be impacted by state and federal requirements to include, but not be limited to, the South Carolina Department of Health and Environmental Control (SCDHEC), National Pollutant Discharge Elimination System (NPDES), Phase II Construction General Permit for Stormwater Discharges from Large and Small Construction Activities (CGP) and the NPDES General Permit for Storm Water Discharges from Regulated Small Municipal Separate Storm Sewer System (SMS4). Those projects not subject to NPDES requirements must still comply with applicable County standards. All projects inside and outside the SMS4 boundary must comply with the applicable County standards.

1.2 Scope

The scope of this Manual is limited to the requirements related to stormwater management as reviewed and approved by Dorchester County Public Works. This Manual is not intended as a textbook or a comprehensive engineering design reference. It was instead developed under the assumption that the user possesses a basic understanding of stormwater control design, construction, or land development depending on the user's area of expertise. References to guidance documents from federal, state, and local agencies, as well as commercial products are given throughout this Manual to provide additional information to users. Two common examples are the Natural Resources Conservation Service's (NRCS) TR-55 and SCDHEC's Best Management Practices (BMP) Manual.

The design standards are not intended to restrain or inhibit engineering creativity, freedom of design, or the need for engineering judgment. When shown to be applicable, it is encouraged that new methods, techniques, and innovative stormwater BMPs be submitted with supporting documentation. The use of such approaches should be substantiated with submitted documentation by design professionals showing that the proposed design is equal to, or exceeds, the traditional procedures in terms of performance and economic feasibility.

On projects that require site specific designs pertaining to stormwater management and water quality, site plans, details, calculations, construction specifications, and other technical documents must be designed and sealed by a professional engineer that is registered in the state of South Carolina, with sufficient knowledge and experience to accomplish all design elements of the site plan. Users who are not justly qualified by education or experience in the fields of stormwater design, construction, or land development should consult with a qualified professional in one or more of these areas prior to planning for construction activities.

1.3 Manual Organization

The Manual is divided into three (3) chapters, organized to present recommended technical and engineering procedures along with criteria obtained from local, state, and federal requirements. The remainder of this chapter provides information on the County's authority to develop and enforce design requirements along with several legal matters, some background information on stormwater management and its importance, and definitions for terms used throughout this Manual. Chapter 2 describes the application process for obtaining a Construction Approval from Dorchester County. Chapter 3 contains specific design criteria, and design recommendations, followed by a reference page. All chapters together provide information for designing components of the stormwater management system.

This Manual shall frequently reference the Dorchester County Public Works website, which includes additional forms and reference materials that shall be used during the permitting and construction process.

1.4 Authorization

This Manual has been prepared under the direction of Dorchester County Public Works, which has been granted the authority to develop engineering design standards and enact programs and policies to ensure compliance with state and federal laws, including the Clean Water Act (CWA), SMS4 SCR300000, CGP, and the County's pertinent ordinances.

1.4.1 Clean Water Act (CWA)

The Federal Water Pollution Act, as amended by the CWA, requires the reduction of water pollution and gave the EPA the congressional authority to develop programs to improve the health of navigable waters.

1.4.2 SMS4 General Permit SCR300000

Dorchester County, like many other counties across the United States, is required to have an SMS4 permit to discharge stormwater. Because construction activities and developed lands contribute to the discharge of pollutants, the SMS4 permit requires that Dorchester County encourage, promote, and implement certain practices, programs, and procedures for the purpose of reducing or limiting discharge of pollutants to Waters of the State(WoS). The General Permit requires that Dorchester County develop and implement a Stormwater Management Program to control the discharge of pollutants from its SMS4 to the maximum extent practicable (MEP). The SWMP has several components that must be met, and this Manual provides partial compliance with several, including construction and post-construction management. The SMS4 permit can be found on the SCDHEC website.

1.4.3 NPDES Construction General Permit SCR100000

The Construction General Permit (CGP) authorizes stormwater discharges from large and small construction activities where those discharges enter surface waters or an SMS4 system leading to surface waters. This permit also authorizes stormwater discharges from any other construction activities designated by DHEC with a potential for contribution to a violation of a water quality standard or for a significant contribution of pollutants to surface waters.

1.4.4 Dorchester County Ordinances, Regulations, Standards

Dorchester County has developed and adopted ordinances and standards, largely based on State and Federal regulations, specifically to address concerns associated with uncontrolled stormwater runoff. The principal ordinances and standards for the County that affect the selection of stormwater management control measures are:

1. Storm Water Management Program Ordinance (07-21): Established the engineering design standards and procedures for obtaining a Construction Approval within Dorchester County. Dorchester County Public Works was authorized by this ordinance to develop all necessary regulations, as detailed in this Manual for properly controlling stormwater runoff and mitigating existing and future impacts.

2. Zoning and Land Development Regulations Ordinance (04-13): Issues that may be impacted by this Ordinance when designing stormwater management systems include but are not limited to: limits on building density, buffer and setback requirements, parking lot islands, required parking spaces, tree protection, planting species selection, and screening requirements for ponds and other BMPs. Applicants should specifically check to make sure a desired development type is allowed in the planned location.

3. An Ordinance To Amend Dorchester County Zoning And Land Development Standards Ordinance Number 04-13, As Previously Amended, To Revise Article XVII, Section 17.7 "Traffic Study", And Article XVIII, Section 18.4 "Traffic Study" (19-06): Revised the standards and processes for Traffic Impact Analyses. A Traffic Impact Analysis (TIA) shall be conducted for projects that meet the requirements outlined in the Ordinance.

4. Building Services: This office issues building permits and enforces all applicable provisions of the building codes and floodplain management regulations.

1.4.5 Applicability

The standards in this Manual apply to land disturbance associated with new development and redevelopment. These activities require approval by the County of a submitted Construction Approval Application (CAA) as described in Section 2.2.1. The County has the responsibility for plan review of:

1. All projects that result in land disturbance of **at least** one-half (1/2) acre for commercial and industrial developments and one (1) acre for residential development within the Dorchester County limits.

2. All projects that, as a whole, are defined as a Larger Common Plan (LCP) of development or sale.

3. All projects that result in disturbance of **at least** one-half (1/2) acre of total land area that is part of an LCP.

4. Any land disturbance of **at least** one-half (1/2) acre **and** within one-half (1/2) mile of a coastal receiving water body.

When developing plans for residential subdivisions, each individual lot in a residential subdivision development shall be required to comply with both:

- The subdivision's overall design in accordance with the County's Construction Approval, and

- All requirements of this manual including specified BMPs for addressing stormwater quality.

The LCP, as a whole, is permitted as a single land-disturbing activity. Construction plans for the LCP shall contain a typical erosion control plan for corner lots and mid-block lots. Lots may require site-specific erosion control plans depending on circumstances. Hydrologic parameters that reflect the fully-built LCP shall be used in all engineering calculations. The primary permittee is responsible for obtaining the permit and ensuring permit compliance.

If individual lots or sections in an LCP are being developed by different property owners, designated as secondary permittees, all land disturbing activities related to the LCP shall be covered by the approved Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP), construction plans, design, and details for the LCP. Secondary permittees (i.e. individual lot owners or developers) shall sign an Erosion Prevention and Sediment Control (EPSC) certificate, found on the County's website, that all activities on that lot shall be carried out in accordance with the approved design for the LCP.

Redevelopment shall generally include changes or improvements to any property that has previously been developed which results in the addition of or modification to the existing property, irrespective of the condition of the existing surface upon which the redevelopment is performed. This may include, but is not limited to, changing of land characteristics as a result of demolition and reconstruction, structural additions, and re-grading of the existing property.

Redevelopment projects shall be evaluated for the following if the disturbance is greater than one-half (1/2) acre:

1. If the redevelopment project site has an existing stormwater management system that is serviceable and operational, perform an evaluation of the system in the redeveloped condition to determine if it can convey the redevelopment flows in accordance with the Manual for the following:

    a. If the existing stormwater management system can handle the redevelopment flows (meet the peak discharge requirements of this Manual), then water quality treatment for the redeveloped area is required as indicated in this Manual and a downstream analysis is required. If the project connects to a public system, the downstream analysis must show that the redevelopment project shall not have an adverse impact on the public system capacity.

    b. If the existing stormwater management system is **not** capable of handling the redevelopment flows, then all standards of the Manual apply for the entire site. Pre-development conditions shall be evaluated as open grass for the onsite soil type(s) for the project site.

2. If the redevelopment project does not have an existing stormwater conveyance system, no detention or retention, or no water quality treatment, then perform the following:

    a. If the redevelopment project area is less than fifty (50) percent of the existing developed condition area and includes the addition of impervious area, then all standards of this Manual apply to the additional impervious area.

    b. If the redevelopment project area equals or exceeds fifty (50) percent of the existing developed condition area, then all standards of this Manual apply for the entire site. Pre-development conditions shall be evaluated as open grass for the onsite soil type(s) for the project site.

3. All building roof drains and downspouts shall be disconnected from impervious surfaces. Care should be taken to preserve undisturbed areas and minimize compaction of these areas during construction.

Dorchester County Public Works may require more stringent requirements than would normally be required under these standards depending on special conditions, existing flooding concerns, and/or environmental constraints.

Dorchester County Public Works has the option of accepting alternatives to the plans, specifications and design details of this Manual if the alternatives proposed meet or exceed the adopted performance standards.

The following activities shall require review and approval by Dorchester County; however, these activities shall not require CAA submittals as described in this Manual.

- Estates being subdivided for the sole purpose of fulfilling the terms of a testate or intestate last will and testament and/or a directive of any court action, provided, however, there are no requirements that the County maintain any road right-of-way or drainage easement.
- A contiguous area for development or sale that will be developed by one Developer or Builder with ten (10) or fewer lots. Residential subdivisions that are composed of ten (10) or fewer lots are not considered to be LCPs.

1.4.6 Updates to the Design Manual

This Manual is subject to updates. As design technology and criteria evolve or change or it becomes evident that additional measures are needed to ensure the public general welfare, the Manual shall be updated as needed. Updates shall be approved by the DIRECTOR. Users of this Manual are encouraged to provide comments on the content of this manual at any time in writing to Dorchester County Public Works. The comments shall include proposed changes, reasoning, and justification (including any technical documents supporting the changes). All comments shall be considered during manual updates. The most current version of this Manual can also be found on the Dorchester County website.

1.4.7 Engineered Design Accountability

This Manual shall assist engineers, plan reviewers, inspectors, and contractors in the design and layout of most land disturbance projects. However, this Manual does not replace or otherwise excuse the need for professional engineering judgment and knowledge. The user of this Manual is hereby cautioned that many aspects of engineering design must be considered, including but not limited to:

- Public health and safety;
- Site-specific conditions or unusual features of a project site that warrant special designs,
- Current versions of design texts, manuals, technical documents, and research.

The design engineer (with assistance from other design professionals as needed) is expected to thoroughly investigate field conditions and coordinate all design efforts with Dorchester County. For applicable projects, construction plans must be stamped and signed by a professional engineer actively licensed in the state of South Carolina, unless otherwise stated in this Manual. The design professional must have sufficient education and experience to perform a complete and thorough design of each element shown on the construction plans and must also have complete control to change or alter plans during the design phase. The professional's stamp is a public guarantee that their design has the highest regard for health and safety, protects the environment (air, soil, water) to the maximum degrees possible, and serves the interests of the general public within Dorchester County. A Certificate of Authorization (COA) is required on the construction plans in addition to the engineer's professional certification.

Dorchester County requires a certain level of design expertise for stormwater calculations and flooding analysis. Stormwater design criteria are based upon current scientific knowledge and engineering judgment. It should be realized by engineering designers that floods and flooding may occur at any time due to any number of factors beyond the reasonable control of Dorchester County, such as: greater amounts of precipitation or different rainfall patterns than used in design storms, wet soil conditions, debris or blockage of key stormwater channels, high groundwater tables, etc.

1.4.8 Legal Aspects

If any portion of this Manual is ruled to be invalid or unconstitutional by any court with adequate jurisdiction over Dorchester County, then such portion shall be considered to have been selectively removed from the design standards without affecting this Manual's overall applicability and legal standing to the Construction Approval process. This Manual shall be revised on a periodic basis to reflect known changes to laws and regulations. All local, state, and federal laws and regulations shall be considered in regard to this Manual. In each instance, the more restrictive requirement shall govern unless sound engineering judgment can determine and prove that the more restrictive requirements would be otherwise unnecessary. In most instances, laws and regulations that are phrased more explicitly shall apply over those items that are described in general terms.

1.4.9 Contact Information

Dorchester County should be contacted for any questions, clarifications, or other information related to stormwater management and this Manual.

Contact for stormwater issues:
Dorchester County Public Works
Stormwater Department 2120 East Main Street
Dorchester, SC 29437
Phone: (843) 832-0070 or 563-0070
PublicWorks@DorchesterCountySC.gov

1.4.10 Definitions

Words used in this Manual shall have their customary meanings as determined by the standard dictionary definition except for the following specific words and terms which are herein defined or are otherwise defined in Dorchester County's Stormwater Management Ordinance. In any case, Dorchester County Public Works shall have the right to define or interpret any other word or term contained within this Manual. The rules of verbal construction found in the Stormwater Management Ordinance apply to this Manual.

1. Best Management Practices (BMPs): schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to Surface Waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In order to effectively reduce erosion and sedimentation impacts, Best Management Practices (BMPs) must be designed, installed, and maintained during land disturbing activities.

2. Building: [noun] (1) a relatively permanent enclosed structure over a plot of land, having a roof and usually windows, used for any of a wide variety of activities, as living, entertaining, or manufacturing; (2) anything built or constructed; or [verb] (3) the act, business, or practice of constructing houses, office buildings, etc.

3. Culvert: any structure not classified as a bridge which provides an opening under any roadway or railway including pipe culverts, and any structure so named in the plans.

4. Construction Approval: The approval required by Dorchester County prior to the initiation of any land disturbing activities. This approval requires an application from the owner that complies with the regulations and requirements of this Manual.

5. Contour: an imaginary line, or representation on a contour (topographic) map, joining points of equal elevation.

6. Detention: the collection and temporary storage of stormwater runoff in a surface or sub-surface

facility for subsequent controlled discharge to a watercourse or water body.

7. Developer: any person, or others who acts in his own behalf, that is required to submit an application for approval to disturb land or encroachment and is there after responsible for maintaining compliance with this Ordinance and conditions of the approved application.

8. Ditch: a drainage channel in earth created by natural or artificial means to convey surface and/or subsurface water, flowing continuously or intermittently.

9. Drainage: a general term applied to the removal of surface or subsurface water from a given area either by gravity via natural means or by systems constructed to remove water, and is commonly applied herein to surface water.

10. Elevation: height in feet above a given known datum, such as mean sea level.

11. Embankment or Fill: a deposit of soil, rock or other material placed by man.

12. Flooding: a backup or accumulation of stormwater that inundates normally dry areas and often causes damage to dwellings, buildings, or roads

13. Grading: any displacement of soil by stripping, excavating, filling, stockpiling, or any combination thereof, including the land in its excavated or filled state.

14. Impervious surface: a surface which has been compacted or covered with a layer of material so that it is highly resistant to infiltration by water. The term includes most conventionally surfaced streets, roads, sidewalks, parking lots, roofs, and other similar structures.

15. Larger Common Plan (LCP): A contiguous area for development or sale that will be developed by one Developer or Builder AND will be composed of more than ten (10) lots. Multiple separate and distinct construction activities may occur at different times, on different schedules, in separate stages, and/or in separate phases. If master calculations have been prepared and/or submitted to address stormwater requirements for a contiguous area, then all phases, parcels, and construction projects on all phases and parcels within this defined area are considered part of an LCP. An LCP may have one Owner/Operator or several Owners/Operators. All Owners, Operators, and/or Developers for each project or site that is part of an LCP shall comply with permitting requirements as defined in the Ordinance. Residential subdivisions that are composed of more than ten (10) lots shall be considered Larger Common Plans.

16. Major Modification: modifications that affect the volume of stormwater discharge and/or any of the site drainage patterns. These modifications shall be required to be submitted for review before implementation. Major Modifications must be approved by S.C. DHEC and Dorchester County Public Works prior to being implemented. Refer to the Dorchester County website for examples.

