

Town of Summerville

Stormwater Management

Design Manual



Date: November 2009

Revised April 2015

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CHAPTER 1 – GENERAL INFORMATION

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 The Town of Summerville and the short-term and long-term public health, safety, and general welfare of the citizens of The Town of Summerville. This Manual and the Stormwater Management Ordinance is 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 will 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 Town’s stormwater management program and do not preclude the Planning, Zoning and Building Departments from performing their permit, plan review, inspection or other related duties and collecting applicable fees.

This Manual describes the policies and procedures used by the Town Engineer to implement the Stormwater Management Ordinance and the Town’s Stormwater Management Program (SWMP). These standards and procedures will:

1. Clearly describe the construction activity application requirements and 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 re-development;
4. Convey other protection provisions related to stormwater discharges such as wetlands and watercourse conservation.

Every effort has been made throughout this Manual to cover the common conditions and information needed by those involved in construction activities, however, these design standards and the Town Ordinances should be reviewed carefully to ensure that all requirements are being

met. Developments may also be impacted by state and federal requirements to include, but not be limited to, the NPDES Phase II Construction General Permit (CGP) for Stormwater Discharges from Large and Small Construction Activities. Those projects not subject to NPDES requirements must still comply with applicable Town standards.

1.2 Scope

The scope of this Manual is limited to the requirements related to stormwater management as reviewed and approved by The Town of Summerville's Town Engineer. 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 particular 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. A copy of SCDHEC's Best Management Practices may be found at <http://www.scdhec.gov/Environment/WaterQuality/Stormwater/BMPHandbook/>.

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. However, 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 control 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 design standards are divided into five (5) 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 Town'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 permit. Chapter 3 contains specific design criteria and the site design credit system. Chapter 4 describes the inspection and enforcement process. Chapter 5 contains references for designing components of the stormwater management system.

1.4 Authorization

This Manual has been prepared under the direction of the Town Engineer, which has been granted the authority to develop engineering design standards and enact programs and policies to ensure compliance with the NPDES Phase II General Permit for Stormwater Discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4s), SCR300000, and the Town's pertinent ordinances.

1.4.1 NPDES MS4 General Permit SCR300000

The Town of Summerville, like many other cities and counties across the United States, is required to have an NPDES MS4 permit to discharge stormwater. Because construction activities contribute to the discharge of pollutants, the NPDES MS4 permit requires that The Town of Summerville encourage, promote, and implement certain practices, programs, and procedures for the purpose of reducing or limiting discharge of pollutants to Waters of the State. The permit requires that The Town of Summerville develop and implement a Stormwater Management Program to control the discharge of pollutants from its MS4 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, and public education. A link to the MS4 permit can be found at http://www.scdhec.gov/Environment/docs/Final_SMS4_Permit.pdf.

1.4.2 The Town of Summerville Ordinances, Regulations, and Standards

The Town of Summerville 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 Town that affect the selection of stormwater management control measures are:

1. **Stormwater Management Ordinance:** Established the engineering design standards and procedures for obtaining a construction permit within The Town of Summerville. The Town Engineer 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:** 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. **Building Services:** this office issues building permits and enforces all applicable provisions of the building codes and floodplain management regulations.

1.5 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 will be updated as needed. Updates will be approved by the Town Engineer. Users of this manual are encouraged to provide comments on the content of this manual at anytime in writing to the Town Engineer. The comments shall include proposed changes, reasoning, and justification (including any supporting technical documents supporting the changes). All comments will be considered during manual updates. This Manual can also be found on The Town of Summerville website at www.summerville.sc.us.

1.6 Stormwater Management

Development has the potential to alter the natural drainage patterns, flow rates, and volumes, and quality of the Town's water resources. Traditional solutions have removed stormwater as efficiently as possible, while maintaining runoff quantity controls. The following sections discuss these impacts and the design considerations that are available and encouraged.

1.6.1 Effects of Development on Watershed Hydrology

Development and urbanization have the following impacts on receiving waterbodies:

- Changes to Stream Flow;
 - Increased runoff volumes;
 - Increased peak runoff discharges;
 - Greater runoff velocities;
 - Increased flooding frequency;
 - Lower dry weather flows (base flow) due to reduction in groundwater recharge;
 - Increase in floodplain elevation;
- Changes to Stream Geometry;
 - Stream channel enlargement;
 - Stream down cutting;
 - Changes in channel bed due to sedimentation;
- Degradation of Aquatic Habitat;
 - Degradation of habitat structure;
 - Decline in stream biological functions;

- Water Quality Impacts;
 - Reduced oxygen in streams;
 - Microbial contamination;
 - Hydrocarbons and toxic materials;
 - Sedimentation;
- Property Damage and Safety Concerns;
- Unsightly Aesthetic Stream Channel Conditions and Restricted Use of Recreational Waters.

1.6.2 Steps to Successful Stormwater Management Plans

Proper planning is necessary to ensure that stormwater management is considered and fully integrated at the various stages of the site-development process. This involves a comprehensive approach to site planning and a thorough understanding of the physical characteristics and resources associated with the project site. This planning includes addressing each of the following categories:

- Stormwater quantity controls;
- Erosion and sediment controls;
- Stormwater quality controls;
- Stormwater conveyance controls;
- Maintenance schedules for construction and post construction activities.

The design of successful stormwater management plans involves adhering to the following principles, where applicable:

- Pre-submittal site meeting/site visit;
- Review of site development requirements;
- Detailed site analysis and supporting calculations;
- A thorough knowledge of the impacts the stormwater system may have on the watershed;
- Creation of a Stormwater Concept Plan;
- Design aspects of the stormwater management plans;

- Approval and completion of the land disturbance permit application.

In Chapter 2, the procedure for including the necessary documentation for a complete land disturbance application is provided.

1.6.3 Innovative Design Approach

When designing for land disturbance activities, the design must address the following four categories of control: water quantity (flood control), design storm control (rate and volume), erosion prevention and sediment control, and pollution control (water quality standards, long-term). If an innovative stormwater design approach is to be used, the design professional should take the following considerations in mind, in addition to meeting these categories of control:

- Stormwater quantity and quality are best controlled at the source of the problem by reducing the potential maximum amount of runoff and pollutants. Source control will typically be more economical in order to treat the first flush of a storm event since a simple BMP for a large area will only treat the first flush from the closest portions of the site;
- Best management practices (BMPs) address stormwater runoff by using simple, structural and nonstructural methods along with or in place of traditional stormwater management structures when applicable;
- Equaling or exceeding traditional stormwater management designs in terms of performance (rate/volume attenuation, pollutant removal) and economic feasibility (long-term) are essential to a proposed concept's eventual approval.

Innovative approaches to site design focus on source control for stormwater runoff that limit the amount of runoff generated for a BMP to control.

1.6.4 Best Management Practices and Site Planning Process

The first step in addressing stormwater management begins in the site planning and design stage of the development project. By implementing BMPs during the site planning process, the amount of runoff and pollutants generated from a site can be reduced by minimizing the amount of impervious area and utilizing natural on-site treatments. The minimizing of adverse stormwater runoff impacts by the use of BMPs and site planning should be a major consideration for a design professional.

The reduction of runoff volumes and stormwater pollutants decreases the total number and size of stormwater management controls that must be implemented under the guidelines set forth in this Manual. BMPs reduce the amount of total post-development impervious areas and maintain natural characteristics of the pre-development site conditions. Therefore, the post-development curve number(s) and time of concentrations are maintained more closely to the pre-development conditions. This reduces the overall hydrologic and hydraulic impact of the development.

1.6.4.1 Maintaining Site Resources and Natural Undisturbed Areas

Conservation of site resources and natural undisturbed areas helps to reduce the post development runoff volume and provides areas for natural stormwater management. Some natural site resources that should be maintained include, but are not limited to:

- Natural drainageways;
- Vegetated buffer areas along natural waterways;
- Floodplains;
- Areas of undisturbed vegetation;
- Low areas within the site terrain;
- Natural forested infiltration areas;
- Wetlands.

1.6.4.2 Lower Impact Site Layout Techniques

Lower impact site layout techniques involve identifying and analyzing the location and configuration of structures on the site to be developed. Where applicable, the following options that create lower impact layouts should be used:

- Fit the design layout to follow the natural contours of the site to minimize clearing and grading and preserve natural drainage ways and patterns;
- Limit the amount of clearing and grading by identifying the smallest possible area on the site that would require land disturbance;
- Place development areas on the least sensitive areas of the site and avoid steeply sloped areas when possible;
- Utilize nontraditional designs to reduce the overall imperviousness of the site by providing more undisturbed open space and minimizing clear-cutting;
- Consider the utilization of cisterns and rain barrels to collect stormwater for reuse;
- Level spreaders or other energy dissipation devices should be used at all discharge points. Level spreaders should also be considered for discharge points into ponds and other basin-type BMPs. More information on these devices is provided in Chapter 3.

1.6.4.3 Minimization of Impervious Cover

The minimization of total impervious area directly relates to a reduction in stormwater runoff volume and the associated pollutants from a development site. The amount of impervious cover on a site can be reduced by the following techniques where applicable:

- Reduce building footprints by constructing some buildings as multi-story;
- Reduce parking lot areas and use porous/pervious pavement surfaces for desired overflow parking where feasible;
- Increase the amount of vegetated parking lot “islands” that can also be utilized for stormwater management practices such as Bioretention areas;
- Disconnect impervious surfaces by directing runoff to adjacent pervious areas so that runoff can be filtered and infiltrated.

1.6.4.4 Utilization of Natural Features for Stormwater Management

Structural stormwater drainage controls are traditionally designed to quickly remove stormwater runoff from the site without utilizing any of the natural storage areas. These natural drainage areas should be considered as potential stormwater drainage systems. These natural areas can be utilized in the following ways where applicable:

- Vegetated buffers and undisturbed areas on the site are useful to control sheet flow (not concentrated flows) by providing infiltration, runoff velocity reduction, and pollutant removal;
- Various natural drainageways should be maintained and not disturbed to provide a natural stormwater drainage system to carry runoff to an existing outlet. The use of natural drainageways allows for more storage of stormwater runoff, lower peak flow rates, a reduction in erosive runoff velocities, and the capture and treatment of pollutants;
- Curb and gutter systems may be combined with vegetated swales at outfalls to provide added water quality benefits versus the traditional piped outfall designs;
- When applicable, direct rooftop runoff to pervious natural areas for water quality treatment and infiltration instead of connecting rooftop drains to roadways and other structural stormwater conveyance systems.

1.6.4.5 Engineered/Proprietary Devices

The Town of Summerville is aware of the potential benefit in using a number of stormwater engineered devices currently available on the market, such as baffle boxes, cartridge filters, bioretention, and sock and tube erosion control devices. The Town Engineer will evaluate any

and all such devices specified for a given product and require appropriate drawings, specifications, and discussions as to the applicability of the product, expected performance, and required maintenance. The Town Engineer reserves the right to request that certain devices be installed and maintained.

1.7 Engineering Design Accountability

This Manual will 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 The Town of Summerville. 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 degree possible, and serves the interests of the general public within The Town of Summerville. A Certificate of Authorization (COA) is required on the construction plans in addition to the engineer's professional certification.

The Town of Summerville requires a certain level of design expertise for stormwater calculations and flooding analyses. 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 The Town of Summerville, 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.

1.8 Legal Aspects

If any portion of this Manual is ruled to be invalid or unconstitutional by any court with adequate jurisdiction over The Town of Summerville, 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 land disturbance process. This Manual will 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 regards 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.

1.9 Contact Information

The Town of Summerville should be contacted for any questions, clarifications, or other information related to stormwater management and this Manual.

Contact for stormwater issues:

The Town of Summerville
Engineering Department
200 South Main Street
Summerville, S.C. 29483
Phone: (843) 851-4225
Fax: (843) 832-8182

1.10 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 The Town of Summerville's Stormwater Management Ordinance. In any case, the Town Engineer 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. **Building**: (1) a relatively permanent enclosed structure over a plot of land, having a roof and usually windows and often more than one level, used for any of a wide variety of activities, as living, entertaining, or manufacturing; (2) anything built or constructed; (3) the act, business, or practice of constructing houses, office buildings, etc.
2. **Culvert**: any structure not classified as a bridge which provides an opening under any roadway, including pipe culverts, and any structure so named in the plans.
3. **Contour**: an imaginary line, or its representation on a contour (topographic) map, joining points of equal elevation.
4. **Detention**: the collection and storage of stormwater runoff in a surface or sub-surface facility for subsequent controlled discharge to a watercourse or water body.

5. Development: 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 thereafter responsible for maintaining compliance with this Ordinance and conditions of the approved application.
6. Ditch: a drainage channel in earth created by natural or artificial means to convey surface and/or subsurface water, flowing continuously or intermittently.
7. 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.
8. Elevation: height in feet above a given known datum, such as mean sea level.
9. Embankment or Fill: a deposit of soil, rock or other material placed by man.
10. EPSC: Erosion Prevention and Sediment Control
11. Flooding: a backup of stormwater that causes damage to dwellings, buildings, or roads
12. Grading: any displacement of soil by stripping, excavating, filling, stockpiling, or any combination thereof, including the land in its excavated or filled state.
13. 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, roofs, sidewalks, parking lots, and other similar structures.
14. Mean sea level (MSL): the average (mean) height of the sea or ocean, in reference to NAVD88.
15. Outlet facility: stormwater management facility designed to regulate the elevation, rate, and volume of stormwater discharge from detention facilities.
16. 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 by 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.
17. 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).
18. 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 form for a land disturbance permit or Waiver.

19. Project: improvements and structures proposed by the applicant to be constructed on a defined site as part of a common plan of development.
20. Town Engineer: the Town Engineer of The Town of Summerville or his designee.
21. Rate: volume of water passing a point per unit of times, generally expressed in cubic feet per second (cfs).
22. Redevelopment: See Development.
23. Retention: the collection and storage of stormwater runoff without subsequent discharge to surface waters.
24. Retrofit: the process of altering an existing drainage system to function properly or more efficiently than currently exists. Retrofitting will be a common method used by the Town to address Total Maximum Daily Loads (TMDLs) to include installation of water quality/runoff treatment devices.
25. Runoff: that part of rainfall that is not absorbed into the sites but flows over the site as surface waters.
26. 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.
27. Sedimentation: the process which operates at or near the surface of the ground, or deposits soils, debris and other materials either on other ground surfaces or in the waterbody.
28. Sedimentation Facility: any structure or area which is designed to retain suspended sediments from collected stormwater runoff, to include sediment basins.
29. 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.
30. Site Construction: is considered the act or process of altering the natural cover or topography and alters the quality or quantity of stormwater runoff.
31. Special Protection Areas: designated areas in the Town 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 will be required to comply with the additional or more stringent design criteria.

32. Storm Frequency: rate of likely recurrence of a rainstorm over a period of specified time.
33. Stormwater Management Plan: 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 runoff 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.
34. 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.
35. Subdivision: all divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, whether immediate or future, of sale, lease, or building development, and includes all division of land involving a new street or change in existing streets, and includes re-subdivision which would involve the further division or relocation of lot lines of any lot or lots within a subdivision previously made and approved or recorded according to law; or, the alteration of any streets or the establishment of any new streets within any subdivision previously made and approved or recorded according to law, and includes a combination of lots of record.
36. Vegetation: all plant growth, especially trees, shrubs, mosses, and grasses.
37. 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 APPROVAL AND PROCEDURES

This chapter provides developers, owners, engineers, contractors, and others with the information needed to obtain approval of a stormwater management plan from the Town Engineer as required for certain construction activities within The Town of Summerville and encompassed municipalities as authorized under intergovernmental agreements. This section describes conditions when a Approval is needed, the types of applications used by the Town Engineer 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 The Town of Summerville 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 the Town Engineer. Construction activities cannot commence prior to approval from the Town Engineer and issuance of a Town Construction Approval.

2.2 Stormwater Construction Approval Application and Procedures

Applications for review and approval under this chapter may be initiated by: (1) petition of all the owners of the property that is the subject of the application; (2) the owners' authorized operators; or (3) Review and Decision-Making Bodies. The remainder of this Manual describes the procedures and application requirements of the Town Engineer. All Construction Approval applications and Certifications shall be submitted, as necessary, to The Town of Summerville's Engineering Department (see contact information in Section 1.9).

The Town Engineer will 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 Water Quality certifications, and/or Navigable waters permits from the US Army Corps of Engineers) to have such permits in hand prior to Town approval.

The Town Engineer has established two (2) categories of applications:

1. **Erosion Prevention and Sediment Control (EPSC) Certifications** are for single family residential structures (SFR) that disturb less than one (1) acre and commercial, industrial, and major subdivisions that disturb less than one-half (0.5) acre, (See Section 2.2.11);
2. **Stormwater Construction Approval Applications** are for single family residential structures that disturb one (1) acre or more and commercial, industrial, and major subdivisions that disturb one-half (0.5) acre or more. (See Section 2.2.12);

Applications required in this Manual shall be considered complete only if they are submitted in the required format, include all mandatory information, and are accompanied by the established fee(s). Any application that is determined to be incomplete shall be returned to the applicant along with an explanation of the application's deficiencies. Fees shall not be refunded. No further processing of the application shall occur until the deficiencies are corrected. Once the deficiencies are corrected, the application may be resubmitted without the payment of additional fees, provided that it is resubmitted within six (6) months of the date that the application was returned to the applicant. Applications resubmitted more than six (6) months after the date that the application was returned as incomplete shall require repayment of applicable fees.

In developing plans for residential subdivisions, each individual lot in a residential subdivision development shall be required to obtain and comply with the subdivision's overall stormwater permit, including specified Best Management Practices (BMPs) for addressing stormwater quality. The residential subdivision development, as a whole, is considered to be a single land disturbing activity requiring a permit. Subdivision plans 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 subdivision development will be used in all engineering calculations.

If individual lots or sections in a residential subdivision are being developed by different property owners, all land disturbing activities related to the residential subdivision shall be covered by the approved SWMP for the residential subdivision. Individual lot owners or developers will sign a certificate of compliance that all activities on that lot will be carried out in accordance with the approved SWMP for the residential subdivision.

Upon receipt of a completed application for stormwater management, the Department shall attempt to accomplish its review of the initial application or revisions and have either the approval or review comments transmitted to the applicant within 20 working days.

The following activities will require review and approval by The Town of Summerville; however, these activities will not require drainage plan submittals.

1. 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 is no requirements that the Town maintain any road right-of-way or drainage easement.
2. Minor Subdivisions that do not exceed the six (6) lot threshold of plat subdividing as described below.

It should be noted that the platting of individual lots from time to time shall not constitute an exempt or minor subdivision. Where the owner or developer has platted individually six (6) or more lots within a given twelve-month period from the same tract of land, the subdivision shall be deemed a major subdivision. In this situation, when the lot six (6) threshold is reached, a full set of plans must be provided which includes the five (5) lots previously platted. The sub-divider shall comply with the provisions of the Ordinance relating to the land development review and approval process for major subdivisions at such time as a sixth lot is proposed to be created by virtue of land subdivision.

2.2.1 Exemptions

Per the Stormwater Management Ordinance, the provisions of this section shall not apply to:

1. Individual single family home construction that disturbs less than one-half (0.5) acre and is not part of a larger common plan of development.
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 disturbing activities on agricultural 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, except that the construction of an agricultural 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 Approval shall require the submittal and approval of a stormwater management and sediment control plan prior to the start of the land disturbing activity.
5. Linear utility installation activities that are covered under their own DHEC approved utility general Approval requiring associated assurance of proper stormwater management.

2.2.2 Final Approval

One complete application for a construction project shall be submitted to The Town of Summerville Engineering Department (see contact information in Section 1.9) along with required components and fees (Section 2.2.11 – 2.2.12). Failure to provide all of the required information shall be considered an incomplete application and the package will be returned to the applicant. The applicant will be notified that further information is needed to complete the package. In some cases, a new complete application package will have to be resubmitted.

Once the application is deemed complete, the Town's review shall be completed and either the approval, denial, review comments, or request for further information transmitted to the applicant. A Plan Review Checklist is provided in Appendix B.

Prior to approval, the applicant may be asked to submit additional sets of construction drawings. 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 the Town Engineer as well. The owner must have a Construction Approval from the Town Engineer prior to beginning any construction activities. The Town Engineer reserves the right to deny coverage if an application fails to conform to the provisions of the Stormwater Management Ordinance and this Manual.

2.2.3 Site Construction and Project Closeout

Construction cannot commence until the Construction Approval is issued to the applicant by the Town's Engineering Department. Construction activities must adhere to the provisions agreed to in the approval. Any substantial revisions to the approved plan should be submitted in writing to the Town Engineer along with any subsequent fees for review. Such changes shall not be implemented until approval is given. Substantial revisions for stormwater management issues may include, but are not limited to pipe size and grade alterations that affect hydraulic capacity, changes to easement boundary due to changes in the stormwater system components, or changes to the general grading plan of the site that affect the flow direction, rate, volume, or quality of stormwater runoff.

The owner is required to maintain at least one copy of all approvals, technical reports, and construction documents, available upon request by The Town of Summerville. The Town Engineer, or his designee, will conduct inspections during the construction phase. Frequency and specific times and dates of these inspections will be done at the discretion of the Town Engineer. More information on inspections is given in Chapter 4. During construction, the owner or designated representative (contractor) must conduct inspections of all temporary erosion and sediment controls on the site in accordance with the submitted and approved maintenance schedule.

At the conclusion of construction, the owner is responsible for making sure a site is stabilized with vegetation established, paved areas and stormwater conveyances clean of debris and sediment, and stormwater controls working properly. In addition, as-builts of the stormwater system must be submitted to the Town prior to closeout. Any problems identified by Town personnel on the site must be corrected by the owner prior to closing out a Town approval. The Town Engineer may require additional items on a case by case basis in order to closeout an approval.

2.2.3.1 Stormwater Construction Approval Transfer

In certain cases and as requested by an applicant, a 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, utility installation, the building of roads, and then turns the property over to a homebuilder(s). In such cases, the applicant must make The Town of Summerville aware of plans to transfer ownership of the Approval and associated stormwater management issues through completion of the transfer of ownership form in Appendix I. A transfer of Approval coverage is also allowed for phases within a project. If a Approval transfer is not requested using the appropriate form, the current Approval holder will continue to be held responsible for stormwater management issues at the site.

2.2.3.2 Project Closeout

At the conclusion of the construction, development or re-development activities, the owner is responsible for making sure a site is stabilized with established vegetation, paved areas and stormwater conveyances clean of debris and sediment, and that stormwater controls are working properly. The owner shall complete and submit a Project Closeout Application Form which includes a certification statement (see Appendix A). The certification statement includes

language to the effect that for projects that include stormwater management systems which will be owned and maintained by the Town, the necessary repair or replacement of any system components within the Town's drainage easements that fail within warranty period from Project Closeout will be the responsibility of the owner. All closed conveyances proposed for public use and maintenance (pipes, boxes, etc.) may be inspected with a video system showing the condition of the installed sections within 30 days of final site grading and site stabilization. The Town Engineer shall have the sole discretion to require video inspections. All video inspections shall be completed in fully dewatered conditions at the expense of the owner/developer. The video files shall be submitted to the Town as part of the Project Closeout procedure. Pipes shall be video inspected again at the end of the warranty period at the discretion of the Town Engineer. All video inspections shall be reviewed by a Professional Engineer, and a report documenting the inspection shall be prepared by this Engineer and submitted to the Town at the expense of the owner/developer. All video shall comply with the following requirements:

1. Color video submitted on a CD or DVD in a high-resolution digital format compatible with Town-approved and available software and equipment.
2. All visual observations will be recorded on a log inspection form incorporating at a minimum the following items:
 - i. Date and time televised;
 - ii. Operator name;
 - iii. Starting and ending manhole (Sta. number, street name, etc.);
 - iv. Pipe diameter (inches), geometry, and material;
 - v. Location of laterals;
 - vi. Location of sags (feet);
 - vii. Location of inflow and infiltration;
 - viii. Location of sags and standing water (feet); and,
 - ix. Location of dry weather flow (feet).
3. The notation of footage (starting at 0.0 feet at the beginning manhole and moving upstream through the pipe) shall be superimposed on the video and be recorded in increments of tenths of feet.
4. All pipe joints shall be inspected by panning 360 degrees at each pipe joint.