17. Mean Sea Level (MSL): the average (mean) height of the sea or ocean, in reference to NAVD88.

18. Minor Modification: simple design changes that are required to address unforeseen drainage issues that may have been overlooked in the design phase. An example of this type of modification would be the addition of riprap check dams or sediment tubes in a swale to help maintain non-erosive velocities within the channel. All Minor Modifications may be implemented without approval; however, shall be recorded in the on-site SWPPP. Refer to the Dorchester County website for examples.

19. Outlet structure: stormwater management feature designed to regulate the elevation, rate, and volume of stormwater discharge from detention facilities.

20. Owner/Operator: means the property owner, or any person who acts in his own behalf, that submits an application for approval to disturb land or vegetation or for encroachment, and the person, if so designated be default or on legal documents, as the responsible party for maintenance of a stormwater management system(s) and/or facility(s). Certification statements must be signed by this person.

21. Pollutant: dredged spoil, solid waste, filter backwash, sewage, garbage, sewage sludge, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into surface waters that have the potential to adversely affect the water quality

22. Post-Development Conditions: those conditions which are expected to exist, or do exist, after alteration of the natural topography, vegetation, and rate, volume or direction of stormwater runoff, (resulting from development activity).

23. Pre-Development Conditions: those conditions, in terms of the existing topography, vegetation and rate, volume or direction of stormwater runoff, which exist at the time the applicant submits an application from a land disturbance permit or Waiver.

24. Primary Permittee: The owner, developer, or operator of a land disturbing project, such as the developer, landowner, realtor, builder, utility provider, public or private entity, etc. This person is responsible for the site's compliance with state and local regulations and compliance and implementation of the site's approved Construction Approval and SWPPP.

25. Project: an undertaking such as, but not limited to, construction of commercial development, residential development, industrial development, roadways, railways, and utility lines.

26. Public Works Director: (DIRECTOR) the Public Works Director of Dorchester County or his/her designee.

27. Rate: volume of water passing a point per unit of times, generally expressed in cubic feet per second (cfs) for stormwater.

28. Redevelopment: the alteration of, or addition to, a previously developed area, typically resulting in an increase in impervious surface

29. Retention: the collection and long-term storage of stormwater runoff without subsequent discharge to surface waters.

30. Retrofit: the process of altering an existing drainage system to function properly or more efficiently than currently exists. Retrofitting shall be a common method used by the County to address Total Maximum Daily Loads (TMDLs) to include installation of water quality/runoff treatment devices.

31. Runoff: that part of rainfall that is not absorbed into the site, but flows over the surface of the site.

32. Secondary Permittee: A person or persons who conduct a land-disturbing activites that is limited to an individual lot or group of lots that are part of an approved LCP, such as an individual lot owner or a residential builder. This person must comply with the approved construction approval and the SWPPPP.

33. Sediment: fine, particulate material, whether mineral or organic, that is in suspension and is being transported, or has been transported, from its site of origin by water or air.

34. Sedimentation: the process of depositing, or settling, sediment, fine particles, debris and other materials either on other ground surfaces or in the waterbody.

35. Site: any tract, lot, or parcel of land or combination of tracts, lots, or parcels of land which are in

common ownership, or are contiguous and in diverse ownership where development is to be performed as part of a unit, subdivision, or project.

36. Site Construction: is considered the act or process of altering the natural cover or topography of a site that has the potential to impact the quality or quantity of stormwater runoff.

37. Special Protection Areas: designated areas in the County within which more stringent design standards have been established to address an existing problem, such as flooding or water quality. Construction activities occurring within these areas shall be required to comply with the additional or more stringent design criteria.

38. Storm Frequency: rate of likely recurrence of a rainstorm over a period of specified time.

39. Stormwater Management Plan (SWMP): the plan to manage stormwater in terms of collection, conveyance, storage, treatment and disposal of stormwater runoff in a manner to meet the objectives of this Ordinance and its terms, including, but not limited to, measures that control the increased volume and rate of stormwater rohunoff and water quality impacts caused by man-made changes to the land. This plan is approved as detailed in this document and includes the engineering calculations and construction drawings.

40. Structures: anything constructed or erected, the use of which requires a location on the ground, or attached to something having a location on the ground, including, but not limited to, tennis courts, swimming pools, fences and buildings.

41. Subdivision: a grouping of residential structures, parcels or lots subject to the requirements of the County subdivision regulations.

42. Storm Water Pollution Prevention Plan (SWPPP): generally means a site-specific written document that (1) identifies potential sources of stormwater pollution at the construction site; (2) describes stormwater control measures to reduce or eliminate pollutants in stormwater discharges from the construction site; and (3) identifies procedures the operator will implement to comply with the terms and conditions of this general permit. The SWPPP includes site map(s), drawings and plans, other documents, and supporting calculations, and identification of construction/contractor activities that could cause pollutants in the stormwater, and a description of measures or practices to control these pollutants. "SWPPP" as used in this permit, generally means Comprehensive Stormwater Pollution Prevention Plan (SWPPP), unless specific reference is given to the On-Site SWPPP.

43. Vegetation: all plant growth, especially trees, shrubs, mosses, and grasses.

44. Waters of the State: defined by the South Carolina Pollution Control Act; surface or underground waters, natural or artificial, that are wholly or partially within or bordering the state.

45. Wetlands: those areas 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 and delineated as freshwater wetlands by the U.S. Army Corps of Engineers.

Chapter 2. Stormwater Construction Approval Application (CAA) and Procedures

This chapter provides developers, owners, engineers, contractors, and others with the information needed to obtain a Construction Approval of a stormwater management plan from Dorchester County Public Works as required for certain land disturbance activities within Dorchester County and encompassed municipalities as authorized under intergovernmental agreements. This section describes conditions when an approval is needed, the types of applications used by Dorchester County Public Works that apply to different situations, application package requirements, and when and if waivers of such requirements are applicable for certain exempted activities.

2.1 Duty to Comply

Unless otherwise allowed by the Stormwater Management Ordinance or this Manual, the surface of land in Dorchester County shall not be disturbed or altered for any purpose whatsoever, nor any major drainage channel or component of the stormwater system impeded or encroached upon without approval from Dorchester County Public Works. Construction activities cannot commence prior to approval from the DIRECTOR and issuance of a Construction Approval letter.

2.2 Application Process and Procedures

A Construction Approval must be obtained from Dorchester County prior to any land disturbing activities, including, but not limited to, new single family residential, commercial, industrial, institutional, multi-family residential, new development, and redevelopment projects. Application for review and approval under this chapter may be initiated by: (1) property owners; (2) the owners' authorized operators; or (3) Review and Decision-Making Bodies. All CAAs and associated documents shall be submitted, as necessary, to Dorchester County Public Works, as described in Section 2.2.1.

Dorchester County Public Works shall require applicants that need permit coverage from any state or federal agency (such as but not limited to: DHEC-OCRM Coastal Zone Consistency Determinations, 401/404 permits and/or Navigable waters permits from the US Army Corps of Engineers (USACE), SCDOT encroachment permits) to have such permits in hand prior to County approval.

2.2.1 Construction Approval Application (CAA)

A CAA shall be submitted to Dorchester County using the online Evolve portal. Apply online on the Dorchester County website. Dorchester County Public Works has established the following categories of applications:

1. **Erosion Prevention and Sediment Control (EPSC) Certification** is for single-family residential structures (SFR) that disturb less than one (1) acre; commercial and industrial projects that disturb less than one-half (1/2) acre; and projects that are part of an LCP that disturb less than one-half (1/2) acre.

2. **Stormwater CAA** is for single-family residential structures that disturb one (1) acre or more; commercial and industrial projects that disturb one-half (1/2) acre or more; projects that are part of an LCP that disturb one-half (1/2) acre or more **and** were not proposed in the original submission of the LCP; and projects that are defined, as a whole, as a Larger Common Plan (LCP).

Dorchester County shall begin a review of an application once it has been verified to be a complete application package. Applications required in this Manual shall be considered complete only if they are submitted in the required format, include all mandatory information (see Section 2.5), and are accompanied by the established fee(s) as included in the Plan Review and Inspection Fees Ordinance 19-20. Any application that is determined to be incomplete shall be returned to the applicant along with an identification of the missing application component.

Fees shall not be refunded for any reason. No further processing of the application shall occur until the missing items/comments are satisfied, and appropriate documents provided. The application may be resubmitted without the payment of additional fees, provided a complete application package is resubmitted within six (6) months of the date the application was returned to the applicant and the application does not constitute a major change. Applications resubmitted more than six (6) months after the date that the application was returned as incomplete may require repayment of applicable fees.

Dorchester County shall perform a review of each application for compliance with the requirements of this Manual, the County's Stormwater Management Program Ordinance, and applicable state and federal requirements. If deficiencies are found, the County shall submit a set of review comments and/or request for additional information to the applicant. The County may require multiple reviews and shall be subject to additional review fees.

Upon receipt of a completed application for Construction Approval, the Department shall review of the initial application or revisions within twenty (20) working days.

2.2.2 Exemptions

The following are exemptions from the Stormwater Management Ordinance 07-21:

1. Improvement of single-family residences or their accessory buildings which are not part of a Larger Common Plan (LCP) and disturb less than one (1) acre.

2. Land disturbing activities undertaken on forestland for the production and harvesting of timber and timber products and conducted in accordance with best management practices and minimum erosion protection measures established by the South Carolina Forestry Commission pursuant to Section 48-18-70 of the Code of Laws of South Carolina 1976, as amended.

3. Activities undertaken by persons who are otherwise regulated by the provisions of Chapter 20 of Title 48, the South Carolina Mining Act.

4. Land disturbance activities on agriculture land for production of plants and animals useful to man, including but not limited to: forages and sod crops, grains and feed crops, tobacco, cotton, and peanuts; dairy animals and dairy products; poultry and poultry products; livestock, including beef cattle, sheep, swine, horses, ponies, mules, or goats, including the breeding and grazing of these animals; bees; fur animals and aquaculture (under the condition they are in compliance with SCDHEC Agriculture Regulations), except that the construction of an agriculture structure of one or more acres, such as broiler houses, machine sheds, repair shops and other major buildings and which require the issuance of a building permit shall require the submittal and approval of a Stormwater Plan prior to the start of land disturbing activity.

5. Certain land disturbing activities undertaken by persons who are exempt from the provisions of the Stormwater Management and Sediment Reduction Act as set forth in Section 48-14-40 of the 1976 Code of Laws of South Carolina as amended.

6. Industrial Facilities having a valid NPDES General Stormwater Permit issued by SCDHEC, and if the facility follows the conditions on the NPDES General Permit shall be deemed in compliance with the requirements of this Manual and the Ordinance.

2.2.3 Final Approval

Once the application is deemed complete and the design is determined to be in compliance with the requirements of this Manual, the County's Stormwater Ordinance, and applicable state and federal requirements, the County shall issue the Construction Approval letter to the applicant through Evolve, the County's online submittal portal.

Upon approval, the applicant is to send additional sets of construction plans to the County's Planning & Zoning office: two (2) full-size printed sets, two (2) half-sized (11"x17") printed sets for stamp approval, and one set in a digital .pdf format. The applicant may also be asked to submit additional sets of construction drawings and/or project information and documents. SCDHEC may request additional information from the applicant for NPDES permit compliance, which may result in changes to the technical report or construction plans. Any such changes shall be provided to Dorchester County Public Works prior to initiating land disturbing activities.

2.2.4 Site Construction

The owner must have a Construction Approval from Dorchester County prior to beginning any land disturbing activities. The contractor and/or owner shall hold a pre-construction conference prior to the commencement of work and provide the County written notice of this pre-construction conference at least forty-eight (48) hours prior to the meeting time. A Stop Work Order may be issued on all projects proceeding without the pre-construction conference.

Construction activities must adhere to the provisions of the approved design. Approved construction plans shall always be retained on-site. Any major modifications to the approved plan should be submitted in writing to Dorchester County Public Works along with any subsequent fees for review. Such changes shall not be implemented without written approval from the County. Minor modifications may be included in the SWPPP records on site and included in the as-builts when issued.

The owner is required to maintain at least one copy of all approvals, technical reports, and construction documents, available upon request by Dorchester County, during construction of the site. Dorchester County Public Works shall conduct inspections at the discretion of Dorchester County Public Works and in accordance with the SWPPP Inspection Manual found on the County website. During construction, the owner or designated representative (contractor) must conduct inspections of all temporary erosion and sediment controls in accordance with the approved plans and erosion and sediment control plan.

2.2.5 End of Construction and Notice of Termination

At the conclusion of construction, the owner is responsible for making sure the site is in conformance with the approved plans and SWPPP to include that the site is stabilized, paved areas and stormwater infrastructure are clean of debris and sediment, and post construction stormwater controls are functioning as designed. The owner shall complete and submit a Closeout Package including a Closeout Application, an as-built survey prepared and signed by a registered land surveyor, a certification statement, pipe video files if applicable (see below), and the SCDHEC NOT. The Closeout Package shall be submitted through Evolve so a final inspection can be conducted and shall comply with the County's Closeout Requirements document, available on the County's stormwater website. More information can be found in the Dorchester County Closeout Requirements document located on the County website.

The NOT may only be submitted after one or more of the following conditions have been met:

1. Final stabilization has been achieved on all portions of the site for which the permittee is responsible;
2. Another Operator has assumed control, according to §122.41(I)(3) of the SC Regulation 61-9, over all areas of the site that have not been finally stabilized;
3. Coverage under an individual or alternative general NPDES permit has been obtained;
4. For residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner;

5. For construction activities on land used for agricultural purposes (e.g., pipelines across crop or range land, staging areas for highway construction, etc.), either (1) final stabilization has been accomplished by returning the disturbed land to its preconstruction agricultural use, and (2) for any areas disturbed that were not previously used for agricultural activities and areas which are not being returned to their preconstruction agricultural use have achieved final stabilization; or

6. Land disturbance activities were never initiated on the construction site and the construction site remains permanently stabilized.

The NOT must be signed by the permittee and submitted within 30 days of one of the above conditions being met. If a NOT has been submitted and the construction site does not meet the criteria for termination, then the construction site remains subject to the provisions of the On-Site SWPPP (OS-SWPPP). The NOT is not valid until the County concurs by letter.

In the event that ownership and responsibility have changed regarding post construction BMPs and Stormwater Management Controls, a revised Operation and Maintenance Agreement shall be submitted for approval and recorded.

For residential subdivisions, Primary Permittees do not need to terminate permit coverage in areas where Secondary Permittees have received permit coverage to perform work under the SCDHEC Construction General Permit. Primary Permittees can request to terminate coverage when Secondary Permittees are authorized to conduct construction activities, independent of the Primary Permittee, for the remaining disturbed areas on the construction site and final stabilization has been achieved on all other areas of the construction site.

2.2.5.1 Pipe Videos

All projects with stormwater pipe to be maintained by the County shall be inspected by video prior to and after the one (1) year Maintenance Liability Period and prior to the Release of Liability. All deficiencies shall be repaired within thirty (30) days of identification and are the responsibility of the owner. All video inspections shall be completed in fully dewatered conditions at the expense of the owner/developer. A professional engineer shall review all video inspections and certify and recommend the repairs required at the expense of the owner/develop. All videos shall comply with Dorchester County's Closeout Requirements found on the County website.

All repairs shall be completed at the expense of the owner/developer and verified by inspection by the County. Upon confirmation that the repairs are complete and satisfactory and the entire site is acceptable, Dorchester County Public Works shall release all remaining bonds upon request by the developer.

2.2.5.2 Stormwater Construction Approval Transfer

Upon request of an applicant, Construction Approval may be transferred from one applicant to another. The most obvious example of this is when a developer prepares a piece of property for a new neighborhood by performing grading activities, installing utilities, and building roads, and then turns the property over to a homebuilder(s). The applicant shall request a Transfer of Ownership by submitting a **Transfer of Ownership Application**, found on the County website.

2.2.6 Expiration of a Stormwater Construction Approval

A Construction Approval shall remain valid for up to five (5) years from the date of issuance, provided that the project complies with the Stormwater Management Ordinance and this Manual and is not inactive for a period of twelve (12) consecutive months. Construction activity must be initiated within twelve (12) months of issuance of the Construction Approval. Failure to initiate construction shall render the approval invalid at the end of the twelfth month.

2.2.7 Responsibility of Owner/Operator

During any construction operation, the owner/operator shall be responsible for carrying out the proposed work in accordance with the Approval, approved plan, specifications, and time schedule, and in compliance with all requirements of the Stormwater Management Ordinance and this Manual.

2.3 Waivers

Dorchester County Public Works may grant waivers from the requirements of the Stormwater Management Ordinance and this Manual for individual construction activities if there are exceptional circumstances applicable to the site such that strict adherence to these provisions shall not meet the intended purpose of the County's Ordinance and this Manual. Discuss all waiver requests with the county engineer prior to submittal. A written request from the applicant shall contain descriptions, drawings, and any other information that is necessary to evaluate the proposed waiver. A separate written waiver request shall be required if there are subsequent additions, extensions, or modifications which would alter a previously approved waiver. Waivers are not available for water quality controls. A project may be eligible for a waiver of stormwater management for water quantity if the applicant can demonstrate that:

1. The proposed project shall have no significant adverse impact on the receiving natural waterway or downstream properties; or

2. Attenuation of the runoff within the subject basin shall alter the release rate such that downstream systems shall be adversely impacted by storing the regulated storm event (i.e. it can be shown that the time of concentration of the basins will coincide, leading to an increase of the peak at an already vulnerable point downstream); or

3. The imposition of peak or volume control requirements of stormwater runoff would aggravate downstream flooding. An example of this situation would be when an overall watershed analysis has indicated that imposing restrictions in the upstream watershed of the proposed project would cause the timing of the peak of the routed hydrograph to coincide with the peak flow from another contributing watershed at a certain point downstream.

2.4 Stormwater Facility Ownership and Maintenance

2.4.1 Ownership

For any project, the owner of a portion or the entire stormwater system, as the case may be, shall be clearly designated on the **Operating and Maintenance Agreement** before a Construction Approval shall be issued. Ownership shall also be recorded on the final plat. Ownership shall imply responsibility for maintaining the stormwater system, including all ponds and other BMPs used for controlling runoff quantity and quality. Ownership does not imply that the owner(s) may in any way alter the size or function of any component of the stormwater system without consent from Dorchester County. Owners found altering such components will be required to remove any alterations and return the system to the designed parameters, at their expense.

Residential: Ownership of all BMPs (water quantity and quality basins/devices/non-structural practices) in new and re-development projects shall in most cases belong to the owner(s) of the parcel(s) or a Homeowners' Association (HOA) of land under or on which it exists.
Commercial: In new and re-development projects, ownership of the entire stormwater system (conveyances, as well as all BMPs, ponds, etc.) shall belong to the owner, or a lessee(s).

2.4.2 Maintenance

The owner/operator, HOA, or operator as applicable, must enter into a permanent maintenance agreement (Operating and Maintenance Agreement for Stormwater Facilities) with Dorchester County. This Agreement is a

legal document, recorded in the permanent land records with the County Register of Deeds, in addition to being fully described on the final plat. The agreement must be signed and executed prior to the issuance of a Construction Approval. This Agreement allows for maintenance to be performed by a third party such as an operator or other contractor. However, the owner must also be listed and is ultimately responsible for adherence to the maintenance requirements.

Each component of the stormwater management system (pipes, inlets, BMPs) shall have a maintenance plan (activities and associated schedule) as part of the Operating and Maintenance Agreement. The plan shall cover temporary measures used during construction in addition to the long-term maintenance of the system. Suggested maintenance activities and recurrence intervals for water quality BMPs can be found in the SCDHEC BMP Manual.

The DIRECTOR shall provide oversight of these Agreements to ensure adherence by the owner or other responsible party. The DIRECTOR shall inspect a system as he deems necessary to ensure maintenance is being performed in accordance with this Agreement. More detail is provided on County inspection and enforcement procedures on the County's website.

2.5 Stormwater Permit Submittal Requirements

Each CAA, as described in Section 2.2, has a set of documents, reports, and approvals that must be submitted to the County as part of the permit submittal package. Some larger construction activities may have additional requirements, as indicated in the following sections. The County's **Construction Approval Application Checklist** provides a guide for what should be submitted with each CAA.

2.5.1 Erosion Prevention and Sediment Control (EPSC) Certifications

Erosion Prevention and Sediment Control Certification submittals must include the following documents:

1. **Erosion Prevention and Sediment Control Certification**, completed and signed
2. A narrative briefly explaining the project
3. Drawings showing the proposed project limits and during-construction erosion and sediment controls

This approval must be obtained for any single-family residential structure which disturbs less than one (1) acre or or any commercial, industrial, or major subdivision that disturbs less than one-half (1/2) acre.

2.5.2 Stormwater Construction Approval Application (CAA)

All applicable land disturbing activities, being single family residential structures that disturb one (1) acre or more; commercial and industrial projects that disturb one-half (1/2) acre or more; projects that are defined, as a whole, as a Larger Common Plan (LCP); and projects that are part of an LCP that disturb one-half (1/2) acre or more **and** were not proposed in the original submission of the LCP, must submit a Stormwater CAA package. This application package must include, at a minimum, the following components. Larger sites shall include additional requirements as will be discussed below.

1. **Construction Approval Application**, completed and signed
2. Completed **Construction Approval Application Checklist**
3. Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP)
   - Include the applicable sections and appendices in the SCDHEC SWPPP template
   - Project Maps, to include but not limited to:
     - Site Map, including adjacent property owners, waterbodies, critical areas

- Location Map
- Topography Map
- Soils Map
- Floodplain Map

4. Technical Report, prepared by a certified professional (Professional Engineer)
   - Project narrative describing the site in general, purposes of the construction activity, existing and proposed site conditions, topographic and soil information, nearby sensitive surface waters, proposed temporary and permanent stormwater BMPs, proposed stormwater management system, design methodology, offsite contributions, and critical downstream areas.
   - If applicable, justification for waivers or other special conditions of the site, including submerged pipes or underground detention systems.
   - Identification of on-site or nearby wetlands and surface waters, with delineation if applicable.
   - Discussion on sensitive waters, including those on the current 303(d) list and those within a TMDL watershed, and how the project will comply with associated requirements to protect water quality.
   - Appliciable portions of the FEMA FIS report
   - Hydrologic and Hydraulic Analysis
     - Identify the type of analysis and modeling software used
     - Summary tables of peak flows at the site boundary/boundaries for pre- and post-development conditions for the 2-, 10-, 25-, 50-, and 100-year, 24-hour storm events
     - Summary table of the pond analysis showing the elevation of the pond bottom, normal water surface elevation, top of pond, emergency spillway, and water surface elevations in the pond at the for the 2-, 10-, 25-, 50-, and 100-year, 24-hour storm events, if applicable
     - Determination of curve numbers, times of concentration, and other hydrologic parameters
     - Peak velocities at pipe outfalls and in open channels for the 2-, 10-, 25-, 50-, and 100-year, 24-hour storm events
     - Model schematic, with nomenclature matching the plans and drainage maps
     - Model inputs to include, at a minimum, drainage areas, curve numbers, times of concentration, rainfall, tailwater conditions, pipe data, pond stage/storage information, outlet control structure inputs, and peaking factor of 323
     - Model outputs to include, at a minimum, existing and proposed peak flows at the boundary points, maximum velocities at pipe outfalls, and pond stage/storage information
     - Pipe calculations showing the pipe capacity for the 2-, 10-, 25-, 50-, and 100-year, 24-hour storm events, if pipes are part of the stormwater system. The pipes must have enough capacity to convey the 25-year, 24-hour storm event.
   - Water Quality Analysis: show that the site shall comply with the water quality requirements outlined in Section 3.4
   - Sedimentation Analysis
     - Description of the erosion and sediment control practices to be used
     - Plan showing the location of all erosion and sediment control practices
     - Design calculations of each measure, including trapping efficiencies. Each measure should also have a standard detail and specification
     - Explanation/discussion of models used in the analysis
     - Wet sediment basins and traps shall have a dewatering time between two (2) and five (5) days. Dry sediment basins and traps shall have a dewatering time between one (1) and three (3) days.
   - Downstream Analysis, in accordance with Section 3.8
   - Project Maps and figures
     - Pre- and post-development drainage maps with existing/proposed contours not exceeding two (2) foot intervals and identifying the drainage area boundaries, clearly defined boundary points used in the hydrologic analysis, time of concentration paths, land covers, streams, wetlands, other surface waters, project limits, jurisdictional boundaries
     - Site Map showing project limits; all existing and proposed buildings, structures, stormwater infrastructure, facilities, and outfalls; and existing and proposed contours

5. Construction Plans signed and certified.
    - Cover Sheet
        - Project name
        - Engineers contact information (name, mailing address, telephone, fax),
        - Contact information (name, mailing address, telephone, fax) of the owners, operator or designated party
        - Vicinity map
        - Table of contents
    - Existing Conditions, including all existing structures, infrastructure, and facilities
        - Include benchmarks if available, referenced to mean sea level (MSL)
    - Site Plan, providing a clear view of the intended construction, limits of disturbed areas, and proposed impervious areas
    - Sediment and Erosion Control Sheet
        - Locations of all proposed temporary and permanent sediment and erosion control features
        - Construction entrance
        - Tree protection and any areas of preservation
        - Buffers, in accordance with the CGP
        - Construction sequence
        - Temporary and permanent seeding and stabilization
        - During-construction maintenance plan
    - Grading and Drainage Sheets
        - Existing and proposed contours for entire disturbed area and offsite areas as needed (1 ft minimum interval, NAVD 88 datum)
        - Point elevations where necessary
        - Existing and proposed stormwater infrastructure and facilities, including applicable elevations
        - Drainage easements
        - Drainage flow patterns
        - Construction sequence
        - Pipe chart to include at a minimum velocity and slope
    - Pipe Profiles, if applicable
        - Pipe size, material, and slope
        - Rim, invert, and sump elevations
        - 25-year hydraulic grade line (HGL)
        - Water/sewer crossings
    - Details
        - All stormwater components (pond, pipes, outlet control structure, etc)
        - Erosion and sediment control details
    - Every sheet should include:
        - Registered engineer's seal
        - Certificate of Authorization seal, as appropriate
        - North arrow and graphic scale
        - Legend
        - Limits of Disturbance
        - Property lines and adjacent landowners' names
        - Legend
        - Existing and proposed contours
        - Land use
        - Delineation of wetlands and/or waters of the state
        - Easements
    - The following standard notes shall be shown on the plans. This list is not meant to be exhaustive and other notes should be included as necessary:
        - SWPPP, inspection records, and rainfall data must be kept onsite or within thirty (30) minutes

of the site at all times from the date of commencement of construction activities to the date that final stabilization is achieved. These items should be in a designated area that is accessible to the inspectors. SWPPP inspections must be completed by a certified inspector.

- Dorchester County shall not maintain Stormwater detention or retention ponds, or drainage ditches and swales. The property owner shall maintain all stormwater detention facilities shown hereon. (The Operating and Maintenance Agreement is to be referenced here and should note that it is or will be recorded with the Dorchester County Register of Deeds.
- An "as-built" plan certified that the facilities have been constructed as shown and that the facility meets the approved storm water plan and specification or achieves the function for which they were designed, shall be submitted prior to: the use or occupancy of any commercial or industrial site, final acceptance of any road into the Official County Road Inventory, release of any financial guarantees held by the County, and/or Approval and/or acceptance for recording of maps, plats, or drawings, the intent of which is to cause a division of a single parcel of land into two or more parcels.
- If necessary, slopes which exceed eight (8) vertical feet should be stabilized with synthetic or vegetative mats, in addition to hydroseeding. It may be necessary to install temporary slope drains during construction. Temporary berms may be needed until the slope is brought to grade.
- Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than fourteen (14) days after work has ceased, except as stated below:
    - Where stabilization by the 14th day is precluded buy snow cover or frozen ground conditions, stabilization measures must be initiated as soon as practicable.
    - Where construction activity on a portion of the site is temporarily ceased, and earth-disturbing activities will be resumed within 14 days, temporary stabilization measures do not have to be initiated on that portion of the site.
- All sediment and erosion control devices shall be inspected once every calendar week. If periodic inspection or other information indicates that a BMP has been inappropriately or incorrectly installed, the Permittee must address the necessary replacement or modification required to correct the BMP within forty-eight (48) hours of identification.
- Provide silt fence and/or other control devices, as may be required, to control soil erosion during utility construction. All disturbed areas shall be cleaned, graded, and stabilized with grassing immediately after the utility installation. Fill, cover, and temporary seeding at the end of each day are recommended. If water is encountered while trenching, the water should be filtered to remove sediment before being pumped back into any waters of the State.
- All erosion control devices shall be properly maintained during all phases of construction until the completion of all construction activities and all disturbed areas have been stabilized. Additional control devices may be required during construction in order to control erosion and/or offsite sedimentation. All temporary control devices shall be removed once construction is complete and the site is stabilized.
- The contractor must take necessary action to minimize the tracking of mud onto paved roadway(s) from construction areas and the generation of dust. The contractor shall daily remove mud/soil from pavement, as may be required.
- Residential subdivisions require erosion control features for infrastructure as well as for individual lot construction. Individual property owners shall follow these plans during construction or obtain approval of an individual plan in accordance with S.C Reg. 72-300 et seq. and SCR100000.
- Temporary diversion berms and/or ditches will be provided as needed during construction to protect work areas from upslope runoff and/or to divert sediment-laden water to appropriate traps or stable outlets.
- All waters of the State (WoS), including wetlands, are to be flagged or otherwise clearly marked in the field. A double row of silt fence is to be installed in all areas where a 50-foot buffer can't be maintained between the disturbed area and all WoS. A 10-foot buffer should be maintained

between the last row of silt fence and all WoS.
- Litter, construction debris, oils, fuels, and building products with significant potential for impact (such as stockpiles of freshly treated lumber) and construction chemicals that could be exposed to storm water must be prevented from becoming a pollutant source in storm water discharges.
- Initiate stabilization measures on any exposed steep slope (3H:1V or greater) where land-disturbing activities have permanently or temporarily ceased and will not resume for a period of seven (7) calendar days.
- Minimize the soil compaction and, unless infeasible, preserve topsoil.
- Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge.
- Minimize the discharge of pollutants from dewatering of trenches and excavated areas. These discharges are to be routed through appropriate BMPs (sediment basin, filter bag, etc.).
- The following discharges from sites are prohibited:
    - Wastewater from washout of concrete, unless managed by an appropriate control
    - Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials;
    - Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and
    - Soaps or solvents used in vehicle cleaning and equipment washing.
- After construction activities begin, inspections must be conducted at a minimum of at least once every calendar week and must be conducted until final stabilization is reached on all areas of the construction site.
- If existing BMPs need to be modified or if additional BMPs are necessary to comply with the requirements of this permit and/or SC's Water Quality Standards, implementation must be completed before the next storm event whenever practicable. If implementation before the next storm event is impracticable, the situation must be documented in the SWPPP and alternative BMPs must be implemented as soon as reasonably possible.
- A Pre-Construction Conference must be held for each construction site with an approved On-Site SWPPP prior to the implementation of construction activities. For non-linear projects that disturb ten (10) acres or more this conference must be held on-site unless the Department has approved otherwise.

6. SCDHEC NOI, complete and signed

7. **Operating and Maintenance Agreement**, completed and signed
    - Must include a detailed maintenance plan for temporary and permanent BMPs.

8. **Dorchester County Plat Checklist/SOP**, completed and signed (when applicable)

9. Army Corps of Engineers (USACE) Jurisdictional Determination (JD) and/or wetlands permit. An Approved JD shall be required for all sites where the limits of disturbance will occur within 50 feet of the edge of the wetland.