Any problems found shall be corrected by the owner/developer. Upon confirming such corrections are complete and the site is ready, the Town of Summerville Engineering Department will request release of any remaining bonds from the Town. The Town of Summerville Engineering Department may require additional items in order to closeout a project.

2.2.4 Expiration of a Stormwater Construction Approval

A Construction Approval will remain valid for up to five (5) years from the date of issuance, provided that the project is in compliance 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 Town Approval. Failure to initiate construction will render the Approval invalid at the end of the twelfth month.

2.2.5 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.

2.2.6 Waivers

The Town Engineer 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 will result in unnecessary hardship and not fulfill their intent. 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. A project may be eligible for a waiver of stormwater management for water quantity if the applicant can demonstrate that:

1. The proposed project will have no significant adverse impact on the receiving natural waterway or downstream properties; or
2. Attenuation of the runoff within the subject basin will alter the release rate such that downstream systems will 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).

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 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.

2.2.7 Non-floodplain Waivers

The Town Engineer may, upon written request from the applicant, grant waiver and exception to any of the provisions of the Stormwater Management Ordinance or this Manual, provided such

variance or exception is in harmony with the general purpose and intent of the Stormwater Management Ordinance and this Manual. A written request for variance must be provided to the Town Engineer stating the specific variance(s) sought and the reason(s) with supporting data for their granting. Any request for variance shall be clearly stated in the Construction Approval application.

2.2.8 Encroachment Permits

An Encroachment Permit, which controls the impacts of traffic, storm drainage, and sediment entering a public road right-of-way and drainage improvements within a public drainage easement, must be obtained from the SCDOT and/or the Town of Summerville Engineering Department before construction begins. Applicants should be aware of The Town of Summerville requirements which may differ from SCDOT’s.

A copy of an Encroachment Approval application(s) to SCDOT must be included in the Construction Approval application package. It is the applicant’s responsibility to comply with all SCDOT Encroachment Approval application requirements. Approved Encroachment Approvals are required prior to final approval from the Town Engineer.

2.2.9 Easements

The following section provides the required easement widths for various components of the stormwater management system(s). In all cases, there will 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 easement width, but may be offset to allow for certain construction needs. Proposed offset easements will be identified and additional width may be required as prescribed by the Town Engineer.

2.2.9.1 Storm Drain Pipe

Drainage easements shall provide adequate room for maintenance equipment to operate. Table 2.1 provides required minimum drainage easement widths for some of the more typical situations:

Table 2.1-Storm Drain Pipe Easements

Pipe size (in)	Maximum depth to invert (ft)	Width of drainage easement (ft)
18	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 for each additional foot to the invert.

- (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 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 the Director of Public Works.

2.2.9.2 Ditches/Canals

(a) *Open channel easements.* For minor ditches which drain into a collector or main ditch or into 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.

(b) *Minor swale ditches.* 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 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).

2.2.9.3 Detention Ponds

A minimum access easement of twenty (20) feet shall be provided. In addition, sufficient access room on the perimeter shall also be included as part of the drainage easement that will include a right-of-way width of thirty (30) feet. While the Town shall not accept responsibility for pond maintenance, unless agreed to in writing, the Town may utilize the easement for necessary emergency repairs.

2.2.9.4 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. The Town Engineer may request or allow other easement widths on a case-by-case basis given site constraints or special conditions. While the Town shall not accept responsibility for stormwater facility maintenance, unless agreed to in writing, the Town may utilize the easement for necessary emergency repairs.

2.2.9.5 Offsite Easements

Any required off-site easements should be obtained prior to Construction Approval issuance which would impact upon that area. Any work done without a proper and adequate easement(s) shall be at the owner's own risk. Non-subdivision projects shall provide validation of necessary easements before a Construction Approval will be issued.

2.2.10 Stormwater Facility Ownership and Maintenance

2.2.10.1 Ownership

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).

For any project, the owner of a portion or the entire stormwater system, as the case may be, shall be clearly designated before a Construction Approval will 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 The Town of Summerville. Owners found altering such components will be required to remove any alterations.

2.2.10.2 Maintenance

Each component of the stormwater management system (pipes, inlets, BMPs) shall have a maintenance plan (activities and associated schedule) as part of the application package for a Construction Approval. The plan shall also 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 are discussed and referenced in Chapter 3.

In addition, the owner/operator, HOA, or operator as applicable, must enter into a permanent maintenance agreement (Operating and Maintenance Agreement for Stormwater Facilities) with The Town of Summerville. 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 Operating and Maintenance Agreement is provided in Appendix D. 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. The Town Engineer will provide oversight of these Agreements to ensure adherence by the owner or other responsible party. The Town Engineer will inspect a

system as he deems necessary to ensure maintenance is being performed in accordance with this Agreement. More detail is provided in Chapter 4 on Town inspection and enforcement procedures.

2.2.11 Erosion Protection & Sediment Control (EPSC) Applications

All Single Family Residential (SFR) construction that disturbs less than one (1) acre or all commercial, industrial, and major subdivisions that disturb less than one-half (0.5) acre must complete the Erosion Prevention and Sediment Control (EPSC) Certification that contains guidance on selecting, installing, and maintaining erosion prevention and sediment controls on a site. This application also requires a certification by the owner/contractor that these measures will be installed and maintained so as to prevent the discharge of sediment-laden runoff and to ensure, as applicable, that the construction will not cause non-compliance for any adjacent construction projects that may be under another Town, County, State, or Federal permit. For these projects, control of the peak runoff discharge is not required. Post construction water quality control is also not required. The application is considered complete if filled out and signed.

2.2.12 Stormwater Construction Approval Applications

This approval must be obtained for any single family residential structure which disturbs an area of one (1) acre or more or any commercial, industrial, or major subdivision that disturbs one-half (0.5) acre or more.

2.2.12.1 Project Disturbs Less Than Five (5) Acres

Projects that require a Construction Approval and disturb less than five (5) acres must follow the submittal requirements detailed below.

1. Application Form: This form is shown in Appendix A. All information requested should be completely filled in. All certifications must be signed.
2. Site Narrative: A narrative should be submitted with the permit application describing the site in general, purposes of the construction activity, topographic and soil information, adjacent properties and owners, waterbodies receiving stormwater runoff (existing and proposed), anticipated starting and completion dates of the various stages of the construction activities and the expected date of final stabilization, existing water quality and flooding issues, and anticipated impacts and benefits. If applicable, the narrative should also contain justification for variances, waivers, or other special conditions of the site. Also, if applicable, wetland and water body disturbance issues should be discussed along with detail on the status of necessary permit application to the Corps of Engineers. If a TMDL(s) is in place for the receiving waterbody, the narrative must describe how the project will comply with the TMDL(s).
3. A sketch of the project area to accompany the narrative containing the following, when applicable:
 - site location drawing of the proposed project showing project location in relation to roadways, jurisdictional boundaries, streams, rivers, and lakes and the boundary lines of the site to be developed;

- identification of all areas within the site that will be included in the construction activities and a calculation of the total disturbed area;
- location of temporary and permanent stormwater management controls.

4. Technical Report:

- One copy of the technical report, prepared by a certified professional (Professional Engineer, Tier B Land Surveyor or Landscape Architect), shall be submitted as part of the application package. This report shall consist of maps, and supporting design calculations for the proposed stormwater management system(s) and erosion/sediment control measures to include, but not be limited to, the following:
- Pre-development hydrologic analysis that determines the existing stormwater peak flow rates, flow velocities, and pollutant loads for all delineated sub basins/discharge points. The natural or historic condition will be the standard by which the stormwater plan for a construction project is evaluated. Chapter 3 contains greater detail on the design criteria (design storm, maximum velocities, etc.);
- Post-development hydrologic analysis that determines the existing stormwater peak flow rates, flow velocities, and pollutant loads for all delineated sub basins/discharge points. The stormwater plan must demonstrate control of runoff quantity and quality in accordance with design criteria provided in Chapter 3;
- Stormwater management system design to include:
 - A description of the stormwater management system, methodologies to be used in their design, existing and proposed runoff patterns, outfalls, offsite contributions, and critical downstream areas.
 - Map(s) showing the location of all existing and proposed stormwater management control facilities and outfalls.
 - Supporting calculations that justify that the system meets Town requirements for runoff rates, volumes, and pollutant loads. The following computations should be included as necessary: hydrographs, routing of hydrographs through system components, estimates of trapping efficiencies of each BMP used, pipe and open channel capacity, velocity calculations, and water surface elevations. All system components should have standard details and specifications.
 - Calculations should also be provided for energy dissipation, fill slopes and embankments, and channel stabilization.
 - Explanation/discussion of models used in the design.
- If the project is located in a Special Protection Area, a comprehensive evaluation of engineering calculations and analysis should be included that demonstrates that the project will not negatively impact current drainage conditions and/or compliance with state and federal conditions on stormwater discharges. More information is provided in Section 3.8;
- Erosion and sediment control plan to include:
 - a description of the erosion and sediment control practices selected,
 - 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 design.
- Downstream analysis calculations showing the effect of post-development design flows on downstream stormwater conveyance systems and channels;
- Watershed delineation maps with consistent sequential notations;
- Location map showing topography and waters of the state in relation to proposed project;
- Discussion and calculation of any wetlands issues;
- Map showing type and classification of all soils expected to be encountered or used at the development site;
- Presentation of existing and proposed contours at the development site;
- General description of the adjacent property and description of existing structures, buildings, and other fixed improvements located on surrounding properties;
- Discussion of site access issues and easements to be obtained and provided to the Town.

5. Construction Plans:

One complete set of certified and signed construction plans are to be included as part of the permit application. The information required on the construction plans shall include, but are not limited to the following list. Other items may be requested by the Town Engineer on a case-by-case basis. Some items may be included in other components of the permit application package, but should be adequately noted. Size D (22" X 34" or 24" X 36") plan sheets/drawings are preferred.

- North arrow and scale,
- Property lines, adjacent landowners' names, and land use conditions,
- Legend,
- Registered engineer's seal,
- Certificate of Authorization seal, as appropriate,
- Existing and proposed contours and land uses,
- Limits of disturbed area,
- Delineation of wetlands and/or waters of the state,
- Easements,
- Stormwater system profiles with existing and proposed ground elevations,

- Construction sequence (include implementation of all stormwater and sediment controls in the first phase of construction),
- Location of Concrete Washout and other Pollution Prevention Measures
- Locations of all temporary and permanent control measures,
- Details for all temporary and permanent control measures,
- Grassing and stabilization specifications and schedule,
- Maintenance requirements (for temporary and permanent controls, grassing, etc.),
- Construction entrance/exit,
- Tree protection, preservation, and overall landscaping plan with appropriate species selection and screening for ponds and other components required by the Landscaping Ordinance,
- Details and specifications of all necessary construction components,
- Location map,
- The cover sheet shall contain, at a minimum, the following items:
 - Project name,
 - Engineers contact information (name, mailing address, telephone, fax),
 - Contact information (name, mailing, address, telephone, fax) of the owner, operator or designated party,
 - Vicinity map, with site outlined (map should have enough detail to identify Surface Waters of the State within 1 mile of the site), and
 - Table of contents.
- 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:
 - 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 by 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 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.
6. Subdivision projects should have a complete set of plans and specifications to include, but not be limited to, the following items, as appropriate: lot layout/site plan and staking, acreage, road plan/profiles, storm drainage plan/profile, drainage areas (both on and off-site) with characteristics, sediment and erosion control, utilities (water and sanitary sewer), post-construction stormwater management facilities, and traffic patterns with temporary (construction) and permanent traffic signage. Plans shall provide existing and proposed contours with intervals of not more than two (2) feet. Where possible, and as needed, contour lines should be extended beyond the site boundary lines. While some of these items lend themselves to combining on a single sheet/drawing, care should be taken to ensure that plans are not overcrowded/cluttered. The lot layout sheet should show a tie distance from the primary entrance of the proposed project to the nearest existing intersection;
 7. All available or used bench marks should be shown on this or other applicable sheet. At least one bench mark shall be available or established on/near (within survey instrument sight distance) the site. The bench mark shall be referenced to mean sea level (MSL.);
 8. The applicant should provide a tentative construction time schedule for the development. Sediment and erosion control practices installation should be some of the first activities at a

site. The schedule should also provide for coordination with the responsibilities of all co-permittees and other contractors, including those installing utilities;

9. Specifications for all components of construction activities related to grading, utilities, sediment and erosion control, temporary and permanent vegetation, water quality BMPs, etc.;
10. Fees:

The cost of performing SWMP reviews and of administering applications for Town stormwater permits vary based on the size and complexity of the development. The right to develop and impose fees is established in the Town Ordinance to assist in financing the Town Program, the SWMP review process, and inspection of stormwater management and erosion control structures. All plan review fees and construction inspection fees are due prior to plans being approved and stormwater permit is issued. Fees are also published on the Town Fee Schedule.