10. SCDOT and/or Dorchester County Encroachment Permit

11. OCRM Coastal Zone Consistency (CZC) Certification

2.5.3 Project Disturbs Five (5) Acres or More

For projects that disturb five (5) acres or more **or are located in a Special Protection Area**, all requirements in

Section 2.5.2 must be submitted, as well as at least two (2) separate erosion and sediment control plan phases. Each plan phase shall be identified and must be addressed separately on at least one single plan sheet, with each sheet reflecting the conditions and the BMPs necessary to manage stormwater runoff, erosion and sediment during the phases, at a minimum, listed below:

- **Phase 1 - Initial Land Disturbance Phase.** This includes, but is not limited to, the perimeter BMPs, the necessary sediment and erosion control BMPs to be installed prior to initial/mass grading, and any additional BMPs necessary to keep the construction site in compliance with the Construction Approval.
- **Phase 2 - Stabilization Phase.** This includes, but is not limited to, all BMPs required to be installed, maintained, and retrofitted during the time required to begin the majority of all construction and grading activities, and the time required to bring the construction site into compliance with permanent water quality requirements and into final stabilization.

2.5.4 Project Disturbs Ten (10) Acres or More

For projects that disturb ten (10) acres or more, all requirements in Section 2.5.2 must be submitted, as well as at least three (3) separate sediment and erosion plan phases. Each plan phase shall be identified and must be addressed separately on at least one single plan sheet, with each sheet reflecting the conditions and the BMPs necessary to manage stormwater runoff, erosion and sediment during the phases, at a minimum, listed below:

- **Phase 1 - Initial Land Disturbance Phase.** This includes, but is not limited to, the perimeter BMPs, the necessary sediment and erosion control BMPs to be installed prior to initial/mass grading, and any additional BMPs necessary to keep the construction site in compliance with the Construction Approval.
- **Phase 2 - Construction Phase.** This includes, but is not limited to, all sediment and erosion control BMPs necessary to be installed, maintained and designed to prevent sediment-laden stormwater from discharging off-site during construction. Examples of such BMP control measures to include in this phase are all temporary BMPs used to convey, manage, and treat stormwater runoff including additional sediment traps and sediment basins, rock check dams, silt fence, sediment tubes, inlet protection, temporary conveyance channels and any other sediment control measure.
- **Phase 3 - Stabilization Phase.** This includes, but is not limited to, all BMPs required to be installed, maintained, and retrofitted during the time required to begin the majority of all construction and grading activities, and the time required to bring the construction site into compliance with permanent water quality requirements and into final stabilization.

Clearing and grading on sites with more than ten (10) acres of land disturbance should be completed in phases to limit the amount of disturbance at a given time. The total disturbed area shall never exceed ten (10) acres unless otherwise approved by the DIRECTOR. The DIRECTOR may reduce the total area that may be disturbed at a given time. All clear-cutting areas and the associated phasing shall be clearly identified on the construction plans.

2.5.5 Project Disturbs Twenty-Five (25) Acres or More and Discharges to an Impaired Waterbody

For projects that disturb twenty-five (25) acres or more and discharge to an impaired waterbody, all requirements in section 2.5.2 must be submitted, as well as the requirements in this section to comply with the DHEC publication entitled "Antidegradation for Activities Contributing to Nonpoint Source Pollution to Impaired Waters."

The C-SWPPP must contain a written quantitative and qualitative assessment that the BMPs selected shall control the construction site's stormwater discharges so that they shall not cause, have the reasonable potential to cause,

or contribute to an excursion above any state water quality standard. The Technical Report shall include a quantitative analysis, including water quality modeling, to show that the development shall not have an adverse impact on the impaired waterbody.

Chapter 3. Design Requirements

This chapter provides engineers, designers, developers, and others with the necessary information and references needed to design adequate systems that shall control the rate, volume, and pollutant loads released from a new or redevelopment project where the DIRECTOR has been authorized by law or agreement to enforce engineering practice and reference State and Federal requirements, engineering publications, and other municipal and academic guidance.

It is the goal of this Chapter to provide a minimum set of design standards that shall result in effective stormwater management to mitigate the impact of land development on existing/natural hydrologic and hydraulic processes, as well as attempt to prevent further degradation of the water quality in Dorchester County through proper planning, design, installation, and maintenance. The design professional shall use all means necessary to develop land in a manner consistent with all County Ordinances and this Manual. Specific methods and applications not covered in this section can and should be discussed with the DIRECTOR for applicability prior to submission of site plans and drainage calculations. The following section details the criteria that shall be followed in the absence of designated specific watershed master plan criteria.

3.1 General Design Standards

General requirements for all stormwater systems and facilities shall include, but are not limited to, the requirements included in this Section, as well as those set forth in the SCDHEC Construction General Permit.

1. The Dorchester County design storm is the *twenty-five (25) year, twenty-four (24) hour* storm event for the design of stormwater systems. However, the post-development peak runoff rate must not exceed the pre-development peak runoff rate, at each boundary point, for the 2-, 10-, 25-, and 50-year, 24-hour storm events.

2. Site designers shall minimize the generation of stormwater and maximize pervious areas by:
   a. Selecting portions of the site where the drainage pattern, topography, and soils are favorable for the intended use.
   b. Exposing the smallest practical area of land for the least possible time during construction. This includes maintaining or creating buffers and preserving natural areas.
   c. Identifying the appropriate BMPs to effectively treat the stormwater runoff for the given drainage areas and land uses.
   d. When feasible, retaining and protecting natural vegetation and saving topsoil for replacing on graded areas.
   e. Using temporary vegetative cover, mulching, hydroseeding, or other stabilization methods to control runoff and protect areas subject to erosion during and after construction.

3. Annual groundwater recharge rates should be maintained to the maximum extent practical by promoting infiltration through the use of structural and non-structural methods.

4. Stormwater runoff generated from development shall be controlled to predevelopment and/or natural rates. The method for computing adequate control shall be based on several design storms. Greater detail is provided in this chapter.

5. Stormwater runoff generated from development shall be treated through the use of structural and/or non- structural practices. It is presumed that sufficient treatment is provided by the proposed BMPs if they are:
   a. Designed according to the specific performance criteria outlined in the Manual, the SCDHEC BMP Manual, the Low Impact Development in coastal SC Manual, or the manufacturer's installation

guidelines
b. Constructed properly
c. Maintained regularly

6. Stormwater discharges to Special Protection Areas with sensitive resources or that have existing flooding or water quality problems [e.g., cold water fisheries, recharge areas, water supply reservoirs, Total Maximum Daily Load (TMDL) watersheds, and 303(d) listings] are subject to additional performance criteria. Section 3.7 contains more specific information and design requirements on the areas that shall receive this additional set of protection criteria.

7. Sediment basins and other BMPs shall be used during construction to remove heavy sediment loads from runoff waters leaving the disturbed area. Design criteria are provided in this chapter.

8. Permanent vegetative cover and long-term erosion protection structures shall be installed as soon as practical in the development process.

9. If wetlands are suspected to exist on the property, they should be investigated and delineated by a qualified wetland specialist. All sites with suspected wetlands are required to get a preliminary Jurisdictional Determination (JD) from the US Army Corps of Engineers (USACE). If impacts to a wetlands are anticipated, or if the land disturbance shall occur within fifty (50) feet of the suspected wetland boundary, the permittee must obtain an approved Jurisdictional Determination to verify the limits of the wetlands, and these limits must be shown on all pages of the construction plans.
   a. All efforts should be made to reduce or eliminate impacts to wetlands such as using a buffer in accordance with the CGP section 3.2.4 and/or installing a double silt fence around wetlands. If the wetlands fall under the jurisdiction of the USACE, a Section 404 permit is needed before any disturbance of the wetlands is allowed. In addition, the DHEC-OCRM Coastal Zone Consistency Determination shall address any proposed wetland impacts. Dorchester County shall accept certified delineations from qualified consultants if the USACE is unable to issue verification on the jurisdictional determination and if no impacts to the wetlands are proposed.
   b. Existing on-site wetlands may not be used for storage of stormwater runoff from impervious areas.

10. In order to minimize sediment discharges during construction, if surface waters are located on or immediately adjacent to the construction site, these discharges need to be treated by an undisturbed buffer zone that is capable of achieving maximum pollutant removal unless circumstances are applicable to Section 3.2.4.C.III of the CGP. The following are the requirements for an undisturbed buffer zone where surface waters are located on or immediately adjacent to the construction site:
    a. Provide and maintain, at a minimum, a thirty (30) foot undisturbed buffer zone during construction. This natural buffer should be located between the surface waters and the outermost sediment and erosion controls at the construction site.
    b. Provide and maintain, at a minimum, a forty-five (45) foot undisturbed buffer during construction where the surface waters are classified as Sensitive Waters as defined by the CGP. This extended natural buffer should be located between the surface waters and the outermost sediment and erosion controls at the construction site.
    c. All discharges into a buffer zone should be non-channelized and non-concentrated to prevent erosion, and must first be treated by the construction site's sediment and erosion controls. Velocity dissipation measures may be implemented within a buffer zone.

11. All stormwater management and sediment control practices shall be designed, constructed, and maintained with consideration for the proper control of mosquitoes and other vectors. Specific design criteria are provided in this chapter.

12. For the purpose of hydraulic design, the capacity of a system to transport stormwater runoff shall be based on the size of the contributing drainage basin or subwatershed, as outlined below:

    a. Minor Drainage Systems and Collector Systems: 0 – < 100 Acres
    All street drainage, curb and gutters, pipe systems, culverts, ditches and channels which drain less than one hundred (100) acres shall be designed to carry flows resulting from a twenty-five (25) year frequency storm.
    b. Major Drainage Channels: 100 – < 300 Acres
    All drainage systems draining at least one hundred (100) acres but less than three hundred (300) acres, such as channel improvements, culverts or bridges along these channels, shall be designed to carry a flow resulting from a fifty (50) year frequency storm. Encroachment upon Major Drainage Channels and the adjacent overflow land shall be avoided to the extent possible.
    c. County or FEMA Floodplains: 300 or more Acres
    Bridges and culverts being constructed in natural channels, creeks, or rivers draining more than three hundred (300) acres shall be designed to carry a flow resulting from a one hundred (100) year frequency storm. Encroachment upon these channels and the adjacent overflow land shall be avoided as much as possible.

13. The floodplain provisions for Dorchester County can be found on the FEMA website.

14. The area outside a project area (e.g. offsite areas) that drains to or through the project site must be included in determining the appropriate design. All hydrological computations shall be based on the contributing watershed, not just site boundaries, the project area, or the disturbed area.

15. All development sites disturbing more than one (1) acre shall have a hydrologic-hydraulic analysis performed of the drainage system to ascertain the function of the system during the one hundred (100) year storm event. More specifically, the analysis must determine that the project shall not:
    a. Increase the likelihood of dwelling flooding and property damage.
    b. Increase water surface elevations or reduce system capacity in stormwater systems and facilities upstream or downstream of the project.
    c. Impose any new or additional increase in stormwater runoff velocity on adjacent properties, discharge points, or downstream areas.
    d. Impose any new or additional increase in erosion and pollutant loads that would adversely impact waters of the state.
    e. If a master plan exists for the area/watershed which encompasses the project, criteria set by the master plan shall be used for determining the extent of this analysis. Without a master plan, a downstream analysis must be performed. See section 3.8 for more details.

3.1.1 Low Impact Development

A site incorporating LID design generally produces a much smaller peak rate and volume of runoff than traditional stormwater management methods. In a traditional design, the increased rate and volume of runoff is concentrated into pipes and then conveyed and detained in a single large structure typically at the "end-of pipe" situation. In a LID approach, stormwater runoff is managed near the source ("source-controlled") in a number of small, landscaped

features. These features encourage infiltration, lengthen the time of concentration, and retain flow to create a hydrologic landscape functionally equivalent to the predevelopment conditions. These source treatment structures should ideally connect to natural drainage ways. The goal of LID is to combine this hydrologically functional site design with pollution prevention integrated management practices (IMPs) to reduce the impacts of development on the quality and quantity of runoff. The term IMP is used in place of BMP or best management practices as IMPs are integrated throughout the development providing source treatment as well as landscape amenities. Dorchester County encourages the use of LID techniques. More information on LID techniques can be found in the Low Impact Development in Coastal South Carolina: A Planning and Design Guide (2014) and SCDHEC's BMP manual. Some examples of LID site planning considerations are listed below:

- Maintain natural drainage patterns
- Direct runoff to depressed areas for infiltration
- Preserve existing trees
- Reduce impervious areas
- Locate IMPs in soils with the highest permeability
- Disconnect impervious areas from one another
- Limit clearing and grading as much as possible
- Locate impervious areas on less permeable soils
- Maintain the existing natural terrain and avoid construction in steep slope areas (>15%)
- Preserve tree canopy and natural vegetative buffers
- Re-vegetate cleared and graded areas
- Avoid concentrating flow into pipes or channels

3.1.2 Hydrologic Computation Methods

All hydrologic computations shall be completed using volume-based hydrograph methods acceptable to the DIRECTOR. The design storm duration for these computations shall be the twenty-four (24) hour storm event utilizing a NRCS distribution with a 0.1-hour duration time increment. Typical hydrologic inputs include, but are not limited to the following:

- Rainfall depth or intensity
- NRCS soil classification and hydrologic soil group
- Land use
- Time of concentration
- Initial abstraction/surface storage

The remainder of this section shall provide basic information for the hydrologic calculations. As discussed, the intent of the Manual is not to provide detail on every aspect of hydrologic computations, their limitations, assumptions, and appropriateness of use, but rather guidance on generally accepted standards. This Manual does, however, reference suggested materials as necessary for detailed discussion of related topics.

3.1.3 Inputs

The precipitation depths and rainfall distributions corresponding to various return periods to be used for projects in Dorchester County are shown in Table 1 below. Rainfall data can also be obtained from the NOAA publication entitled Atlas 14, Volume 2.

NRCS has replaced the Type I, Type IA, Type II, and Type III rainfall distributions with new distributions based on the Atlas 14 data. For the Ohio Valley and neighboring states, including South Carolina, the new distributions are NOAA A, NOAA B, NOAA C, and NOAA D. The new distributions are based on the 1-hour to 24-hour rainfall ratio. Three of the distributions apply to Dorchester County.The table below lists design storm precipitation data

and the closest default NRCS distribution for each storm event within Dorchester County. The new distributions can be found in the Dorchester County Rainfall Distributions document.

Table 1: 24-hour Design Storm Precipitation Data for Dorchester County, SC

Area	1-year	2-year	5-year	10-year	25-year	50-year	100-year
24-Hour Precipitation Data (inches)	3.27	3.98	5.13	6.08	7.44	8.55	9.75
Closest Default Distribution	NOAA A	NOAA A	NOAA B	NOAA B	NOAA B	NOAA B	NOAA C
Source: NOAA, April 2017 for the location at Latitude: 33.1105° & Longitude: -80.4095°							

Soil types in Dorchester County range from sands to sandy clays and can be found on the USDA website. When encountering Hydrologic Soil Group (HSG) A/D soils, either A or D may be selected based on site specific characteristics and groundwater levels. However, the HSG selected for pre-development *must be the same* HSG selected for post-development.

Existing land use and corresponding runoff potential factors should be obtained from the site visit and other appropriate sources. The USDA NRCS TR-55 Urban Hydrology for Small Watersheds provides a good reference to determine hydrologic parameters, including curve numbers and times of concentration. The following curve numbers are required in Dorchester County for the landuse and/or surface cover specified below.

Table 2: Dorchester County Land Use Curve Numbers

Landuse	HSG A	HSG B	HSG C	HSG D
Wetlands, surface waters, and all stormwater ponds (wet and dry)	98	98	98	98
Gravel/ROC parking areas	95	95	95	95

3.1.4 Stormwater Management Design Methodologies

Dorchester County recommended methods and corresponding design circumstances are listed in **Table 3** and **Table 4** below. If other methods are used, approval must first be given by the DIRECTOR. Complete source documentation must be submitted for approval.

Table 3: Recommended Methodologies Based on Land Disturbance Area

Method	Size Limitations[1]	Comments
(Modified) Rational Method	0 – < 1 Acres	Acceptable for sizing individual culverts or storm drains that are not part of a pipe network or system. ***Not to be used for storage design.***
"SCS Method" (TR-55)	0 – 2000 Acres	Used for estimating peak flows from urban areas.
[1]Size limitations refer to the subwatershed size to the point where a stormwater system component (i.e., culvert, inlet, BMP) is located.		

Details of Rational Method and modified Rational Method can be found in Chow (1988), ASCE (1996), USDA (1996), and Mays (2001). Documentation on the commonly used SCS (or NRCS) Method can be found on the US Department of Agriculture website. The USGS regression equations for South Carolina can be obtained from the US Geological Survey website.

Table 4: Recommended Hydrologic Methods for Designing Various Stormwater Management Systems and Controls

Method	Rational Method	SCS Method

Extreme Flood Protection		+
Storage/Sedimentation Facilities		+
Outlet Structures		+
Gutter Flow and Inlets	+	
Storm Drain Pipes	+	+
Culverts	+	+
Small Ditches		+
Open Channels		+
Energy Dissipation		+

Methods for calculating the time of concentration and abstraction are numerous. However, a minimum time of concentration of six (6) minutes shall be used for all hydrologic calculations. Sheet flow should be limited to one hundred (100) feet. See references given above for suggested methodologies and information on these calculations.

3.1.5 Hydrographs

Hydrographs should be used to evaluate entire systems by routing storm events through pipes and/or storage systems. The use of a hydrograph will provide better insight into system performance than simply using the peak discharge. The DIRECTOR shall accept computer models commonly used in the industry as well as newer models with appropriate documentation. A list of accepted models to date includes, but is not necessarily limited to:

- ICPR
- Drain: Edge
- PondPack/Civil Storm
- HEC-HMS HYDRAFLOW
- HydroCad
- SWMM

3.2 Water Quantity Control Standards

Water quantity control is an integral component of overall stormwater management. Quantity control is effectively flood control, reducing potential damages and health risks, but because uncontrolled runoff can cause erosion, it can also be a form of water quality control. The following criteria are established for water quantity control. All designs of storage facilities utilized for stormwater quantity control and required downstream analysis shall be submitted as part of the Technical Report when applying for a Construction Approval from Dorchester County.

3.2.1 Accepted Water Quantity Controls

Detention structural controls are used for providing water quantity control and are typically used downstream of other minor structural controls. These structures are designed to provide channel protection, overbank flood protection, and protection against adverse downstream impacts that are related to the increase in peak flow rates and flow volumes from a land development. Some references to BMP selection, effectiveness, and design can be found in the SCDHEC BMP Manual. Structural detention stormwater controls accepted by Dorchester County are shown in **Table 5**.

Table 5: Accepted Water Quantity Controls

General Structural Control	Description
Dry Detention or Dry Extended Detention Basins	Dry detention basins and dry extended detention basins are surface storage facilities intended to provide temporary storage of stormwater runoff and releasing it at a designed flow rate to reduce downstream water quantity impacts. These structures are designed to completely drain to a dry condition within 72 hours.

Wet Stormwater Detention Basins - Wet Pond - Wet Extended Detention Pond - Interconnected Pond System	Wet detention basins are constructed stormwater basins that have a permanent pool of water. Runoff from each rain event is detained above the permanent pool depth and released at a designed flow rate to reduce downstream water quantity impacts. Permanent pool depths must be 4 - 6 feet to prevent mosquito breeding.
Underground Detention	Underground detention is used as an alternative to surface dry-detention basins. It is used in areas that are space-limited where there is not enough adequate land to provide the required detention volume. Underground storage utilizes tanks, vaults, and buried pipes to supply the required storage volume.
Infiltration Basins	Infiltration basins are used to remove runoff from the flow path and promote ground water recharge.

3.2.2 Water Quantity Design Standards

1. The post development peak outflow for the 2-, 10-, 25-, and 50-year 24-hour storm event must not exceed the peak outflow for the pre-existing conditions. The peak outflow for the 100-year, 24-hour storm events must also be provided for both pre- and post-developed conditions.

2. All discharges from a development or redevelopment site shall be modeled with an appropriate tailwater condition.
    a. For tidal locations, this should be the Mean Higher High Water elevation for NAVD 88. NOAA provides tidal stations.
    b. For inland locations within a Flood Zone, the FEMA FIS report usually has information that can be used for tailwater conditions.
    c. Some portions of the County have watershed studies and masterplans that can be used to help determine appropriate tailwater conditions.
    d. If there is no known information for the boundary conditions, consider modeling the next downstream culvert as two-thirds (2/3) full or the downstream ditch as two-thirds (2/3) full.
    e. Other tailwater conditions must be approved by the DIRECTOR.
    f. In Special Protection Areas, the tailwater condition must be approved by the DIRECTOR.

3. All quantity controls discharge points may be no closer than twenty (20) feet from the property boundary.

4. All quantity controls that are also used for quality control shall have a forebay or screening vault for removal of debris and coarse sediments. See section 3.2.3.9 for forebay design criteria.

5. Post-development discharge velocities shall be reduced to provide non-erosive flow velocities from structures, channels or other discharge points.

6. Stormwater stored above the normal water surface level in a pond with a permanent pool shall be drained from the retention pond in no less than two (2) days and no more than five (5) days.

7. Stormwater stored in a pond without a permanent pool shall be drained from the detention pond in no less than one (1) day and no more than three (3) days.

8. No structures or canopy vegetation shall be within at least twenty (20) feet of the BMP.

3.2.3 Detention and Retention Ponds/Reservoirs

1. All ponds shall have an emergency spillway designed to pass the 100-year, 24-hour storm event if the storage capacity is exceeded. The spillway invert should be set at or above the 100-year water surface elevation.

2. A minimum freeboard of one-half (1/2) of a foot above the 100-year water surface elevation shall be provided for all impoundments.

3. Ponds with vegetated embankments shall be less than fifteen (15) feet in height and shall have slopes no steeper than 3H:1V. Embankments protected with Erosion Control Blankets or Turf Reinforcement Matting (TRM) shall be no steeper than 2H:1V. Geotechnical slope stability analysis is required for embankments that are greater than ten (10) feet in height and have steeper slopes than those indicated above. Access inside a pond shall be provided with at least one side slope at 3H:1V or flatter.

4. All constructed embankments shall have a clay core with an excavated cutoff trench.

5. Use a watertight pipe outlet barrel to riser connection. All pipes that extend though an embankment shall have anti-seep collars or filter diaphragms to control the migration of soil materials and prevent potential embankment failure from "piping" within the backfill soil along the conduit.

6. The bottom of detention structures shall be graded towards the outlet structure(s) to prevent standing water conditions with a minimum bottom slope of one-half of one percent (0.5%) (0.005 ft/ft).

7. The maximum depth of permanent storage facilities with a permanent pool shall be determined by site conditions, design constraints, and environmental needs. The facility should provide a permanent pool of water with a depth sufficient to discourage weed and mosquito growth without creating undue potential for anaerobic bottom conditions. A minimum depth of four (4) to six (6) feet is reasonable unless Dorchester County Mosquito Control requirements dictate otherwise. Aeration or other means shall be used as necessary to prevent anaerobic conditions.

8. Orifices should not be smaller than three (3) inches in diameter. If smaller diameter orifices must be used for water quality treatment, an appropriate trash rack, downturned elbow, or floating skimmer must be used on the orifice to prevent clogging.

9. All stormwater ponds shall have a sediment forebay which meets the following design criteria:
   a. The forebay shall be placed upstream of the main detention area.
   b. Forebay volume shall be twenty (20) percent of the required storage volume of the ~~wet~~ pond.
   c. Forebay depth is dependent upon the required storage volume. Recommended depth is between two (2) and four (4) feet.
   d. The forebay shall be separated from the main detention area by barriers of baffles. Acceptable materials include earth, stones, riprap, gabions, or geo-textiles.
   e. A fixed cleanout stake shall be placed near the forebay berm. Forebay cleanout height shall be half (1/2) the height of the forebay's berm. Direct access to the forebay is necessary to allow for cleanout of accumulated sediment. Show forebay access on construction plans.
   f. The forebay will require more frequent maintenance than the main detention area. Include relevant notes in the Operating and Maintenance Agreement.

10. All ponds shall be designed to prevent short-circuiting. Ponds both with and without a permanent pool shall be designed to maximize flow length between the pond's inlets and outlets. Runoff should have to

travel the longest distance possible thorough the basin before being discharged. The shallow and narrow end of the basin should be located near the inlet and the deeper and wider end near the outlet. The length-to-width ratio of ponds should be at least 2:1. Length and width measurements may be measured from the top of the embankment. In situations where this is not possible, permanent baffles may be used to extend the flow path.

3.2.4 Underground Detention Devices

Underground detention devices and systems are limited due to high groundwater table levels, maintenance requirements, and other issues that may arise short- and/or long-term from various issues such as maintenance, storage, and access. If underground detention is incorporated into a site design, it shall be designed using the following criteria:

1. If using infiltration practices, refer to the design criteria in Section 3.3.5: Infiltration Devices.

2. The DIRECTOR reserves the right to require that the feasibility of underground devices be evaluated by a soil scientist, geotechnical engineer, or other individual certified by the State of South Carolina in water table estimation.

3. Underground detention systems are to be located downstream of other stormwater controls providing treatment of the water quality volume. The underground detention system shall not be used as the primary water quality treatment control.

4. The maximum contributing drainage to be served by a single underground detention vault or tank is five (5) acres.

5. All systems shall be designed and laid out to facilitate maintenance. Sediment and debris should be cleaned out from all systems at least once a year, but more frequently if necessary. As with all stormwater controls, a maintenance schedule shall be submitted with the Operating and Maintenance Agreement.

6. Underground detention systems must meet structural requirements for overburden support and traffic loading if appropriate. All systems to be located under roads, driveways, or parking lots shall be shown to have an HS-20 loading capacity.

7. Access must be provided over the inlet pipe and outflow structures. Access openings can consist of standard frame, grated and solid cover, or preferably a removable panel.

8. Access or inspection ports shall be available at least every one hundred (100) feet.

9. All underground detention systems shall accommodate a volume reduction of at least twenty (20) percent due to a sediment storage. That is, calculations shall show that the General Design Standards in Section 3.1 can be met if the storage capacity of the underground detention system is decreased by twenty (20) percent due to sedimentation.

10. Appropriate anchoring is required to prevent flotation of the underground storage tank.

11. A geotechnical report is required to determine the seasonal high water table (SHWT) at the proposed location of the underground detention. If the SHWT is higher than the bottom of the invert of the underground detention, the system must be wrapped in an impervious layer or designed such that the SHWT elevation is the lowest elevation of storage used in the calculations.

12. System configurations which create stagnant water conditions are to be avoided.

13. The system shall have an emergency overflow.

Dorchester County Public Works reserves the right to require phased inspections from the manufacturer or authorized representative at critical install points (e.g. installation of inspection ports, installation of bedding and prior to covering the device) and provide documentation of the inspections to Dorchester County.

3.2.5 Infiltration Devices

Infiltration devices are only allowed in areas where they are feasible based on the seasonal high water table (SHWT) and soil infiltration rates. The following requirements must be met:

1. The feasibility of infiltration shall be evaluated by a registered soil scientist, geotechnical engineer, or other professionals certified by the State of South Carolina in evaluating subsurface, groundwater, and soil conditions. A Geotechnical Report must be provided for all sites using infiltration.

2. Infiltration device design shall be based on soil characteristics of the first twelve (12) inches below the proposed bottom of the device (not the first twelve (12) inches below ground surface). Quantitative in-situ testing (e.g. dual ring infiltrometer) should be performed and appropriate reduction factors applied to determine infiltration rates.

3. Areas draining to these devices must be stabilized and have vegetative filters established prior to runoff entering the system. Infiltration practices shall not be used if a suspended solids filter system does not accompany the device. If vegetation is the intended filter, there shall be at least a twenty (20) foot length of vegetative filter prior to stormwater runoff entering the infiltration device. Forebays or other engineered devices for sediment removal may be prudent.

4. Each system shall be designed to prevent clogging by fine material and for ease of maintenance.

5. The bottom of the infiltration devices shall be at least one-half (1/2) foot above the "zone of seasonal saturation" determined by direct piezometer measurements, which can be demonstrated to be representative of the maximum height of the water table on an annual basis during years of normal precipitation, or by the depth in the soil at which mottling first occurs as determined by an appropriately licensed individual.

6. The infiltration device shall be designed to completely drain within 72 hours.

7. Soils must have adequate permeability to allow water to infiltrate. Infiltration devices are limited to soils having an infiltration rate of at least 0.50 inches per hour. If the infiltration rate is greater than 0.50 inches per hour but less than 2.00 inches per hour, then an underdrain system must be installed. In water quantity calculations, the maximum allowable infiltration rate to be used is 7.00 inches per hour. Initial consideration will be based on a review of the appropriate soil survey and proposed depths of excavation. The survey may serve as a basis for rejection. On-site soil borings and textural classifications must be accomplished to verify the actual site and seasonal high water table conditions when infiltration is to be utilized.

8. Infiltration devices greater than three (3) feet deep shall be located at least ten (10) feet from basement walls.

9. Infiltration devices shall be at least one hundred fifty (150) feet from any public or private water supply well.

10. The design of an infiltration device shall have a properly sized overflow or bypass for larger storm events. Measures to provide a non-erosive velocity of flow along its length and at the outfall shall also be included as necessary. Additional control devices will typically be necessary prior to a release to a watercourse to meet water quality requirements.

11. The slope of the bottom of the infiltration device shall not exceed five (5) percent.

12. An infiltration device shall not be installed on or atop a slope whose natural or existing angle of incline exceeds twenty (20) percent.

13. If an underdrain system is required, cleanouts shall be provided at a minimum of every one hundred (100) feet along the infiltration device to allow for access and maintenance.

14. Infiltration systems shall not be installed on fill soils, and every effort should be taken during construction to minimize the compaction of the soils within the infiltration system.

15. In cases where such criteria or limitations make the use of infiltration devices inappropriate, but no discharge currently leaves a given site, runoff control must be provided by some other measure. The DIRECTOR shall be contacted for guidance on the appropriate controls to employ or other mutually accepted best management practices.

3.3 Water Quality Control Standards

Water quality control is an integral and required component of overall stormwater management systems. New development and redevelopment projects must now include controls that treat or otherwise limit the discharge of pollutants. These requirements have been added due to new state and federal requirements, but also due to the need to improve and preserve the water resources in Dorchester County. Because this is a requirement of stormwater design, some background information and references are provided in the sections below, followed by the design standards for addressing water quality.

3.3.1 Accepted Water Quality BMPs

In selecting a BMP(s), it is most important to know what pollutants need to be removed, how to remove them, and what degree of removal is needed to meet water quality goals. There are many other project-specific considerations, and with the proper planning, installation, and maintenance, BMPs are expected to reduce pollutant loads to receiving waters, reduce erosion, provide health and safety benefits, and be cost effective.

The varieties of water quality BMPs are numerous and are typically considered either structural or non-structural. Dorchester County's current approved list of stormwater quality BMPs, listed in Table 6, is based on literature reviews and local experience. Some references to BMP selection, effectiveness, and design can be found in SCDHEC BMP Manual as well as the Low Impact in Coastal South Carolina: A Planning and Design Guide.

Table 6: Accepted Water Quality Controls

General Structural Control	Description
Stormwater Wetlands	Stormwater wetlands are natural or constructed systems used for stormwater management. Stormwater wetlands consist of a combination of shallow marsh areas, open water, and semi-wet areas above the permanent water surface.
Bioretention Areas	Bioretention areas are shallow stormwater basins or landscaped areas that utilize engineered soils and vegetation to capture and treat stormwater runoff. Runoff may be returned to the conveyance system or partially exfiltrate into the soil.
Sand Filters	Sand filters are multi-chamber structures designed to treat stormwater runoff through filtration, using a sand bed as its primary filter media. Filtered runoff may be returned to the conveyance system or partially exfiltrated into the soils.
Enhanced Grasses Swales	Enhanced swales are vegetated open channels that are explicitly designed and constructed to capture and treat stormwater runoff within dry or wet cells formed by check dams or other structures that slow the flow of water.

Manufactured Treatment Devices - Vortex Separator - Baffles - Cartridges - Skimmers - Gravity Oil-Grit Separator - Filter Material - Inlet inserts	Pre-fabricated controls use the movement of stormwater runoff through a specially designed structure to remove target pollutants. They are typically used on smaller commercial sites and urban hotspots. There are numerous commercial vendors of these structures, but data may be limited on the performance and achieved pollutant removal. The DIRECTOR shall evaluate any such device if included in designs, provided evidence is submitted as to their effectiveness. Such evidence must include applicability and proof of third-party testing on trapping efficiencies. Pre-approved devices can be found on the SCDOT Qualified Products List 78.