The following table includes the plan review fees required for all projects:

FEE SCHEDULE FOR STORMWATER PLAN REVIEW¹			
Type of Development or Activity	Size of Development	Standard Fee	Additional Fee
Residential – Individual Single Family	Less than 1 Acre	Exempt – No Fee	
Residential – Individual Single Family	1 Acre or Greater	\$100 per acre disturbed	
Residential – Single Family Subdivision	0.5 Acre or Greater	\$100 per acre disturbed	
Residential – Multi-Family	0.5 Acre or Greater	\$200 per acre disturbed	
Non-Residential	0.5 Acre or Greater	\$200 per acre disturbed	
Review of Application for Variance	Any	\$300	
¹ SCDHEC requires a \$125 fee to issue an NPDES permit.			

11. Maintenance Schedules and Agreements:

Each component of the stormwater management system (pipes, inlets, BMPs) shall have a maintenance plan (activities and associated schedule) as part of the application package for a Construction Approval. The plan shall also 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 are discussed and referenced in Chapter 3.

In addition, the owner/operator, Homeowner’s Association (HOA), or operator as applicable, must enter into a permanent maintenance agreement with The Town of Summerville. This agreement is a legal document, recorded in the permanent land records with the Dorchester, Berkeley, or Charleston County Register of Deeds, in addition to being fully described on the final plat. The operating and maintenance

agreement is provided in Appendix D. It 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. The Town Engineer will provide oversight of these agreements to ensure adherence by the owner or other responsible party. The Town Engineer will inspect a system as he deems necessary to ensure maintenance is being performed in accordance with this permit. More detail is provided in Chapter 4 on Town inspection and enforcement procedures.

12. Stormwater Pollution Prevention Plan (SWPPP):

A SWPPP is a document that provides guidance to owners and contractors and co-permittees/subcontractors on the activities that shall be done during construction to reduce the risk of pollution. Construction projects are considered an industrial category and are required to prepare and implement a SWPPP to be submitted with the permit application package for The Town of Summerville. A checklist of necessary SWPPP items is provided in Appendix B. The stormwater pollution prevention plan requirement applies to both development and redevelopment sites.

If the SWPPP has been developed by a Registered Professional Engineer, Registered Landscape Architect or Tier B Land Surveyor, the following statement must be included within the SWPPP:

“I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, pursuant to Regulation 72-300 et seq. (if applicable), and in accordance with the terms and conditions of SCR100000.”

2.2.12.2 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 2.2.12.1 must be submitted, as well as the requirements in this section. Special Protection Areas are areas within the Town that require some additional stormwater management controls due to existing problems. Such problems can include, but are not limited to, flooding and State recognized water quality impairments.

The owner/operator must provide methods to show compliance with any adopted Total Maximum Daily Loads (TMDLs) or other waterbody impairments that may limit the allowable pollutant load that can be discharged.

2.2.12.3 Project Disturbs Ten (10) Acres or More

Clear cutting for installation of utilities and roads or for development may be allowed, but limits have been established. The total disturbed area shall never exceed 10 acres unless otherwise approved by the Town Engineer or his appointee. The Town Engineer or his appointee may reduce the total area that may be disturbed at a given time. Project areas exceeding 10 acres must be phased to comply with this requirement. All clear cutting areas are to be clearly identified on construction documents. The decision to consider an activity as clear cutting shall belong to the Town Engineer or his appointee, but will normally be defined as the removal of trees and stumps and all disturbances of surface vegetation and debris.

CHAPTER 3 - DESIGN REQUIREMENTS

This chapter provides engineers, designers, developers, and others with the necessary information needed to design adequate systems that will control the rate, volume, and pollutant loads released from a new or re-development project where the Town Engineer has been authorized by law or agreement to enforce engineering standards. These design requirements have been developed based on common 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 will 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 resources in The Town of Summerville through proper planning, design, installation, and maintenance. The design professional shall use all means necessary to develop land in a manner consistent with all Town Ordinances and this Manual. Specific methods and applications not covered in this section can and should be discussed with the Town Engineer for applicability prior to the 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 will include, but not be limited to, the following:

1. 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 development. This includes maintaining or creating buffers and preserving natural areas.
 - c. Limiting the drainage area to all BMPs. Specific maximum contributing areas to BMPs are provided in this chapter.
 - d. When feasible, retaining and protecting natural vegetation and saving topsoil, for replacing on graded areas.
 - e. Using temporary plant cover, mulching, hydroseeding, or other stabilization methods to control runoff and protect areas subject to erosion during and after construction.

2. Annual groundwater recharge rates should be maintained to the maximum extent practical by promoting infiltration through the use of structural and non-structural methods.
3. 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.
4. 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 this Manual,
 - b. Constructed properly, and
 - c. Maintained regularly.
5. 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 Loads (TMDLs), and 303(d) listings] are subject to additional performance criteria. Section 3.9 contains more specific information and design requirements on the areas that will receive this additional set of protection criteria.
6. All BMPs shall have an enforceable operation and maintenance agreement to ensure the system functions as designed. Chapter 4 contains more detail on these operation and maintenance agreements.
7. Redevelopment, defined as any construction, alteration or improvement equal to or greater than one-half (0.5) acre of land disturbance on sites where existing land use is commercial, industrial, institutional, or multi-family residential, is governed by the following Stormwater Management design criteria:
 - a. Redevelopment which has no increase or a net decrease in impervious area yet lacks evidence of a functioning retention/detention facility will be required by the Town engineer to retrofit the site to current Town of Summerville standards for peak attenuation and stormwater volume and water quality controls.
 - b. The design of stormwater management facilities should be based upon soil conditions as follows:
 - In areas where soils have been classified under the Soil Conservation Service (SCS) Hydrologic Soil Classification System as type A or B (pervious), the overall stormwater management strategy should be that of on-site retention and infiltration into the ground or other BMPs as outlined in the BMP Manual. Information documenting the permeability of these

soils as well as the groundwater table elevations shall be provided as part of the design of the stormwater management system.

- In areas where the soils have been classified under the SCS Hydrologic Soils Classification as types C and D (impervious) or A/D, B/D, and C/D (high groundwater table areas), the overall stormwater management system shall make use of retention/detention basins or other BMPs as outlined in the BMP Manual to attenuate peak and retain excess volume from the contributory drainage area and to settle solids washed off or eroded therefrom. Information documenting the permeability of these soils as well as the groundwater table elevations shall be provided as part of the design of the stormwater management system.
8. 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.
 9. Permanent vegetative cover and the long-term erosion protection structures shall be installed as soon as practical in the development process.
 10. If wetlands are suspected to exist on the property, they should be investigated and delineated by a qualified consultant. The US Army Corps of Engineers (USACOE) must make a determination as to whether or not the wetlands fall under their jurisdiction. All efforts should be made to reduce or eliminate impacts such as using a buffer and/or installing a silt fence around wetlands. If the wetlands fall under the jurisdiction of the USACOE, a Section 404 permit is needed before any disturbance of the wetlands is allowed. In addition, the DHEC-OCRM Coastal Zone Consistency Determination will address any proposed wetland impacts. The Town of Summerville will accept certified delineations from qualified consultants if the USACOE is unable to issue a verification on the jurisdictional determination.
 11. Where existing wetlands are intended as a component of an overall stormwater management system, the approved plan for stormwater management shall not be implemented until all necessary federal and state permits have been obtained.
 12. 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.
 13. For the purposes of hydraulic design, 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: 0.5 - < 10 Acres

All street drainage, curb and gutters, pipe systems, culverts, ditches and channels which drain less than 10 acres shall be designed to control post development peak runoff discharge to pre-development runoff rates for the 2-, 10-, and 25-

year storm events and to carry flows resulting from a(10)-year frequency storm event without causing damage to structures or exceeding the limits allocated for this storm event. Minimum allowable pipe diameter shall be 15 inches.

b. Collector Systems: 10 - < 40 Acres

All drainage systems draining at least 10 acres but less than 40 acres shall be designed to control post development peak runoff discharge to pre-development runoff rates for the 2-, 10-, and 25- year storm events and to carry flows resulting from a twenty-five (25) - year frequency storm event without causing damage to structures or exceeding the limits allocated for this storm event.

c. Major Drainage Channels: > 40 Acres

All drainage systems greater than 40 acres, such as channel improvements, culverts or bridges along these channels, shall be designed to control post development peak runoff discharge to pre-development runoff rates for the 2-, 10-, and 25- year storm events and to carry a flow resulting from a one-hundred (100) - year storm event without causing damage to structures or exceeding the limits allocated for this storm event. Encroachment upon Major Drainage Channels and the adjacent overflow land shall be avoided to the extent possible.

d. Town or FEMA Floodplains: 300 and more Acres

Bridges and culverts being constructed in natural channels, creeks, or rivers draining more than 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.

The Floodplain provisions for The Town of Summerville can be found by contacting the Engineering Department.

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

14. All development sites disturbing more than one (1) acre shall have an analysis performed of the drainage system to ascertain the function of the system during the 100-year storm event (precipitation only) or more specifically, determine that the project will not:
- Increase the likelihood of dwelling flooding and property damage.
 - Increase water surface elevations or reduce system capacity in stormwater system 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.

If a master plan exists for the area/watershed which encompasses the project, criteria set by that plan shall be used for determining the extent of this analysis. Without a master plan, analysis shall extend up to the top of the watershed and down to a water of the state or to a point in which the project comprises 10% of the total contributing area, whichever occurs first. In these cases, the analysis criteria shall include, but is not limited to:

- a. Utilization of existing land use curve numbers for all areas,
- b. Routing the flows using an accepted hydrologic and hydraulic method, and
- c. Providing hydraulic step-backwater calculations using USACE's HEC-2 or HEC-RAS models or equivalent. Other calculations may be required by the Town Engineer based on severity of potential impact and location of the project.

If the downstream analysis determines that the development of a particular site does contribute to flooding, pollution, or erosion problems, then the system design shall be changed or additional controls shall be included.

- 15. Watersheds that have documented water quantity problems may have more stringent or modified design criteria as determined from The Town of Summerville master plan studies or as dictated by State and Federal Regulations. The Town Engineer reserves the right to impose additional design requirements, such as the examples listed below:
 - a. Post-development discharge rates from the entire development area not exceeding pre-development discharge rates for storm frequencies greater than the 25-year frequency 24-hour duration storm event,
 - b. Post-development discharge volumes from the entire development area not exceeding pre-development discharge volumes for storm frequencies smaller than the 1-year frequency 24-hour duration storm event,
 - c. Reduction of peak flow rates below pre-development levels,
 - d. Downstream channel, culvert, or property improvements.

3.2 Hydrologic Computation Methods

All hydrologic computations shall be completed using volume-based hydrograph methods acceptable to the Town Engineer. The design storm duration for these computations shall be the 24-hour storm event utilizing a SCS Type III 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, and
- Initial abstraction/surface storage.

The remainder of this section will 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, appropriateness of use, but rather general guidance on generally accepted standards. This Manual does, however, reference suggested materials as necessary for detailed discussion of related topics.

3.2.1 Inputs

The precipitation depths corresponding to various return periods to be used for projects in The Town of Summerville are shown in Table 3.1.

Table 3.1: Design Storm Precipitation Data (in Inches) for Dorchester County, S. C.