Some structural BMPs have limited applications and are recommended to be used in conjunction with other BMPs. Limited application controls may be used within a system of water quality controls and are very effective pre-treatment structures for the controls listed in Table 6. Limited application structural controls should be designed and used only in development situations where regular maintenance is guaranteed. Some popular limited stormwater controls are shown in Table 7.

Table 7: Limited Structural Controls

Limited Structural Control	Description
Vegetated Filters - Filter Strip - Grassed Channels and Swales	Both filter strips and grassed channels provide filtering of stormwater runoff as it flows across the vegetation. However, by themselves these controls do not consistently obtain adequate sediment and pollutant removal. Both filter strips and vegetated channels shall be used as pretreatment measures or part of a treatment system approach.
Submerged Gravel Wetland Systems	Submerged gravel wetlands use wetlands plants in submerged gravel or crushed rock media to remove stormwater runoff pollutants. These systems should only be used in mid- to high-density environments where other structural controls shall be utilized.
Small Sand Filters - Surface Sand Filter - Perimeter Sand Filter	Sand filters are multi-chamber structures designed to treat stormwater runoff through filtration, using a sand bed as its primary filter media. Filtered runoff may be returned to the conveyance system or partially exfiltrated into the soil.
Porous Pavement and Paver Systems	Porous paver systems consist of open void paver units laid on gravel subgrade to promote stormwater infiltration. Porous pavers provide water quality and quantity benefits.

Regardless of the type of control, maintenance schedules should be included and attached to the Operating and Maintenance Agreement for each BMP proposed.

Listed below are some non-structural BMPs that should be considered for use in larger construction activities and redevelopment projects.

1. Buffers: an area along a shore line, wetland, or stream where development is restricted or prohibited. The primary function of the buffer is to physically protect and separate a stream, lake, or wetland from future disturbance or encroachment.
2. Disconnected roof drains, impervious areas: directing stormwater runoff from rooftops towards pervious areas where it is encouraged to filter through vegetation and other landscaped material and infiltrate into the soil.
3. Cluster development: concentrate development away from environmentally sensitive areas such as streams, wetlands, mature wooded areas, and steep slopes.
4. Literature for owners and Homeowner Associations (HOAs): to educate and train on the impact they can have on water quality and the activities necessary to maintain structural controls. These efforts are particularly critical in Low Impact Development (LID) designs and when the BMP is located on HOA

property.

3.3.2 Water Quality Design Standards

Water quality control is an integral and required component of overall stormwater management systems. New development and redevelopment projects must include controls that treat, or otherwise limit the discharge of, pollutants. These requirements are due to local, state and federal requirements, but also to the need to improve and preserve the water resources in Dorchester County.

1. All sites that require a Construction Approval shall include BMPs to address water quality, along with an Operation and Maintenance Agreement that guarantees maintenance of all BMPs in perpetuity.
   a. All permanent water quality ponds having a permanent pool shall be designed to store and release a water quality volume (WQV) defined as the first one-half (1/2) inch of runoff ("first flush") from the site over a twenty-four (24) hour period. The "first flush" volume should be determined from the contributing watershed area (impervious and pervious) that drains to the water quality pond(s).
   b. Permanent water quality ponds, not having a permanent pool, shall be designed to store and release the first one (1) inch of runoff from the contributing watershed area over a minimum period of twenty-four (24) hours.
   c. Infiltration practices must infiltrate the first one (1) inch of runoff from the contributing impervious surface.
   d. For sites discharging within one thousand (1000) feet of a shellfish bed, the WQV shall be one and one-half (1.5) inches from the impervious area.
   e. For areas not draining to a pond or infiltration practice, it should be demonstrated how permanent water quality requirements will be addressed.
   f. Treatment devices must show that stormwater discharges at a rate of at least one-tenth of one (0.1) cubic foot per second at twenty-four (24) hours after the beginning of the rain event.

2. The water quality treatment may be provided by engineered devices on private sites only. Applicability shall be based on submitted information showing that the device(s) has a design pollutant removal efficiency equivalent to a "dry" pond with a WQV of one (1) inch of runoff from the contributing watershed area.

3. BMPs used strictly for water quality that shall be capturing one (1) or more acres shall have a pretreatment device as part of the BMP or treatment system, such as a forebay or vault, to remove debris and coarser sediments.

4. Projects that discharge either directly or indirectly into an impaired waterbody as determined by the existence of an adopted TMDL by SCDHEC or through SCDHEC's listing of the waterbody on the latest 303(d) list shall be required to reduce pollutant loads so as to meet applicable water quality standards. More background information is covered in Section 3.7 – Special Protection Areas. This shall require the installation and implementation of measures (structural or non-structural BMPs) which are expected to adequately reduce pollutant loads to levels required by the TMDL (currently expressed as percent (%) reductions) or to prevent further impairment.

5. If the site disturbs less than twenty-five (25) acres, an evaluation of the BMPs chosen to control the release of pollutants must be provided in accordance with Section 3.2 of the SCDHEC CGP. Such evaluations may reference published values on BMP effectiveness. For projects that disturb twenty-five (25) acres or

more, a quantitative and qualitative analysis shall be provided and include, at a minimum, calculations that show:

- The site's annual pollutant load for all pollutants of concern in a predeveloped condition
- The trapping effectiveness of the chosen BMPs, and
- The site's annual pollutant load for all pollutants of concern in a postdeveloped condition indicating no increase compared to predeveloped conditions.

The DIRECTOR reserves the right to require specific effluent limits for any pollutant from a site if necessary to ensure the water quality standards and other state and federal quality regulations are met.

3.3.3 Manufactured Treatment Devices

Manufactured Treatment Devices (MTDs) are only allowed on private commercial sites. They are not permitted on any roads or other publicly maintained location. MTDs function as stormwater treatment devices before stormwater runoff is discharged off-site or to receiving water bodies and may be incorporated into a series of water quality BMPs to remove pollutants from stormwater runoff. MTDs are not designed or intended to store a volume of water for water quality treatment. MTD pollutant removal efficiencies are variable and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity, and other factors. South Carolina Department of Transportation Qualified Stormwater Manufacturer Treatment Devices (MTD) from the Qualified Products List 78 are the only approved MTDs unless approved by the DIRECTOR based on the components and performance requirements listed below.

Use MTDs designed to filter and trap trash, sediment, total suspended solids (TSS), oil and grease, metals, hydrocarbons, and other pollutants. Provide MTDs that combine settling, filtration, and various biological processes into one controlled system. The following MTD types may be considered for projects in Dorchester County:

- MTD Type 1 - Separation Devices (Standard Stormwater MTD)
- MTD Type 3 - Catch Basin Inserts (unique project requirements)

No substitution or equivalent shall be allowed without approval from the DIRECTOR. MTD devices must be bypassed during construction and other BMPs temporarily put in place until the system is completely installed and functional. An Operating Permit maintenance schedule shall be required if MTDs are used as a permanent BMP.

Phased inspections by the manufacturer at critical install points (e.g., installation of inspection ports, installation of bedding, and prior to covering the device) and certification from the manufacturer that the device was installed properly are required for all MTDs.

Design Criteria

1. MTD Type 1 and MTD Type 3 must be designed to treat, at a minimum, the peak flow rate of the stormwater runoff from the 1.8-inch, twenty-four (24) hour, storm event, from the entire drainage area to the MTD. This is defined as the water quality event (WQE).

2. MTDs are to be designed to treat the entire water quality event (WQE) with no bypass for a minimum 80% total suspended solids (TSS) removal efficiency. The WQE flow rate is a separate flow rate from the level of service (LOS) flow rate.

3. In addition to meeting the required treatment efficiency for the WQE, the MTD must be capable of passing the specified LOS flow rate (i.e. twenty-five (25) year storm event) without causing adverse hydraulic impact to upstream portions of the drainage system and without causing any resuspension or scour of previously trapped pollutants, or the MTD may be required to be placed off-line.

4. Ensure tailwater conditions are accounted for in the MTD design.

3.3.3.1 Stormwater Manufactured Treatment Devices (MTDs) Type 1

MTD Type 1 (separation devices, also referred to as hydrodynamic separators) must be designed and sized to treat, at a minimum, the stormwater runoff from the 1.8-inch, twenty-four (24) hour, SCS Type III storm event, to prevent pollutants from being transported downstream.

MTD Type 1 must contain a sump for sediment deposition with a series of chambers, baffles, or weirs to trap trash, oil, grease, and other contaminants. MTD Type 1 may include a high flow bypass mechanism for rainfall events larger than the water quality event to prevent scouring and resuspension of previously trapped pollutants.

MTD Type 1 not providing a high flow bypass mechanism must provide specific lab testing results verifying no resuspension or scour of previously trapped pollutants during the level of service (LOS) design event for the MTD. Use MTD Type 1 with treatment elements or other upstream BMPs to remove trash, debris and other gross pollutants.

MTD Type 1 must be sized using acceptable scaling methodologies based on the results of laboratory testing with a maximum hydraulic loading rate of 25 gpm/sf (0.0557 cfs/sf). Submittals of designs including MTDs scaled with higher hydraulic loading rates must provide specific lab results verifying the required removal efficiency for the water quality event at the higher hydraulic loading rate.

MTD Type 1 must have the following properties:

1. Designed for a minimum eighty (80) percent total suspended solids (TSS) removal efficiency (ASTM D-3977-97 SSC) of coarse sand (125 micron mean size, OK-110, or F-95 Silica Sand) for the peak flow rate from the water quality event for average influent concentrations ranging from 100 mg/L to 300 mg/L.

2. Use settling, separation, swirling, and centrifugal force techniques to remove pollutants from stormwater runoff.

3. Contain no moving components that require an external power source such as electricity, gas powered engines, or generators.

3.3.3.2 Stormwater Manufactured Treatment Devices (MTDs) Type 3

MTD Type 3 (catch basin inserts) may be needed for unique project requirements. MTD Type 3 is not applicable for long stretches of linear highway projects containing many stormwater inlets.

MTD Type 3 must be designed for direct installation into storm drain catch basins. Use MTD Type 3 sized for the specific catch basin they are inserted into.

MTD Type 3 may contain filter media including polypropylene, porous polymers, treated cellulose, and activated carbon designed to absorb specific pollutants.

MTD Type 3 must provide overflow features that do not reduce the original hydraulic capacity of the catch basin. Pollutant removal efficiencies vary and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity, and other factors.

The following properties must be met for MTD Type 3 applications:

1. Designed for a minimum eighty (80) percent total suspended solids (TSS) removal efficiency (ASTM D-3977-97 SSC) for:

- Coarse sand (125 micron mean size, OK-110, or F-95 Silica Sand) with average influent concentrations ranging from 1500 mg/L to 2000 mg/L (6% target sediment to water concentration) using ASTM 7351 or equivalent laboratory testing methods.

- Street sweeping sediment load (average particle size of 200 micron) with average influent concentrations ranging from 24000 mg/L to 26000 mg/L (2.5% target sediment to water concentration) using ASTM 7351 or equivalent laboratory testing methods.

2. Use separation, settling, swirling, centrifugal force, and filtering techniques to remove pollutants from stormwater runoff.

3. Contain no moving components that require external power sources such as electricity, gas powered engines, or generators.

4. Are capable of removing the pollutants of concern for the unique project requirements.

3.4 Erosion Prevention and Sediment Control Standards

Dorchester County requires that an erosion prevention and sediment control (EPSC) plan be submitted and approved for all land disturbing activities, in accordance with Section 2.2. This plan shall describe the practices and controls that shall be used during and after construction to meet the following goals:

1. Control stormwater volume and velocity within the site to minimize soil erosion during construction activity

2. Control stormwater discharges, including peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion during construction activity

3. Minimize the extent and duration of disturbed soil exposure during construction

4. Minimize the disturbance of steep slopes, unless infeasible

5. Minimize sediment discharges from the site during construction activity

6. Provide and maintain natural buffers around surface waters and, after stormwater runoff is treated by the construction site's BMPs, direct the construction site discharges into these vegetated areas to increase sediment removal and maximize stormwater infiltration, unless infeasible during construction activity

7. Minimize soil compaction and, unless infeasible, preserve topsoil

8. Promptly stabilize disturbed areas

9. Design and implement an ongoing inspection and maintenance plan

3.4.1 Accepted EPSC BMPs

Dorchester County accepts Erosion Prevention and Sediment Control BMPs that are included in the SCDHEC BMP Field Manual and the South Carolina LID Manual. These generally fall into three categories: erosion prevention measures, temporary sediment controls, and runoff control and conveyance measures. Runoff from sites should contain controls that fall into at least one of these categories and are appropriate for the site conditions, intended construction plans, and project phasing.

3.4.2 Temporary Vegetation/Seeding

The purpose of temporary seeding is to reduce erosion and sedimentation by stabilizing disturbed areas that would otherwise lay bare for long periods of time before they are worked or stabilized. Temporary seeding is also used where permanent vegetation growth is not necessary or appropriate. The SCDOT Technical Specification for Seeding (SC-M-810-2(04/11) should be utilized for guidance in temporary seeding.

Temporary seeding is used on exposed soil surfaces as denuded areas, soil stockpiles, dikes, dams, banks of sediment basins, banks of sediment traps, and temporary road banks. Temporary seeding prevents and limits costly maintenance operations on sediment control devices. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than fourteen (14) days after work has ceased. Temporary stabilization may be accomplished by the application of mulch. When the temporary vegetation does not grow quickly or thick enough to prevent erosion, re-seed as soon as possible. Keep seeded areas adequately moist. Irrigate the seeded areas if normal rainfall is not adequate for germination and growth of seedlings. Water seeded areas at controlled rates that are less than the rate at which the soil can absorb water to prevent runoff. Runoff of irrigation water wastes water and can cause erosion.

3.4.3 Permanent Vegetation/Seeding

Prior to the County conducting a final site inspection and closing out a construction project, the site must meet final stabilization requirements. Final stabilization means that all land-disturbing activities at the construction site have been completed and that on all areas not covered by permanent structures, either:

1. A uniform (e.g., evenly distributed, without large bare areas) vegetative cover with a density of seventy (70) percent has been established, or
2. Equivalent permanent stabilization measure (such as the use of landscaping mulch, riprap, pavement, or gravel) have been implemented to provide effective cover for exposed portions of the construction site not stabilized with vegetation. The SCDOT Technical Specification for Seeding (SC-M-810-2(04/11) should be utilized for guidance in permanent vegetation/seeding practices.

Permanent seeding is used on exposed soil surfaces such as denuded areas, soil stockpiles, dikes, dams, banks of sediment basins, banks of sediment traps, and road banks. Seeding prevents and limits costly maintenance operations on other sediment control structures. Sediment cleanout requirements for sediment basins, sediment traps, and silt fence is reduced if the drainage area is seeded when grading and construction operation are not taking place. Permanent stabilization is required within fourteen (14) days after construction activity is complete.

3.4.4 EPSC Design Standards

1. EPSC plans shall be developed to achieve an eighty (80) percent design sediment removal efficiency goal. Simply applied, the structural and nonstructural EPSC measures shall be designed to trap eighty (80) percent of the total suspended solids (TSS) that are generated by the site. The design storm event associated with this level of control is the 10-year, 24-hour storm event. Calculations using models, such as IDEAL, SEDPRO or SEDCAD, or SCDHEC design aids shall be provided to show adherence to this criterion.

2. SCS procedures should be used to determine runoff amounts. It is important to note that when a BMP is designed for the 10-year, 24-hour storm event, the BMP shall have a greater trapping efficiency for more frequent events such as the 2-year, 24-hour storm event.

3. A sediment basin is required when ten (10) or more acres of disturbed land area drains to a single outlet point. All basins shall be designed to have a design of eighty (80) percent trapping efficiency for TSS,

control the 10-year, 24-hour storm event to pre-development conditions, and successfully pass the 50-year, 24-hour storm event. Sediment basins shall be limited to controlling runoff for twenty (20) acres. Sediment basin designs are required to include the SCDHEC requirements for forebays, porous baffles and surface withdrawal outlets.

4. Sediment traps shall not have more than five (5) acres draining to them.

5. All sediment basins and traps shall be designed to prevent short-circuiting.
   a. Sediment basins/traps shall be designed to maximize flow length between the basin/trap's inlets and outlets. Runoff should have to travel the longest distance possible thorough the basin/trap before being discharged.
   b. The shallow and narrow end of the basin/trap should be located near the inlet and the deeper and wider end near the outlet.
   c. The length-to-width ratio of sediment basins/traps should be at least 2:1. Length and width measurements may be measured from the top of the embankment.
   d. In situations where this is not possible, permanent baffles may be used to extend the flow path.

6. All sediment basins and traps shall have a sediment forebay which meets the following design criteria:
   a. The forebay shall be placed upstream of the main detention area.
   b. Forebay volume shall be twenty (20) percent of the required storage volume of the sediment basin/trap.
   c. Forebay depth is dependent upon the required storage volume. Recommended depth is between two (2) and four (4) feet.
   d. The forebay shall be separated from the main detention area by barriers of baffles. Acceptable materials include earth, stones, riprap, gabions, or geo-textiles.
   e. A fixed cleanout stake shall be placed near the forebay berm. Forebay cleanout height shall be half (1/2) the height of the forebay's berm. Direct access to the forebay is necessary to allow for cleanout of accumulated sediment. Show forebay access on construction plans.
   f. The forebay will require more frequent maintenance than the main detention area. Include relevant notes in the Operating and Maintenance Agreement.

7. If a forebay is infeasible in a sediment basin/trap, the sediment basin/trap shall have porous baffles that meet the following design criteria:
   a. If basin/trap length is greater than fifty (50) feet, there shall be at least three (3) rows of porous baffles installed across the width of the entire basin/trap. If basin/trap length is less than fifty (50) feet, only two (2) rows of porous baffles are required.
   b. Each baffle shall have a height of three (3) feet. The height of each baffle shall be at or above the 10-year, 24-hour design storm's water surface elevation.
   c. Baffles shall be composed of turf reinforced matting (TRM) or materials derived from coir (coconut fibers) products. Selected materials should allow 10-30% light penetration. Silt fence may not be used.
   d. Steel posts with a minimum weight of 1.25 pounds per linear foot shall be used to install porous baffles.
   e. Porous baffles shall be trenched or anchored to the basin/trap's bottom and tied to side slopes.

8. Activities that disturb between one (1) and ten (10) acres of land area that do not drain a single outlet point may incorporate practices other than a sediment basin to achieve an equivalent removal efficiency.

9. Silt fencing shall be placed at the toe of all slopes and soil berms and below disturbed areas where the size of the contributing drainage area is no more than one-quarter (¼) acre per one hundred (100) feet of silt fence length. The maximum slope length behind the fence is one hundred (100) feet and the maximum gradient behind the fence is 2H:1V.

10. To encourage the development and testing of innovative alternative EPSC BMPs, alternative management practices that are not included in the Manual may be allowed upon review and approval by the DIRECTOR. To use an alternative BMP, the design professional shall submit substantial evidence that the proposed measure shall perform at least equivalent to currently approved BMPs contained in the Manual. Evidence may include, but is not limited to:
    a. Supporting hydraulic and trapping efficiency calculations
    b. Peer review by a panel of licensed professional engineers
    c. Research results as reported in professional journals
    d. Manufacturer's literature

11. Detailed EPSC plans shall comply to the maximum extent practicable with the following specific standards and review criteria:
    a. Sediment tracking control shall be implemented using stabilized construction entrance(s) that are to be located and utilized at all points of ingress/egress on a construction site. The transfer of soil, mud, and dust onto roads shall be prevented.
    b. Crossing of waterways during construction should be minimized and must be approved by the DIRECTOR and possibly the U.S. Army Corps of Engineers (USACE). Encroachment into stream buffers, riparian areas, and wetlands should be avoided when possible.
    c. Topsoil shall be stockpiled and preserved from erosion or dispersal both during and after site grading operations when applicable.
    d. Where construction or land disturbance activity shall or has temporarily ceased on any portion of a site, temporary site stabilization measures shall be required as soon as practicable, but no later than fourteen (14) calendar days after the activity has temporarily ceased. Hydroseeding is encouraged. Stabilization of disturbed areas is one of the best approaches for erosion prevention and sediment control.
    e. All slopes must be stabilized though grassing, hydroseeding, synthetic or vegetative matting, diversion berms, temporary slope drains, etc. Stabilization must be performed within fourteen (14) working days after the necessary grading (temporary or permanent).
    f. Final stabilization of the site shall be required as soon as practicable, but in no case more than fourteen (14) calendar days after construction completion. Final stabilization is defined as having a uniform vegetative cover with a density of seventy (70) percent established on all unpaved areas and areas not covered by permanent structures.
    g. Temporary structural controls installed during construction shall be designed to accomplish maximum stabilization and control of erosion and sedimentation, and shall be installed, maintained, and removed according to the specifications set forth in the Manual and project specifics developed as part of the Approval application and engineering calculations. All temporary structural controls shall be designed to control the peak runoff resulting from the ten (10) year storm event.
    h. All permanent structural controls, including drainage facilities such as channels, storm sewer inlets, and detention basins, shall be cleaned out as part of the project closeout process.
    i. Linear projects (utility lines, road construction) over, under, or along a water body shall include measures and controls which adequately protect the water body from undue impact. Such work should be coordinated with the installation of erosion prevention and sediment control measures so that disruption is minimized. Every effort should be made to install utilities during the initial construction phases. Trench sharing is encouraged to the extent practicable.

12. The grading plan should include the following general measures at a minimum:
    a. The finished cut and fill slopes to be vegetated should not be steeper than 3H:1V.
    b. Cuts of fills should not be so close to property lines as to endanger adjoining property without adequately protecting such properties against erosion, sedimentation, slippage, settlement, subsidence, or other damages.
    c. Subsurface drainage should be provided in areas having a high water table to intercept seepage that would affect slope stability or bearing strength, or create undesirable wetness.
    d. Fill shall not be placed adjacent to channel banks where it can create bank failure, reduce the capacity of the stream, or result in downstream sediment deposition.
    e. All borrow and disposal areas should be included as part of the grading plan.
    f. Temporary concrete washout facilities shall be located a minimum of fifty (50) feet from storm drain inlets, open drainage facilities, waterbodies, creek banks, or perimeter controls. All temporary concrete washout facilities (both above- and below-grade) shall be lined with a minimum of ten (10) mil polyethylene sheeting that is free of holes, tears, or other defects that compromise the impermeability of the material.
    g. Adequate channels and floodways should be provided to safely convey increased runoff from the developed area to an adequate outlet without causing significant channel degradation or increased off-site flooding.
    h. The site should be graded to direct flows to appropriate controls.

3.5 Stormwater Drainage System Design Standards

This section provides the design requirements for various storm sewer drainage collection system components including design storms, velocities, and pipe and inlet sizes. Storm drainage systems shall include all storm drainage structures and pipes that convey runoff under roadways. These systems are commonly referred to as lateral closed systems. These standards are required for all publicly maintained systems and are recommended for private systems.

3.5.1 Stormwater Pipes

1. Storm drainage lines shall be staked at each box or at intervals that would be enough to check alignment and grade of the construction with the approved plans. The use of lasers to augment control is encouraged.

2. The minimum size stormwater pipe allowable shall be fifteen (15) inches in diameter.

3. The minimum allowable slope for stormwater pipe shall be one-half of one percent (0.5% or 0.005 ft/ft) or a minimum flow velocity of three (3) feet per second at all flow levels. Maximum allowable slope for stormwater pipe is twenty (20) percent. Maximum allowable flow velocity shall be ten (10) feet per second.

4. Pipes designed to equalize two adjacent ponds may have a slope of zero (0) percent. These pipes must be submerged at all times. In residential subdivisions, connector pipes shall be dedicated to equalize the ponds and shall not have other stormwater inlets and must be limited to 300 linear feet. On commercial sites, submerged systems with additional tie-ins may be permitted upon approval from Dorchester County Public Works. A Waiver request shall be uploaded to Evolve and an additional narrative must be included in the CAA explaining why the design includes tie-ins to submerged connector pipes.

   Submerged systems shall be avoided if possible and shall only be permissible based upon justification and prior approval from Dorchester County Public Works. Submerged pipes must comply with the following design requirements:

- Pipe must always be fully submerged to avoid corrosion and other issues associated with exposing the material to a combination of water and air.
- Details and a narrative shall be included in the CAA explaining the pipe and pond pump down using isolation boxes for maintenance.
- A third-party inspector is required to document installation of all submerged runs with pictures/videos/reports. A report of the installation shall be submitted and certified by the engineer of record prior to county acceptance of infrastructure.
- Pipes are to be inspected before installation and all defective pipes removed from site – provide in report.
- Pipes must be gasketed and joints wrapped a minimum of eighteen (18) inches in either direction .
- A third-party geotechnical professional must confirm compaction around the pipe in six (6) inch lifts at 95% modified proctor.
- Isolation boxes are required where submerged pipes enter and exit ponds.
- Public Works shall be provided forty-eight (48) hours' notice and given the opportunity to view installation of all submerged runs and isolation boxes.

5. Drainage system installation must be such that stormwater discharge is not concentrated on adjacent properties and velocity is less than erosive limits for the site soils. At pipe outfalls, this normally requires the use of a riprap apron, placed on filter fabric and lightly grouted, for a minimum distance greater than or equal to six (6) pipe diameters. Level spreaders and three-dimensional soil stabilization matting may also be used upon engineering review and approval.

6. Type and class of stormwater pipe, as well as the construction of pipe culverts, shall be in accordance with Sections 714 of the SCDOT specifications. All stormwater pipes under pavement in roadways shall be reinforced concrete pipe (RCP) with O-ring joints and a minimum Class III. Backfill shall consist of suitable material and compaction requirements per SCDOT Specifications.

7. A minimum of one (1) foot of cover shall be provided for all stormwater pipes under unpaved roads or any other situation in which no roadway or other structure is to cover the pipe. The RCP pipe minimum cover for under any paved surface shall be nine (9) inches (excluding base course and pavement section), providing the pipe's design meets loading requirements. Minimum covers as listed in SCDOT's 714 standard drawings is recommended. Contact Dorchester County Public Works for minimum depths in other situations (e.g., other pipe types). RCP Class IV or Class V may be requested by Dorchester County Public Works in special conditions (e.g., deep installation, excessive surface loads, etc.).

8. Stormwater pipe shall be placed to minimize length running under pavement. Where it is necessary for a pipe to cross the roadway, it preferably shall be placed at a ninety (90) degree angle, and in no case at less than forty-five (45) degrees. All cross lines in the roadway shall be compacted in six (6) inch loose lifts to 95% Standard Proctor maximum density. Subgrade and base course compaction shall be per SCDOT Standards.

9. Any "open" storm drainage cross line pipe shall extend out to the toe of the roadway embankment; in no case shall the end of the pipe be within the five (5)-foot roadway shoulder.

10. Stormwater pipe discharging into a drainage channel shall intersect the channel in a manner such that the interior angles measured from their centerlines of flow, is greater than or equal to ninety (90) degrees. Riprap, or other suitable protection, is required from the outlet point to the bottom of the channel and on the opposite channel bank to prevent scour and erosion.

11. Stormwater pipes discharging into a wet pond shall have the discharge invert above the permanent pool elevation and riprap or other energy dissipation structures shall be placed from the outlet point to one (1) foot below the normal pool level.

12. A maintenance access point shall be available at a minimum distance of two hundred (200) feet for all drainage lines. In addition, manholes shall be placed at all intersections, grade changes, alignment changes, pipe size changes, or pipe geometry changes.

13. The 100-year, 24-hour storm event shall be used to check all drainage designs for local flooding, and possible flood hazards at adjacent structures and/or property.

14. Hydraulic grade line and head loss calculations for determining water surface elevations shall be performed for all systems connections. Where water quality devices are used, headwater depths shall be at such an elevation to allow for the appropriate function of the device.

15. Calculations must be performed for the appropriate design storm event (see Section 3.2 above).

16. For storm drainage systems with less than five (5) connections, Manning's Equation shall be acceptable for sizing the capacity of drain pipes for non-submerged conditions where the free water surface elevation is below the crown of the pipes.

17. Storm drain profile plots shall be included in the set of construction plans with the 25-year storm hydraulic grade line (HGL) included.

18. Storm drainage systems shall be designed to convey stormwater runoff by gravity flow.

19. For very flat flow lines, flow velocities shall increase progressively throughout the system. Upper reaches of the pipe system may have flatter slopes than the lower end of the system.

20. It shall be unlawful for any person to uncover any component of the public stormwater system or connection branches thereof, for any purpose or to make connection therewith, unless and except with the approval and inspection of the Department of Public Works.

21. In opening trenches in any street or public way, the paving or base material shall be removed in a manner directed by the Department of Public Works. The sides of the trench shall be sheeted or braced in accordance with current OSHA standards. The earth removed from the trench shall be placed so as not to obstruct the gutters and so as to cause the least obstruction to public travel. Gas and water pipes shall be protected from impact, the trench enclosed and lighted at night, and every precaution taken to prevent injury to person or property during the progress of the work.

22. Notice shall be provided to the Public Works Department at least two (2) working days prior to the installation of a public storm drain. No material shall be used or work covered until inspected and approved by the Public Works Department. At the end of all projects in which pipes were installed, the entire closed system (pipes, boxes, etc.) shall be video inspected and sent to the Public Works Department as of the closeout procedure. Pipes shall be video inspected again at the end of the one (1) year warranty period. See Chapter 2 for video specifications.

3.5.2 Culverts

1. Proper consideration of inlet and outlet control shall be given in the design of culverts and outlets.

2. The pipe, appurtenant entrance and outlet structure should properly account for water, bed load, and floating debris at all stages of flow.

3. The outlet should be designed to resist undermining and washout.

4. Culvert design shall include all cross drainage facilities that transport stormwater runoff under roadways. Culvert selection techniques can range from solving empirical formulas, to using nomographs and charts, to comprehensive mathematical analysis for specific hydraulic conditions. The models used for these calculations are listed below. Other widely accepted models may be used, but must be approved by Dorchester County Public Works. Designs shall be based upon SCDOT requirements where applicable.

5. Culverts under roadways shall be designed for the 50-year storm event, regardless of contributing area. Ponding on the upstream end of the culvert is acceptable as long as the roadway is not overtopped during the precipitation event. Ponding or backwater effects shall not impact any new or existing structures and recede after the storm event in a time period acceptable to the Public Works Department.

6. Additional hydraulic capacity shall be required, as necessary, to prevent backwater effects that may adversely impact upstream properties or structures.

7. Acceptable models for designing culverts include, but are not limited to:

    - ICPR
    - HY8
    - Pond Pack
    - HEC-RAS
    - Flow Master
    - HydroCad

8. A complete study of culverts and design considerations can be found in USDOT 2001a.

9. Culvert installation should follow the standards outlined in SCDOT Standard Specifications, Section 714.

3.5.3 Headwalls and Outlets

All exposed ends of pipes shall be protected by one of the following:

1. A concrete or brick plastered headwall with non-shrink grout is preferred; it is required on culverts located in major drainage channels. An acceptable design detail is provided in the DHEC BMP Handbook.

2. A flared or beveled end section is acceptable for pipes thirty-six (36) inches or less in diameter.

3. A riprap headwall is acceptable for pipes twenty-four (24) inches or less in diameter in a number of situations. If used, it should conform to the standard details provided in the DHEC BMP Handbook. Note that this technique requires the use of both filter fabric and grout.

All pipe outlets and outfalls must meet the following requirements:

1. Storm drainage or pond outfalls must be carried to an existing drainage outfall such as a pipe, ditch, etc.

2. If feasible, provide a twenty (20) foot minimum buffer between the property line and the end of all pipes or energy dissipation measures installed.