Area	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Dorchester (North)	3.4	3.8	4.9	5.8	7.1	8.1	9.3
Dorchester (South)	3.6	4.2	5.4	6.4	7.8	8.9	10.1

Source: SCDHEC 2005

Soil types in Dorchester County range from sands to sandy clays. Existing land use and corresponding runoff potential factors should be obtained from the site visit and other appropriate sources. Appropriate runoff potential factors can be found in several of the references listed in Chapter 5.

3.2.2 Stormwater Management Design Methodologies

The Town of Summerville recommended methods and corresponding design circumstances are listed in Table 3.2 and 3.3 below. If other methods are used, approval must first be given by the Town Engineer. Complete source documentation must be submitted for approval.

Table 3.2: Recommended Methodologies Based on Land Disturbance Area

Method	Size Limitations*	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. <u>Not to be used for storage design.</u>
“SCS Method” (TR-55)	0 – 2000 Acres	Used for estimating peak flows from urban areas.

*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 (<http://www.wcc.nrcs.usda.gov/hydro/hydro-tools-models-tr55.html>). The USGS regression equations for South Carolina can be obtained from the US Geological Survey website (<http://water.usgs.gov/osw/programs/nffpubs.html>). Haan, C. T., Barfield, B. J., and Hayes, J. C. (1995) and USDT (1996, 2001) can also be referenced for greater detail on hydrology calculations and assumptions.

Table 3.3: 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. See references given above for the suggested methodologies for information on these calculations.

3.2.3 Hydrographs

Hydrographs should be used to evaluate entire systems by routing storm events through pipe or storage systems. The use of a hydrograph will provide better insight into system performance than simply using the peak discharge. The Town Engineer will accept computer models commonly used in the industry as well as newer models with appropriate documentation.

3.3 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 design criteria are established for water quantity control. All designs of storage facilities utilized for stormwater quantity control and required downstream analyses shall be submitted as part of the engineering calculations when applying to The Town of Summerville.

3.3.1 General Water Quantity Criteria

1. Controls shall be designed by a traditional reservoir routing procedure.
2. All ponds shall have an emergency spillway designed to pass the 100-year storm event if the storage capacity is exceeded.
3. All quantity controls that are also used for quality control shall have a forebay or screening vault for removal of debris and coarse sediments.
 - a. Forebays shall be placed upstream of the main pond storage area.
 - b. Unless a separate vault is to be used for the forebay, the forebay shall be separated from the larger detention area by barriers or baffles that may be constructed of earth, stones, riprap, gabions, or geo-textiles. The barrier and/or baffles act as a trap for coarse sediments and minimize their movement into the main pond.
 - c. Maintenance of forebays will be needed more frequently than the main storage area and all designs should consider this need.

3.3.2 Detention Ponds/Reservoirs

1. Ponds with vegetated embankments shall be less than 15-feet in height and shall have side slopes no steeper than 3H:1V. Embankments protected with Erosion Control Blankets or Turf Reinforcement Matting shall be no steeper than 2H:1V. Geotechnical slope stability analysis is required for embankments greater than 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.

2. A minimum freeboard of 1-foot above the design storm high water elevation shall be provided for all impoundments.
3. The bottom of detention structures shall be graded towards the outlet structure(s) to prevent standing water conditions with a minimum 0.5% bottom slope.
4. 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 six (6) is reasonable. Aeration or other means shall be used as necessary to prevent anaerobic conditions.

3.3.3 Underground Detention Devices

1. Underground detention facilities shall be designed using the following criteria:
 - a. Underground detention systems shall be located downstream of other stormwater controls providing treatment of the water quality volume.
 - b. The maximum contributing drainage area to be served by a single underground detention vault or tank is five (5) acres.
 - c. All systems shall be designed and located to facilitate maintenance. Systems should be cleaned out (sediment removal) at least once a year, but more frequently if necessary.
 - d. The minimum pipe diameter for underground detention tanks is 24 inches or equivalent.
 - e. Underground detention systems must meet structural requirements for overburden support and traffic loading if appropriate.
 - f. Access must be provided over the inlet pipe and outflow structure. Access openings can consist of a standard frame, grate and solid cover, or preferably a removable panel.
 - g. All underground detention systems should accommodate at least six (6) inches of sediment storage in the volume calculations.
 - h. The feasibility of these devices for a given situation shall be evaluated by a soil scientist, geotechnical engineer, or other individual certified by the State of South Carolina in water table estimation.
 - i. Water table estimation shall be based on first occurrence of two chroma features.

2. Any development that uses a parking area or other feature for detention storage capacity shall clearly identify the limits and depths of the proposed detention pool.
3. Basin configurations which create stagnant water conditions shall be avoided.
4. Post-development discharge rates shall not exceed pre-development discharge rates for the 2, 10, and 25-year frequency 24-hour duration storm events. The same hydrologic procedures shall be used in determining both the pre-development and post-development peak flow rates.
5. Post-development discharge velocities shall be reduced to provide non-erosive flow velocities from structures, channels or other control measures, or equal the pre-development 10-year 24-hour storm event flow velocities, whichever is less.
6. The volume within any structure used for water quantity control shall be drained from the structure within 72 hours.

3.3.4 Infiltration Devices

1. Infiltration devices shall be required on those sites which do not currently discharge stormwater runoff or have no existing outlet. In such cases, in the post-development condition, devices shall be designed to infiltrate the runoff volume equivalent to the 5-year storm event. For evaluating the 10-year and 25-year storm events, the discharge rate from the site shall be limited to (not exceed) that of a site of equivalent size and slope with a SCS Curve Number equal to 39. As with detention ponds, the response of the system to the 100-year storm event must be analyzed, but only to the extent that no structure flooding or damage results. The following other criteria, based primarily on SC Code of Regulation Section 72-307.C requirements, shall be followed in the design of infiltration systems:
 - a. Infiltration device design shall be based on soils characteristics of the first twelve (12) inches below the proposed bottom of the device (not necessarily the first twelve (12) inches below ground surface).
 - b. Areas draining to these devices must be stabilized and 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.
 - c. Each system shall be designed to prevent clogging by fine material and for ease of maintenance.
 - d. The bottom of the infiltration devices shall be at least 0.25 feet above the “zone of seasonal saturation” and infiltration interface.

- e. The infiltration device shall be designed to completely drain of water within 72 hours.
- f. Soils must have adequate permeability to allow water to infiltrate. Infiltration devices are limited to soils having an infiltration rate of at least 0.30 inches per hour. If the infiltration rate is greater than 0.3 but less than 2.0 inches/hour, then an underdrain system must be installed. 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.
- g. Infiltration devices greater than three (3) feet deep shall be located at least twenty-five (25) feet from basement walls.
- h. Infiltration devices designed to handle runoff from areas with a high runoff potential shall be a minimum of one hundred fifty (150) feet from any public or private water supply well.
- i. 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.
- j. The slope of the bottom of the infiltration device shall not exceed five (5) percent. Also, the practice shall not be installed in fill material as piping along the fill/natural ground interface may cause slope failure.
- k. An infiltration device shall not be installed on or atop a slope whose natural or existing angle of incline exceeds twenty (20) percent.
- l. If an underdrain system is required, clean outs will be provided at a minimum, every one hundred (100) feet along the infiltration device to allow for access and maintenance.
- m. 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 Town Engineer shall be contacted for guidance on the appropriate controls to employ or other mutually accepted best management practices.

3.3.5 Water Quantity Waiver and Design/Construction References

1. A project may be eligible for a waiver from the stormwater management requirements for water quantity control if the applicant can verify the items listed below.
 - a. The proposed project will not create any significant adverse effects on the receiving storm water system downstream of the property, and
 - b. The imposition of peak flow rate or volume control for stormwater management would create, aggravate, or accelerate downstream flooding or cause a detrimental impact to the downstream ecosystem.

Final approval of a waiver request will be given at the discretion of the Town Engineer. A water quantity waiver doesn't excuse water quality considerations.

2. Construction shall conform to the latest version of SCDOT's *Standard Specification Manual for Highway Construction*, for publicly maintained systems.
3. Guidance on the design, installation, and maintenance of stormwater quantity facilities can be found in Paine, J., and Akan, A., (2001), ASCE & WEF (1994), and Mays (2001).

3.3.6 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 disturbing activity development. Structural detention stormwater controls accepted by The Town of Summerville are shown in Table 3.4.

Table 3.4: Accepted Water Quantity Controls

General Structural Control	Description
Dry Detention/Dry Extended 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 Storm Water Detention Basins <ul style="list-style-type: none"> • Wet Pond • Wet Extended Detention Pond • Micropool Extended Detention Pond • Multiple Pond System 	Wet detention basins are constructed stormwater basins that have a permanent pool or micropool of water. Runoff from each rain event is detained above the permanent pool and released at a designed flow rate to reduce downstream water quantity impacts. Permanent pool depths must be ≥ 3 feet to prevent mosquito breeding.
Multi-purpose Detention Areas	Multi-purpose detention areas are used for one or more specific activities such as parking areas and rooftops. These areas are used to provide temporary storage of runoff. Some of the multi-purpose areas such as infiltration trenches or bio-retention cells may also be used for water quality purposes.
Underground Detention	Underground detention is used as an alternative to surface dry-detention basins. They are 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 into the ground. They are used in areas that currently do not discharge stormwater or create runoff only during large storm events.

3.3.7 Standard Water Quantity Design Procedures

This section provides the general procedures for the design of stormwater quantity structures. The following items shall be required for the design of these structures and routing flows through them:

1. Compute the inflow hydrograph for the structure for the 2 and 10-year 24-hour storm events for both the existing and proposed conditions. From this, determine peak flow rates for each storm.

2. Compute a stage-storage relationship for the proposed structure. A stage storage-curve defines the relationship between the depth of water and storage volume within the detention facility.
3. Compute stage-discharge relationship of the outlet control structure(s). A stage-discharge curve defines the flow capacity of a structure at a given stage or elevation.
4. Perform routing calculations for the 2 and 10-year 24-hour storm events. Calculations may be done by hand, or may be done by using a storage routing computer model.
5. Determine the cumulative volume at the 24-hour point released from the facility.
6. Compare the two volumes and two peak discharges. The volume released from the pond after 24 hours should be at or below that for pre-development conditions. The peak discharge rate from the pond should be at or below the peak discharge rate for the pre-development condition for the 2 and 10-year storm events. Check to make sure the discharge hydrograph from the 100-year storm event does not overtop the banks of the facility.
7. Evaluate the control structure outlet flow velocity and provide velocity control and channel stabilization if needed. Drawings and details should be provided for outlet structures and basins.
8. Repeat Steps 1-7 for post-development condition until peak, volume, and velocity criteria are met.
9. Provide all calculations in submittal package in a cohesive, organized, and easy to follow format.

Stage-storage and stage-discharge calculations should be included in the engineering calculations. Common methodologies for stage-storage curves include the double end area method and the pyramid frustum method. Other methods will be accepted upon justification.

Hand calculations are available for routing hydrographs through detention structures, however they are time consuming and inefficient when multiple designs are required to be evaluated. For this Manual, it is assumed that the design professional will be using one of the many computer software packages available to perform storage routing calculations. All models/methodologies used must be approved by The Town of Summerville. 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

3.4 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 The Town of Summerville. 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.

3.4.1 Characterization of Urban Storm Water Runoff Quality

This section provides some background information on the major sources of pollutants commonly found in stormwater flows and those that impact Town waterbodies. In Table 3.5, these sources and the pollutants most commonly associated with them are presented. This is followed by a detailed discussion of the most common pollutants found in stormwater discharges.

Table 3.5: Typical Stormwater Pollutants and Sources

Pollutant Source	Pollutants of Concern
Erosion	Sediments and attached soil nutrients (numerous nitrogen and phosphorus forms), organic matter, and other adsorbed pollutants.
Atmospheric Deposition	Hydrocarbons emitted from automobiles, dust, metals, nutrients, and other chemicals released from industrial and commercial activities.
Roadways/Transportation related areas	Hydrocarbons emitted from automobiles, dust, metals,
Construction Sites	Sediment, metals, paint, and wood preservatives.
Manufactured Products (Industrial land uses)	Heavy metals, phenols, and oils from automobiles, Zinc and Cadmium from tire wear.
Lawn and Landscape Maintenance	Fertilizer and pesticides.
Plants and Animals	Plant debris, animal excrement.
Septic Tanks	Coliform bacteria, nitrogen, NO ₃ .
Non-Storm Water Connections	Sanitary sewage, industrial wastewater, commercial discharge, and construction activities.
Accidental Spills	Pollutants of concern depend on the nature of the spill.
Animal Waste Management	Coliform bacteria, nitrates, and phosphorus.
Pesticide Applications	Pollutants of concern depend on the pesticide being used and the type of crop or pest being treated.
Land Disturbance Agriculture	Sediment and attached soil nutrients, organic matter, and other adsorbed pollutants.
Fertilizer Applications	Nitrogen and phosphorus.