3. No new point discharge onto adjacent property, where there was not an existing point discharge, is allowed without the property owner's written permission. Discharge points created with new development shall connect to an existing drainage system, whether natural or man-made. The new outlet may not cause flooding or in any way degrade the existing drainage system and proof of such shall be provided. In some cases, conveyance must be constructed from the new development to a point of discharge into the existing system and shall be done at the owner's expense. In these cases, the owner is responsible for obtaining all necessary easements and agreements to construct such drainage improvements.

4. Outlets shall not be allowed to discharge on fill slopes.

3.5.4 Energy Dissipation

1. All outlets should be sufficiently stabilized. Calculations shall be provided justifying the design and material used (e.g. riprap aprons' geometry and diameter).

2. If riprap aprons are used, filter fabric is to be installed beneath all riprap.

3. Level spreaders, plunge pools, etc. shall be properly designed and installed at the proposed outlet(s).

3.5.4.1 Catch basins, yard inlets, manholes, and junction boxes

1. Materials and construction shall be as specified in Section 719 of the SCDOT specifications.

2. When the depth of a catch basin or junction box exceeds four (4) feet, rungs/steps shall be provided for ascent and descent. (Steps are to be ASTM-C-478, or equivalent).

3. The box top shall be a minimum of three (3) feet by three (3) feet. Sides shall be plastered with grout.

4. All inlet and outlet pipes shall not protrude more than four (4) inches into the box, and where possible should be cut flush with the inside surface walls.

5. All roadway catch basins shall be a standard SCDOT type approved by Dorchester County Public Works based on the application.

6. Maximum roadway catch basin inlet capacity for an inlet shall be determined based on the following:

    - For inlets at sag, capacity shall be based on weir flow (unsubmerged). The depth flow shall be limited to the curb depth, but may be further limited by the allowed spread, detailed below. In sag conditions, a fifteen (15) percent factor of safety shall be used to account for debris/clogging.
    - For inlet on grade, theoretical capacity shall be considered in the design of the longitudinal and cross slopes, and gutter depression. The length of gutter opening must be such that the gutter efficiency is eighty (80) percent of the theoretical capacity. Several equations and nomographs are available in the literature for determining the theoretical capacity. Maximum flow depth shall be limited to the depth of curb.

7. SCDOT inlets shall be designed to accommodate a projected flow such that ponded water dissipated within twenty-four (24) hours and does not cause flooding to adjacent buildings or other structures. As long as these criteria are met, the depth of ponded water is allowed to exceed the top of the manhole lid by no more than six (6) inches for the appropriate design storm.

8. SCDOT inlets shall be designed to accommodate a projected flow such that ponded water dissipated within twenty-four (24) hours and does not cause flooding to adjacent buildings or other structures. As long as these criteria are met, the depth of ponded water is allowed to exceed the top of the manhole lid by no more than six (6) inches for the appropriate design storm.

9. Catch basins shall be located outside curve radii. If this is not possible, the catch basin shall be set back an extra foot and the face of the catch basin shall be parallel to a chord joining the two points on the curve radius located by projecting lines from the sides of the catch basin box.

10. Catch basins shall contain a minimum drop of 0.1 feet from invert in to invert out.

11. Within a catch basin, the elevation at the crown of any inlet pipe shall be greater than or equal to the crown of the outlet pipe.

12. Catch basins shall be field staked to ensure proper catch basin inlet alignment with the street gutter line.

13. Area around all catch basins shall be backfilled in eight (8) inch loose lifts, compacted to 95% Standard Proctor maximum density.

14. Inlet protection shall be provided at all inlets into the stormwater system during construction and until project closure procedures have been competed or notification from Dorchester County Public Works has been given stating that an acceptable level of stabilization has been achieved. Guidance on design, installation, and maintenance of inlet protection can be found in SCDOT specifications.

15. Inlet spacing shall be based partly on the maximum spread of water into the roadway. For the appropriate design storm, at least one full travel lane width must be available during the rain event for all roads. Inlets up-gradient of a road intersection, sag inlet, or the last inlet for a given system must be designed with sufficient capacity to handle the entire flow, such that there is no flow through/bypass.

16. Maximum depth in which the water may pond above or around an inlet must not threaten surrounding permanent structures or facilities including vehicular or pedestrian traffic.

17. Inlets placed in roadway gutter lines must be spaced to prevent flow from entering road intersections and to not exceed a maximum spread of six (6) feet, or one-half (1/2) of a travel lane, whichever is greater, and based on maximum inlet capacity.

18. Catch basins that are proposed in series shall include the last catch basin prior to discharge to a ditch or pond with a minimum of a twelve (12) inch sump. The location of the catch basin shall be such that access can be provided for maintenance purposes and by Public Works personnel in an emergency situation.

3.5.5 Open Channel Hydraulics

Open channels shall include all permanent storm drainage channels including swales, culverts, and diversions. These storm drainage systems shall be designed based upon the following criteria:

1. All open channels shall be uniform and shall be stabilized to prevent erosion in a manner approved by Dorchester County Public Works. A number of acceptable techniques are shown in the current version of the SCDHEC BMP Manual.

2. The design of open channels shall be based on Manning's Formula where backwater effects from obstructions and/or tailwater is not present. Flow velocities for the 10-year storm event must be less than five (5) feet per second (two and one-half (2.5) feet per second in bare sandy soils) or the channel surfaces must be adequately lined with riprap, concrete, etc.

3. The minimum channel grade shall be one-half (1/2) of one percent (0.005 ft/ft), unless supporting calculations show that there will be no pools or standing water areas formed in the channels at smaller slopes.

4. Design conditions can be assumed to be steady, uniform flow.

5. Except for roadside ditches, the side slopes of grassed-lined channels without erosion control blankets (ECBs) or turf reinforcement matting (TRM) shall be no steeper than 3H:1V.

6. Channels may be designed with multiple stage levels with a low-flow section to carry the 2-year storm event and a high-flow section to carry storms of larger frequencies.

7. Dorchester County allows vegetated channels.

8. Additional hydraulic capacity shall be required as necessary to prevent backwater effects that may adversely impact upstream property or structures. Acceptable models for designing open channels include, but are not limited to:

- HY8
- ICPR
- Pond Pack
- HEC-RAS
- Flow Master
- HydroCad

General guidance on open channel design can be found in USDT (1996, 2001).

3.6 Downstream Analysis

A downstream analysis shall be required for all new development and redevelopment sites to determine the downstream effects from any development activity unless the County Engineer determines it is not required.

Hydrologic and hydraulic engineering analysis shall be implemented to determine the downstream effects from any development activity. This analysis shall extend downstream to a specific point of concern. The point of concern may be identified by the County Engineer in certain situations. The following are typical points of concern:

1. The point downstream where the development represents less than ten (10) percent of the total drainage of the watershed

2. The first downstream road crossing

3. Downstream development

4. Location of known existing flooding, drainage, or erosion problems

5. Any point as directed by the County

The primary areas of analysis shall be done for each of the following:

1. The development area

2. All drainage exit points from the property

3. The receiving channel at the exit points

4. Each component of the downstream system including:
   - Channels
   - Pipes
   - Culverts
   - Bridges
   - Overbank areas
   - Overbank structures

All downstream analysis shall be done using the 2-year, 10-year, 25-year, 50-year and 100-year 24-hour storm events.

The downstream analysis shall determine whether the design storm events of interest cause or increase flooding, drainage, or erosion impacts to downstream properties or road crossings. The analysis criteria shall include but is not limited to:

1. Existing landuse curve numbers shall be used for undeveloped and developed areas upstream. Where future development areas are known upstream, the County Engineer may require these areas to be considered developed in the future land use condition.

2. Existing landuse for downstream areas of interest may be used, but future landuse, when applicable, is recommended for conservative results.

3. Flows shall be routed using accepted hydrologic and hydraulic methods.

4. Hydraulic step backwater calculations (Corps of Engineer's HEC-2 or HEC-RAS models or equivalent) shall be performed to determine flood elevations of any downstream impacted areas.

5. The effects of any upstream and proposed storm water quantity or quality structures shall be considered.

If the downstream analysis determines that the development of a particular site does contribute to flooding, drainage, or erosion problems, then at least one the following improvements shall be implemented:

1. On-site water quantity control

2. Off-site water quantity control

3. Improvements to the downstream stormwater conveyance system

On-Site Water Quantity Control

The design professional may select to implement on-site water quantity control structures designed according to this Manual. These structures may consist of nonstructural controls such as swales, open drainageways, and low areas within the site terrain. These structures may also consist of structural approaches such as engineered detention facilities.

Off-Site Water Quantity Control

The design professional may use an off-site publicly- or privately-owned facility to prevent adverse downstream impacts. The use of off-site facilities must meet the following requirements:

1. The facility to be used must be functional.

2. The owner/entity must have agreed to accept runoff from the proposed development site.

3. The owner has an implemented maintenance agreement for the facility.

4. The facility is sized to effectively handle increased flow rates and flow volumes.

5. There are no significant adverse impacts between the outlet from the proposed development site and the inlet to the off-site facility.

Improvements to the Downstream Storm Water Conveyance System

The design professional may perform and provide supporting calculations that indicate that the best solution is to upgrade the downstream system. This option may be implemented under the following requirements:

1. The downstream property owner of the facilities to be improved has granted temporary construction easements,

2. The downstream improvements are economically feasible, and

3. The improvement shall not cause any other significant problems downstream.

3.7 Special Protection Areas

In an effort to address some of the most critical water resource problems that exist in the County, Special Protection Areas have been established. Those wishing to develop or redevelop lands within these protected areas shall be required to comply with the minimum standards listed in the preceding sections as well as a more stringent set of design criteria detailed below. These generally focus on either a water quantity (reduce or prevent frequent and/or extreme flooding) or a water quality problem (prevent or reduce degradation of riverine, estuarine, coastal ecosystems or maintain a designated use(s)). Dorchester County Public Works shall inform Construction Approval applicants on whether or not a proposed project is required to comply with additional design criteria listed in the following sections. The map is located on the County's website. All projects located within the Special Protection Area are subject to the additional water quantity requirements listed below. Projects located within the Special Protection Area that drain to impaired waterbodies are subject to the additional water quality requirements listed below.

3.7.1 Water Quantity Issues

Flooding problem areas exist in many locations around the County to the point that stormwater controls have become overwhelmed, or where controls were never adequately designed or installed to control runoff. The ability to maintain a system is also suspected to be contributing to some of the frequent flooding. To relieve existing flooding problems, the following list of design criteria shall be required in designated special protection areas. The requirements in conjunction with the enforcement of other design criteria listed in the sections above are required to provide the necessary controls.

1. The post-development, peak discharge rates for the 2- and 10-year storm events shall be restricted to the lesser of the following:

   a. One-half or less of the pre-development, peak discharge rates for the 2- and 10-year storm events OR

   b. The peak discharge rate that will not overwhelm/surpass the downstream system capacity.

   If a project is located in a special protection area and the stormwater pond drains directly to a river or major stream via a wetland, a waiver may be requested for the peak discharge rate requirements detailed in this section.

The post-development, peak discharge rates for the 2- and 10-year storm events are restricted to one-half (1/2) the pre-development rates for the 2- and 10-year storm events or to the downstream system capacity, whichever is less.

2. The post-development runoff volumes for the 2-year 24-hour duration storm events above the predevelopment level shall be stored for a period of twenty-four (24) hours on average before release.

Additional criteria may be established on a case-by-case basis.

3.7.2 Water Quality Issues

In conjunction with the NPDES permitting program, SCDHEC, through delegated responsibility from EPA, must identify and mitigate impaired waterbodies. Impaired waterbodies are identified through a monitoring program, the results of which are compared against water quality standards developed to protect designated uses of individual waterbodies. Impaired waterbodies are those that do not meet these standards and cannot be used for their designated purposes, such as fishing, swimming, recreation, and/or support of aquatic life. In accordance with Section 303 of the Clean Water Act, states must release a biannual report of the impaired waterbodies. Waters listed on the 303(d) list shall eventually have a TMDL developed, which represents the daily amount of a particular pollutant that a waterbody can receive and still meet the water quality standard for its designated use(s). A list of impaired waterbodies and adopted TMDLs can be found on the SCDHEC website. Additional measures may be required on any project that drains to a TMDL or impaired waterbody as directed by Dorchester County Public Works. Potential requirements include, but not limited to:

- Specific location for the portable toilet for fecal coliform (FC) or Enterococci
- Pet waste bags/receptacles for dog parks/walks
- Aeration in ponds for dissolved oxygen
- Specific fertilizer requirements for nitrogen and phosphorus

3.8 Easements

The following section provides the required easement widths for various components of the stormwater management system(s) for both public and private systems. In all cases, there shall be an allowance for offset easements, in which the pipe, channel, or other stormwater system component does not necessarily have to be in the middle of the easements shall be identified and additional width may be required as prescribed by Dorchester County Public Works. Easements shall be kept clean and free of large vegetation and structures that would impede access by inspection and maintenance equipment.

3.8.1 Storm Drainpipe

Drainage easements shall provide adequate room for maintenance equipment to operate.
Table 8 provides require minimum drainage easement widths for some of the more typical situations:

Table 8: Storm Drainpipe Easements

Pipe size (in)	Maximum depth to invert(ft)	Width of drainage easement (ft)
15	3.5	20
24	5.0	20
42	7.0	20
54	7.0	24
72	9.0	30

Notes:
(1) For depths greater than shown, add two feet of easement width for each additional foot of invert depth.
(2) For pipe sizes not specifically listed above, the easement width and depth to invert shall be that of the next size up, i.e. the easement width for a 36-inch pipe is the same as those for a 42-inch pipe.
(3) For larger pipe sizes and/or multiple lines of pipe, easement width shall be as determined by Dorchester County Public Works.

3.8.2 Ditches/Canals

For minor ditches which drain into a collector or main ditch or a piped drainage system, the width of the drainage easement shall be equal to the maximum top width of the ditch plus an additional twenty (20) feet, provided that the maximum depth of the ditch does not exceed five (5) feet. When the maximum depth of the ditch exceeds five (5) feet, the width of the drainage easement shall be equal to the maximum top width of the ditch plus the maximum depth of the ditch, plus an additional fifteen (15) feet.

For major or main drainage ditches or canals, the width of the drainage easement shall be equal to the maximum top width of the ditch plus an additional twenty-five (25) feet, provided that the maximum depth of the ditch or canal does not exceed five (5) feet. When the maximum depth of the ditch or canal exceeds five (5) feet, the width of the drainage easement shall be equal to the maximum top width of the ditch plus the maximum depth of the ditch, plus an additional twenty (20) feet.

For minor swale ditches along lot lines draining a small area where street drainage is not involved and where the depth of the swale does not exceed one (1) foot, a drainage easement not less than ten (10) feet in width shall be provided. In the case of a residential subdivision, the drainage easement for a swale should be granted to a homeowner's association (HOA). Dorchester County will not maintain grassed swales or their easements. All swales shall be privately owned and maintained. All swale easements shall be labeled as private easements.

3.8.3 Detention Ponds

A minimum access easement of twenty (20) feet shall be provided around the perimeter of all detention ponds. Within this easement, a ten (10) foot maintenance shelf with a maximum slope of two (2) percent must be included around the pond's perimeter. In addition, sufficient access room on the perimeter shall also be included as part of the drainage easement for maintenance that shall include a minimum ingress-egress easement of thirty (30) feet. While the County shall not accept responsibility for pond maintenance, the County may utilize the easement for necessary emergency repairs and inspections.

3.8.4 Other Stormwater Facilities and BMPs

All other structures used for the control of stormwater runoff (quantity or quality) not otherwise covered above, shall have an easement for access and maintenance that is a minimum of twenty (20) feet beyond the boundary of any such structure. Dorchester County Public Works may request or allow other easement widths on a case-by-case basis given site constraints or special conditions. While the County shall not accept responsibility for stormwater facility maintenance, unless agreed to in writing, the County may utilize the easement for necessary emergency repairs.

3.8.5 Offsite Easements

Any required off-site easements should be obtained prior to Construction Approval. Any work done without a proper and adequate easement(s) shall be at the owner's own risk. Projects that are not part of an LCP shall provide validation of necessary easements before a Construction Approval shall be issued.

Chapter 4. References

This chapter lists the various references used in the manual and if available, websites where they can be retrieved.

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