Source: U.S. Environmental Protection Agency, June 1992.

3.4.1.1 Suspended Solids

The most prevalent form of stormwater pollution is the presence of suspended matter that is either eroded by stormwater or washed off paved surfaces by stormwater. Suspended solids increase the turbidity of the receiving water, thereby reducing the penetration of light, resulting in decreased activity and growth of photosynthetic organisms. The increased turbidity also detracts from the aesthetics of natural waters. In addition, the clogging of fish gills has been attributed to the presence of suspended solids. Combined sewer overflows typically contain high suspended solids concentrations. The solids that settle in the receiving water pose long-term threats resulting from their oxygen demand and gradual accumulation of toxic substances (Moffa, 1990), as well as reducing primary production. Sedimentation and other forms of physical separation are often an effective means of removing suspended solids from stormwater.

Sediment is derived from a variety of sources, including erosion from disturbed areas, washoff of sediment deposited on impervious areas, and detachment of sediment due to the increased stream power that comes from increased flow rates and flow durations with urbanization. A significant number of models are available to predict total suspended solids (TSS) contributions from “clean” sediment, but few of the models have parameters specific to urbanized areas. Most of the models were developed to deal with agricultural soils, and their application to urban areas is limited.

Models that do have capabilities that have been used for predicting urban sediment include SWMM, SWAT, and SEDPRO models. For the models to be effectively utilized in sizing BMPs, predictions must be made of time varying quantities as well as the size distribution. Those distributions must be of the aggregated particles, not just the primary particles.

3.4.1.2 Oxygen Demanding Matter and Bacteria

Sufficient levels of dissolved oxygen (DO) in the water column are necessary to maintain aquatic life, growth, and reproductive activity, as well as to maintain aerobic conditions. The introduction of stormwater containing oxygen-demanding organic matter can impair the receiving water quality by reducing the DO levels such that it is unable to sustain certain forms of aquatic life and can further cause the water to become foul. Bacteria enter the stormwater drainage systems typically from the runoff of animal feces and organic matter from the catchment surface, possibly even disturbed soil. Bacteria also may enter the stormwater system and ultimately natural waters through leaking sewer systems (lateral connections, manholes, and industrial or commercial drains, etc.) and malfunctioning septic systems, all of which are termed illicit discharges and illegal by The Town of Summerville Stormwater Management Ordinance. Organic matter, usually in the form of vegetation and detritus, is carried through the conveyance system by the stormwater. Pathogenic bacteria and viruses in stormwater discharges pose human health threats. The removal of pathogenic bacteria is achieved primarily through the process of biological decay and physical-chemical disinfection where practiced. Presence of such bacteria is assumed based on the detection of indicator bacteria such as fecal coliforms or E-coli. The reduction of bacteria in waters of the State has been the focus of TMDL efforts by SCHDEC to date.

3.4.1.3 Nutrients

Nitrogen and phosphorus are plant nutrients that promote the growth of plants such as algae, and are the second leading stressor of impaired rivers and streams and the leading source of pollution in impaired lakes (US EPA, 1997). Such nutrients contribute to the eutrophication of water bodies which can result in decreased oxygen supply, alteration of aquatic life and decreased recreational value (Novotny, 1985).

Nutrients are typically derived from agricultural runoff as well as runoff from chemicals applied to lawns in urbanized areas, runoff from industrial sites, municipal wastewaters (of more concern for combined sewer overflows), or atmospheric deposition onto impervious surfaces that is later washed into stormwater. Model studies indicate that the increase in nutrient loading due to increased imperviousness will be dramatic. For example, the increase in the Maryland Chesapeake Bay watershed due to increased urbanization is expected to range from 2 to 20 times the current load, depending on whether residential development is highly restricted or unrestricted (Houlahan, 1992). Nutrients can be removed from stormwater prior to discharge through biological uptake such as by plantings in stormwater quality control ponds.

Most models of nutrient loadings that have an extensive data base included have been based on agricultural and forest operations. These have applicability to washoff from fertilized lawns and forested areas but not to the impervious areas. Models of nutrient loading in urban runoff are typically based on washoff type calculations or user-defined loadings and concentrations, all of which require user-defined constants and are relatively simplistic. A relatively new model called IDEAL, has additional treatment procedures for nutrient loads and removal using isothermic relationships that define adsorbed to dissolved nutrient ratios.

3.4.2 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, however, 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. The Town of Summerville's current approved list of stormwater quality BMPs, listed in Table 3.7, are based on literature reviews and experience. Some references to BMP selection, effectiveness, and design can be found in SCDHEC (2005), Agricultural Resource Council (2001), Schueler (1987), and Water Environment Foundation (WEF) & American Society of Civil Engineers (ASCE) (1998). Guidance on applying BMPs into Low Impact Development (LID) approaches can be found in Prince George Town (1999 a and b).

Table 3.6. Average Pollutant Concentrations for Various Land Uses (mg/l)

Land Use	Pollutant Concentration (mg/l)											
	BOD	COD	TSS	TDS	TP	DP	TKN	NO2 / NO3	Pb	Cu	Zn	Cd
Forest/ Rural Open	3	27	51	415	0.11	0.03	0.94	0.80	0.000	0.000	0.000	0.000
Urban	3	27	51	415	0.11	0.03	0.94	0.80	0.014	0.000	0.040	0.001
Agricultural/ Pasture	3	53	145	415	0.37	0.09	1.92	4.06	0.000	0.000	0.000	0.000
Low Density Residential	38	124	70	144	0.52	0.27	3.32	1.83	0.057	0.026	0.161	0.004
Medium Density Residential	38	124	70	144	0.52	0.27	3.32	1.83	0.180	0.047	0.176	0.004
High Density Residential	14	79	97	189	0.24	0.08	1.17	2.12	0.041	0.033	0.218	0.003
Commercial	21	80	77	294	0.33	0.17	1.74	1.23	0.049	0.037	0.156	0.003
Industrial	24	85	149	202	0.32	0.11	2.08	1.89	0.072	0.058	0.671	0.005
Highways	24	103	141	294	0.43	0.22	1.82	0.83	0.049	0.037	0.156	0.003
Water/ Wetlands	4	6	6	12	0.08	0.04	0.79	0.59	0.011	0.007	0.003	0.001

Adapted from NURP (1983), Horner et. al (1994), and Cave et. Al. (1994)

- BOD = Biochemical Oxygen Demand TKN = Total Kjeldahl Nitrogen
- COD = Chemical Oxygen Demand NO₂/NO₃ = Nitrates / Nitrites
- TSS = Total Suspended Solids Pb = Lead
- TDS = Total Dissolved Solids Cu = Copper
- TP = Total Phosphorus Zn = Zinc
- DP = Dissolved Phosphorus Cd = Cadmium

Fecal coliform (FC) concentrations were not provided in the table above due to the large variability. Guidance from SCHDEC and NURP (1983) should be sought when estimating existing and post-development bacteria loads and the reduction requirements.

Table 3.7: Accepted Water Quality Controls

General Structural Control	Description
Wet Ponds	Wet stormwater ponds are constructed stormwater basins that have a permanent pool or micropool of water. Runoff from each rain event is detained and treated in the pool, and released at a designed rate.
Storm Water 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 soil.
Infiltration Trenches	An infiltration trench is an excavated trench filled with stone aggregate used to capture and allow infiltration of stormwater runoff into the surrounding soils from the bottom and sides of the trench.
Enhanced Grassed 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.
Engineered Devices <ul style="list-style-type: none"> • Vortex Separator • Baffles • Cartridges • Skimmers • Bioretention • 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 there is limited data on the performance of these structures. Until further research is done and substantial removal efficiencies are published, these structures may require monitoring. Some of the popular vendors/products include, but are not limited to, Crystal Stream, Vortech, Aquashield, Filterra, Stormceptor, Stormfilter, CDS, BaySaver, and Downstream Defender ¹ . This is by no means a complete list and the Town Engineer will 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.

¹ This list is not intended as preference for these devices nor to exclude others.

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 3.7. 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 3.8.

Table 3.8: Limited Structural Controls

Limited Structural Control	Description
Vegetated Filters <ul style="list-style-type: none"> • 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 wetland plants in a 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 will be utilized.
Small Sand Filters <ul style="list-style-type: none"> • 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 / 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 for each BMP proposed.

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

1. Buffers: an area along a shoreline, 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 allowed to filter through vegetation and other landscaped material and infiltrate into the soil.
3. Grass/Porous pavements: allows for the reduction of paved areas by implementing areas that are infrequently used, providing water quality benefits through increased infiltration. Should be avoided in high traffic areas
4. Cluster development: concentrate development away from environmentally sensitive areas such as streams, wetlands, mature wooded areas, and steep slopes.
5. Literature for owners, and Homeowners Associations (HOAs) to educate and train themselves 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.

3.4.3 Water Quality Design Standards

3.4.3.1 General Standards

The following design criteria are established for water quality control and must be incorporated in one or more BMPs for a given sub-basin unless a specific quality waiver is granted by the Town Engineer. Incorporation of these requirements shall constitute adequate control of the discharge of pollutants.

1. All sites which disturb one (1) acre or greater shall include best management practices (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) over a 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 1-inch (1") of runoff from the contributing watershed area over a minimum period of 24-hours.
 - c. For areas not draining to a pond, it should be demonstrated how permanent water quality requirements will be addressed.

2. The WQV requirement may be waived if treatment is instead provided by engineered devices. Applicability of such waivers will 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 1-inch.
3. BMPs used strictly for water quality that will 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 3.8 – Special Protection Areas. This will 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 % reductions) or to prevent further impairment. A list of approved water quality devices was provided in the previous section.

If the site disturbs less than 25 acres, an evaluation of the BMPs chosen to control the release of pollutants must be provided. Such evaluations may reference published values on BMP effectiveness. For projects that disturb 25 acres or more, a quantitative and qualitative analysis shall be provided and include, at a minimum, calculations that show:

- a sites pollutant load for all pollutants of concern (see Table 3.5),
 - the trapping effectiveness of the chosen BMPs, and
 - that the runoff discharged through the last water quality BMP has a water quality level equal to or better than the in-stream standard or as required by an applicable TMDL.
5. All BMPs must have a maintenance plan. Suggested schedules and routine activities are provided in the BMP Manual (SCDHEC 2005).
 6. The Town Engineer 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 water quality regulations are met.

3.4.3.2 Typical Water Quality Design Procedures

1. Determine an appropriate, accepted BMP(s) needed for the site, considering the land use, pollutants of concern (Table 3.5), soils, maintenance requirements, and location in relation to waters of the State and any impairments that may exist.

2. If the receiving water of the project is impaired or has an adopted TMDL, the applicant must show that water quality standards are being met and designated uses are not impacted. This proof must be quantitative and qualitative for sites which disturb greater than 25 acres. The appropriate steps include:
- a. Calculate the estimated load for the pollutant(s) of concern. The IDEAL model may be used for all water quality calculations. Another, less preferred option is the Schuler Simple Method (Schueler 1987). This method is based on an extensive database obtained in Washington, D.C. for the National Urban Runoff Program (NURP). The Simple Method estimates pollutant loads from urban development by the following equation:

$$L = 0.227(Q P_j R_v C A) \quad \text{Equation 1}$$

Where:

- L** = Pollutant load in pounds per desired time interval,
Q = Runoff depth,
 ½-inch for wet ponds, some wetlands,
 1-inch for all other BMPs,
P_j = Fraction of rainfall events over the time intervals that produce runoff
 P_j = 1 for a single event
 P_j = 0.9 for larger time intervals (months, years),
R_v = Volumetric runoff coefficient expressing the fraction of rainfall converted to runoff (See Equation 2),
C = Event mean pollutant concentration in mg/l (See Table 3.6),
A = Total area of site in acres (areas < 640 acres are recommended for this method).

The most important factor affecting the volumetric runoff coefficient (**R_v**) is the imperviousness of the watershed, **I**, in percent. An empirical relationship was developed that relates **R_v** and **I** as:

$$R_v = 0.05 + 0.09(I) \quad \text{Equation 2}$$

The rainfall depth, **P**, was chosen such that a large percentage of storm events will be captured, with larger events only partially captured or bypassed. Greater than 85% of the average annual rainfall amount in The Town of Summerville occurs from storm events with a total depth equal to or greater than 1-inch. The 1-inch of runoff from pervious areas is the result of approximately 4.5-inches of total rainfall, but it only takes a rainfall of 1.2 inches on impervious surfaces.

Other loading modules, such as in SEDPRO and SEDCAD for eroded particles or common buildup and washoff equations may be used.

- b. Select appropriate BMPs from Tables 3.7 and the BMP Uses tables in Appendix J. The use of an engineered device would require documentation to demonstrate its equivalency in meeting water quality criteria.
 - c. Compute BMP effectiveness for removing pollutants of concern, showing at a minimum that the concentration of the pollutants of concern from the last BMP meets applicable water quality standards.
3. If the BMP is to capture runoff from 5 or more acres, design a forebay or vault. Guidance on this aspect can be found in SCDHEC (2005) and ARC (2001).
 4. Calculate the water quality volume using the following equation.

$$WQV = \frac{Q * DA}{12} \quad \text{Equation 3}$$

Where:

- WQV** = water quality volume (acre-feet)
- Q** = runoff depth inches (one-half inch (1/2") for permanent pool ("wet") structures, one inch (1") for dry structures, one and one-half inches (1-1/2") if project is within 1,000 feet of a shellfish bed)
- DA** = drainage area to water quality BMP (acres). Runoff from the entire site must be captured in a water quality BMP, unless otherwise allowed by the Town Engineer.
5. Compute the inflow hydrograph for the structure for one inch (1") or one-half inch (1/2"), 24-hour storm event, as necessary, for the proposed condition. Note – this is the one inch (1") **runoff** event.
 6. Unless already known from the quantity calculations detailed in section 3.3.2, compute stage-storage and stage-discharge relationships of the outlet control structure(s).
 7. Perform routing calculations for the one inch (1") or one-half inch (1/2"), 24-hour storm event through the BMP. These may be done by hand, or may be done by using a storage routing computer model.
 8. Determine if the entire volume from the one inch (1") or one-half inch (1/2"), 24-hour storm event was released before the 24-hour point. If it does, the outlet is too large. Resize outlet structure.
 9. Repeat steps 4-8 until entire volume is not released prior to 24-hours. This procedure is commonly accomplished using a low-flow orifice and the two-year discharge level is not reached.

10. For engineered devices, alternative calculations other than detailed here should be provided. SCDHEC has accepted some such devices as providing adequate treatment as compared to capturing and detaining the one inch (1") storm event.
11. Provide all calculations in the submittal package in a cohesive, organized, and easy to follow format.

3.5 Erosion Prevention and Sediment Control Standards

The Town of Summerville requires that an erosion prevention and sediment control (EPSC) plan be submitted and approved for construction activities that result in land disturbance of equal to or greater than one (1) acre (Type II or III Application). This plan shall describe the practices and controls that will be used during and after construction to meet the following goals:

1. Minimization of the extent and duration of disturbed soil exposure,
2. Prompt stabilization of disturbed areas,
3. Protection of off-site and downstream locations, drainage systems and natural waterways from the impacts of erosion and sedimentation,
4. Limitation of the exit velocities of the flow leaving the site to non-erosive or pre-development conditions, and
5. Design and implementation of an ongoing inspection and maintenance plan.

3.5.1 Accepted EPSC BMPs

The various types of EPSC BMPs that are acceptable for use in The Town of Summerville are presented below. 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.

3.5.1.1 Erosion Prevention Measures

Erosion prevention measures shall be used during and after construction site preparation to avert the discharge of runoff highly concentrated with sediment and other associated pollutants. One or more measures are typically needed on a given site. Measures that fall into this category along with their preferred application are provided in Table 3.9. Details on each of these measures are not discussed in this Manual. Guidance documents that should be referenced as necessary include: SCDHEC (2003), Haan, C. T., Barfield, B. J., and Hayes, J. C. (1995) and Schwab, Glenn O. and Richard K. Frevert (1985). Other practices, such as engineered devices, will be allowed as long as sufficient evidence is presented as to their effectiveness. Standard details can be found at

[.http://www.scdhec.net/environment/ocrm/pubs/tech_docs_water.htm#bmp](http://www.scdhec.net/environment/ocrm/pubs/tech_docs_water.htm#bmp).

Table 3.9 Erosion Prevention BMP Suggested Uses

BMP	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Erosion Prevention Measures	X	X	X	X	X	X	X
Surface Roughening	X		X				
Bench Terracing	X		X				
Temporary Seeding	X		X		X	X	X
Mulching	X				X	X	
Erosion Control Blankets (ECB) and Turf Reinforcement Mats (TRM)	X	X	X			X	
Final Stabilization	X		X		X		X
Topsoiling			X		X		
Permanent Seeding and Planting of Grasses	X		X		X		X
Permanent Ground Cover Plants	X		X				X
Sodding	X		X		X		X
Riprap or Aggregate	X	X	X				
Outlet Protection		X		X			X
Dust Control					X	X	X
Polyacrylamide (PAMs)	X		X	X	X	X	X

3.5.1.2 Temporary Sediment Control Measures

The Town of Summerville emphasizes preventative measures as the main control to protect against erosion, both during and following construction. However, there are typically instances where erosion prevention measures alone do not provide sufficient control. For these situations, temporary sediment controls shall be implemented to control the migration of eroded sediment off site. The sediment control measures are typically only applicable as practices for use during construction. One or more of the measures should be utilized as appropriate during the project's construction phase. Table 3.10 contains a list of some of the suggested controls of this type along with their intended use. Details on these and others measures are located at http://www.scdhec.net/environment/ocrm/pubs/tech_docs_water.htm#bmp. Additional information can be found in Haan, Barfield, and Hayes (1995) and the SCDHEC BMP Handbook. Other practices, such as engineered devices, will be allowed as long as sufficient evidence is presented as to their effectiveness.

Table 3.10 Temporary Sediment Control BMP Suggested Uses

BMP	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Temporary Sediment Control Structures	X	X	X	X	X	X	X
Storage Volumes and Maintenance Schedules		X		X			X
Temporary Sediment Basin		X	X	X			X
Multipurpose Basin		X	X	X			X
Temporary Sediment Trap		X	X				X
Silt Fence	X	X					X
Rock Ditch Check			X				X
Stabilized Construction Entrance					X		X
Storm Drain Inlet Protection		X		X			X
Vegetated Filter Strips		X					X
Rock Sediment Dike		X	X				X

3.5.1.3 Runoff Control and Conveyance Measures

This category of EPSC BMPs should be used as necessary during and following construction. Suggested varieties and their corresponding uses are provided in Table 3.11.

Table 3.11 Runoff Control and Conveyance Measure BMP Suggested Uses

BMP	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Pipe Slope Drains	X		X				
Temporary Stream Crossing		X	X				X
Runoff Conveyance Measures	X					X	X
Construction De-watering		X		X	X	X	
Level Spreader			X		X		X
Subsurface Drains			X		X		

3.5.1.4 Temporary Vegetation/Seeding

Description

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.

When and Where to Use

Temporary seeding is used on exposed soil surfaces such 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. Cleanout requirements for sediment basins, sediment traps and silt fence is reduced if the drainage area is seeded when grading and construction operations are not taking place.

Temporary stabilization is required within fourteen (14) days after construction activity is complete unless construction activity is going to resume within 21 days. Cover seeded areas with an appropriate mulch to provide protection from the weather. 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.

Plant Selection

Plant seed selection should be based on the type of soil and the season of the year in which the planting is to be done. Tables 3.12 and 3.13 should be used if you plan to use conventional tillage methods (plowing, seedbed preparation, hydroseeding, etc). If you need a fast growing crop to nurse your permanent species, then use the mix rate. Failure to carefully follow agronomic recommendations often results in an inadequate stand of temporary vegetation that provides little or no erosion control.

Tillage

If the area has been recently plowed, no tillage is required other than raking or surface roughening to break any crust that has formed and to leave a textured surface. If the soil is compacted less than 6-inches, it should be disked for optimal germination.

Soil Testing

Information on soil testing is available from the Clemson University Home and Garden Information Center at (888) 656-9988 or at <http://hgic.clemson.edu>.

Lime

Lime is not required for temporary seeding unless a soil test shows that the soil pH is below 5.0. It may be desirable to apply lime during the temporary seeding operation to benefit the long-term permanent seeding. Apply a minimum of 1.5 tons of Lime/acre (70 pounds per 1000 square feet) if it is to be used.

Fertilizer

A minimum of 500 pounds per acre of 10-10-10 fertilizer (11.5 pounds per 1000 square feet) or equivalent should be applied during temporary seeding unless a soil test indicates a different requirement. Fertilizer and lime (if used) should be incorporated into the top 4-6 inches of the soil by disking or other means where conditions allow.

Seeding

The surface of the soil should be loosened just before broadcasting the seed. Seed should be applied evenly by the most convenient method available for the type of seed to be used and the location of the temporary seeding. Typical application methods include but are not limited to cyclone seeders, rotary spreaders, drop spreaders, broadcast spreaders, hand spreaders, cultipacker seeder, and hydro-seeders. Cover applied seed by raking or dragging a chain, and then lightly firming the area with a roller or cultipacker.

Mulching

Mulch should be used in seeded areas to retain soil moisture and reduce erosion during establishment of vegetation. The most commonly accepted mulch used in conjunction with temporary seeding is small grain straw. This straw should be dry and free from mold damage and noxious weeds. The straw may need to be anchored with netting or emulsions to prevent it from being blown or washed away. The straw mulch may be applied by hand or machine at the rate of 1.5 - 2 tons per acre (90 pounds per 1000 square feet). Frequent inspections are necessary to check that conditions for growth are good.

Irrigation

Seeded areas should be kept adequately moist. Irrigate the seeded area if normal rainfall is not adequate for the 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.

Re-seeding

Areas where the plants do not grow quickly, thick enough, or adequately to prevent erosion should be re-seeded with temporary grasses as soon as such areas are identified.

Table 3.12 Temporary Vegetation Schedule

Species	Rates (lbs/acre)	Optimum Dates to Plant	Remarks
Browntop Millet (Alone)	40	April 20 - August 15	Quick, Dense Cover
Browntop Millet (Mix)*	10	April 20 - August 15	Quick, Dense Cover
Rye Grain (Alone)	56	February - March, August 15 - November 20	Quick Cover
Rye Grain (Mix)*	10	February - March, August 15 - November 20	Quick Cover
Rye Grass (Alone)	50	August 10 - October 10	Competitive, Dense
Rye Grass (Mix)	8	August 10 - October 10	Competitive, Dense

* For details on mixes consult the Clemson University Home and Garden Information Center at (888) 656-9988 or at <http://hgic.clemson.edu>.

Table 3.13 Temporary Vegetation for Steep Slopes/Cut Slopes

Species	Rates (lbs/acre)	Optimum Dates to Plant	Remarks
Weeping Lovegrass (Alone)	4	April - July 20	Quick cover, deep roots, likes dry sites, seldom used alone, clumps
Weeping Lovegrass (Mix)	2	April - July 20	Quick cover, deep roots, likes dry sites, seldom used alone, clumps

* For details on mixes consult Clemson University Home and Garden Information Center at (888) 656-9988 or at <http://hgic.clemson.edu>.

3.5.1.5 Permanent Vegetation/Seeding

Plant Selection

Plant seed selection should be based on the type of soil, the season of the year in which the planting is to be done, and the needs and desires of the permanent land user. Tables 3.14 and 3.15 should be used to select the desired species to be planted. Failure to carefully follow agronomic recommendations often results in an inadequate stand of permanent vegetation that provides little or no erosion control. The rates in Tables 3.14 and 3.15 are based on purity and germination standards required for certification.

The following notes apply to Tables 3.14 and 3.15.

1. In mixtures with temporary cover, the full seeding rate of permanent cover shall be used.

Mix means 2 or more long term species plus short term species. For dates other than optimum, contact the Clemson University Home and Garden Information Center at (888) 656-9988 or at <http://hgic.clemson.edu>.

2. A legume, such as a clover, crown vetch, and sericea should be used where it is possible.
3. The appropriate inoculants should be used.

Topsoil

If the surface soil of the seedbed is not adequate for plant growth, topsoil should be applied.

Tillage

If the area has been recently plowed, no tillage is required other than raking or surface roughening to break any crust that has formed and to leave a textured surface. If the soil is compacted less than 6-inches, it should be disked for optimal germination. If the soil is compacted more than 6-inches, it should be sub-soiled and disked.

Soil Testing

Information on soil testing is available from the Clemson University Home and Garden Information Center at (888) 656-9988 or at <http://hgic.clemson.edu>.

Lime

Unless a specific soil test indicates otherwise, apply 1½ tons of ground course textured agricultural limestone per acre (70 pounds per 1000 square feet).

Fertilizer

A minimum of 1000 pounds per acre of a complete 10-10-10 fertilizer (23 pounds per 1000 square feet) or equivalent should be applied during permanent seeding of grasses unless a soil test indicates a different requirement. Fertilizer and lime (if used) should be incorporated into the top 4-6 inches of the soil by disking or other means where conditions allow. Do not mix the lime and the fertilizer prior to the field application.

Seeding

The surface of the soil should be loosened just before broadcasting the seed. Seed should be evenly applied by the most convenient method available for the type of seed to be applied and the location of the temporary seeding. Typical application methods include but are not limited to

cyclone seeders, rotary spreaders, drop spreaders, broadcast spreaders, hand spreaders, cultipacker seeder, and hydro-seeders. Cover applied seed by raking or dragging a chain or brush mat, and then lightly firming the area with a roller or cultipacker. Do not roll seed that is applied with a hydro-seeder and hydro-mulch.

Mulching

All permanent seeded areas should be covered with mulch immediately upon completion of the seeding application to retain soil moisture and reduce erosion during establishment of vegetation. The mulch should be applied evenly in such a manner that it provides a minimum of 75% coverage. Typical mulch applications include straw, wood chips, bark, wood fiber, and hydro-mulches. The most commonly accepted mulch used in conjunction with permanent seeding is small grain straw. This straw should be dry and free from mold damage and noxious weeds. The straw may need to be anchored with netting or asphalt emulsions to prevent it from being blown or washed away. The straw mulch may be applied by hand or machine at the rate of 2 tons per acre (90 pounds per 1000 square feet). Frequent inspections are necessary to check that conditions for growth are good.

Irrigation

Permanent seeded areas should be kept adequately moist, especially late in the specific growing season. Irrigate the seeded area if normal rainfall is not adequate for the 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.

Re-seeding

Inspect permanently seeded areas for failure, make necessary repairs and re-seed or overseed within the same growing season if possible. If the grass cover is sparse or patchy, re-evaluate the choice of grass and quantities of lime and fertilizer applied. If the permanent seeding has less than 40% cover, have the soil tested to determine any acidity or nutrient deficiency problems.

Final stabilization by permanent seeding of the site requires that it be covered by a 70% coverage rate.

Post-Stabilization

Once areas are stabilized they can be converted to native species or for establishing on non-critical, level sites. Table 3.16 lists some native species of The Town of Summerville that can be used.

Table 3.14 Permanent Vegetation Schedule

Species	Rates (lbs/acre)	Optimum Dates to Plant	Remarks
Bermuda Grass (Hulled) (Alone)	8-12	April - July 15	Quick cover, Sod forming, partial winter kill
Bermuda Grass (Hulled) (Mix)*	4-6	April - July 15	Quick cover, Sod forming, partial winter kill
Fescue, Tall (KY31) Alone	40	August 15 - October	Seldom seeded alone, not for dry or wet sites
Fescue, Tall (KY31) Mix*	20	August 15 - October	Seldom seeded alone, not for dry or wet sites
Sericea Lespedeza (Scarified) Alone or Mix*, (Inoculate with EL Inoculant)	40	April - June	Good for slopes, cuts, and fills that require low maintenance
Ladino Clover (Mix* only), (Inoculate with AB Inoculant)	2	August 20 - October	Naturally adds nitrogen

* For details on mixes consult the Clemson University Home and Garden Information Center at (888) 656-9988 or at <http://hgic.clemson.edu>.

Table 3.15 Permanent Vegetation Schedule for Steep Slopes/Cut Slopes

Species	Rates (lbs/acre)	Optimum Dates to Plant	Remarks
Weeping Lovegrass (Alone)	4	April – July 20	Quick cover, deep roots, likes dry sites, seldom used alone, clumps
Weeping Lovegrass (Mix)*	2	April – July 20	Quick cover, deep roots, likes dry sites, seldom used alone, clumps
Crownvetch (Mix*) (Inoculate with Type M Inoculant)	8-10	March - April	2 years to establish, no mowing, green all year, 20” maximum height

* For details on mixes consult the Clemson University Home and Garden Information Center at (888) 656-9988 or at <http://hgic.clemson.edu>.

3.5.2 EPSC Design Standards

3.5.2.1 General Standards

1. EPSC plans shall be developed to achieve an eighty (80) percent design sediment removal efficiency goal. Simply applied, when a site is completely denuded of vegetation, the structural and nonstructural EPSC measures shall be designed to trap 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 SCS Type III storm event. Calculations using models, such as SEDPRO or SEDCAD, or SCDHEC design aids shall be provided to show adherence to this criteria.

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 will 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 drain to a single outlet point. Such basins shall be designed to have a design of 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 100 acres. Sediment traps shall not have more than 5 acres draining to them.

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

4. Silt fencing shall be placed at the toe of all fill slopes and soil berms and below disturbed areas where the size of the area is no more than $\frac{1}{4}$ -acre per one hundred (100) feet of silt fence length. The maximum slope length behind the fence is 100 feet and the maximum gradient behind the fence is 2H:1V.
5. The following nonstructural site management practices shall be utilized on the plans where applicable:
 - a. Minimize site disturbance to preserve and maintain existing vegetative cover,
 - b. Limit the number of temporary access points to the site for land disturbing activities,
 - c. Protect off-site and downstream locations, drainage systems and natural waterways from the impacts of erosion and sedimentation,
 - d. Phase and sequence construction activities to minimize the extent and duration of disturbed soil exposure, and
 - e. Implement an ongoing inspection and maintenance plan. Suggested maintenance schedules are given in SCDHEC (2005).
6. Sediment storage volumes shall be calculated for all sediment controls to determine the required clean-out frequencies and maintenance schedules. The Universal Soil Loss Equation (USLE) and subsequent modifications or other acceptable methods that determine sediment yield may be used to predict the required sediment storage volumes for specific sediment control structures.

7. 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 Town Engineer. To use an alternative BMP, the design professional shall submit substantial evidence that the proposed measure will 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.
8. 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 entrances 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. Crossings of waterways during construction should be minimized and must be approved by the Town Engineer and possibly the U. S. Army Corps of Engineers (USACOE). 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 will 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 seven (7) calendar days after the activity has ceased. Hydroseeding as often as possible is encouraged. Stabilization of disturbed areas is one of the best approaches for erosion prevention and sediment control.
 - e. All slopes must be stabilized through grassing, hydroseeding, synthetic or vegetative matting, diversion berms, temporary slope drains, etc. and must be performed within two (2) working days after the necessary grading (temporary or permanent) has been achieved.
 - f. Final stabilization of the site shall be required within fourteen (14) calendar days of construction completion. Final stabilization is defined as having a uniform vegetative cover with a density of seventy (70) % 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/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
9. 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. The finished grades of cut and fill slopes to be vegetated with vines and/or groundcovers should not be steeper than 1H:1V.
 - b. Cuts or 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, bearing strength or create undesirable wetness.
 - d. No fill shall be placed where it can slide or wash onto another property.
 - e. 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.
 - f. All borrow and disposal areas should be included as part of the grading plan.
 - 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.

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10. EPSC plan shall have the following information contained in a cohesive, organized, and easy to follow format:
 - a. Location of all erosion and sediment control structures on construction documents;
 - b. Delineation of all sensitive features (wetlands, streams, ponds, existing stormwater structures, etc.) and potential sediment sources;
 - c. Installation sequencing and maintenance schedules for all EPSC BMPs during and after construction;
 - d. Provisions to preserve topsoil and limit the amount of total disturbed area;
 - e. Details of site grading;
 - f. Design details and computations for all EPSC structures;
 - g. Protection of all storm drain inlets and outlets;
 - h. For sites which disturb greater than five (5) acres, a list or calculation of the trapping efficiency for all EPSC BMPs, as applicable;
 - i. For sites which disturb greater than five (5) acres, calculations of required sediment storage volumes for all EPSC BMPs, as applicable;
 - j. Explanation of any computer models or software used with highlights of and/or notes on the output data;
 - k. Locate temporary and permanent soil disposal areas, haul roads, and construction staging areas to minimize erosion, sediment transport, and disturbance to existing vegetation;
 - l. All necessary certifications by the person responsible for the activity. This includes the NOI application signatures and operating/maintenance agreement. Proper preparation of the EPSC Plan and the SWPPP, if necessary, by a registered engineer.

3.5.2.2 Typical EPSC Design Procedures

The design procedures will vary depending on the EPSC BMP. Many of the BMPs listed in Tables 3.9 – 3.16 do not need to be “designed” using calculations, such as surface roughening or dust control. Others require the use of equations or design aids to properly design. SCDHEC has two handbooks, the BMP Handbook (SCDHEC 2005) and the Stormwater Management and Sediment Control Handbook (SCDHEC 2003) that provide the procedures and equations needed to design some of the EPSC BMPs listed in Tables 3.9 – 3.15. Example problems are given for most types. As with the design of any BMP, engineering judgment will be needed on most

applications. Proper design must be complemented with proper installation and routine maintenance in order for BMPs to be effective and to adhere to the provisions of this section.

3.6 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.

1. Storm Drain Pipes:
 - a. Storm drainage lines shall be staked at each box or at intervals that would be sufficient to check alignment and grade of the construction with the approved plans. The use of lasers to augment control is encouraged.
 - b. The minimum size storm drainage pipe allowable shall be fifteen (15) inches in diameter.
 - c. The minimum allowable slope for storm drainage pipe shall be one-half of one (1) percent [0.005 ft/ft] or a minimum flow velocity of three (3) feet per second at all flow levels. Maximum allowable slope for storm drainage pipe is twenty (20) percent. Maximum allowable flow velocity shall be ten (10) feet per second.
 - d. Drainage system installation must be such that stormwater discharge is not concentrated on adjacent property owners and that the velocity is less than erosive limits for the site soils. At pipe outfalls, this normally requires the use of a rip-rap apron, placed on filter fabric and lightly grouted, for a minimum distance equal to or greater than six (6) pipe diameters. Level spreaders and three dimensional soil stabilization matting may also be used upon engineering review and approval.
 - e. Type and class of storm drainage pipe, as well as the construction of pipe culverts, shall be in accordance with Sections 714 of the SCDOT specifications. All storm drainage pipes under pavement in roadways shall be RCP with o-ring joints and a minimum Class III. Backfill shall consist of suitable material and compaction requirements per SCDOT Specifications.
 - f. A minimum of one (1) foot of cover shall be provided for all storm drainage pipes under unpaved roads or any other situation in which no roadway or other structure is to cover the pipe. For RC pipe under any paved surface, the absolute minimum cover is 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 highly recommended. Contact the Town Engineer for minimum depths in other situations (e.g. other pipe types). RCP Class IV or Class V may be requested by the Town Engineer in special conditions (e.g. deep installation, excessive surface loads, etc).

- g. Storm drainage 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 8" loose lifts to 95% Standard Proctor maximum density. Subgrade and base course compaction shall be per SCDOT Standard.
- h. Any "open" storm drainage cross line pipe shall extend out to the toe of the roadway embankment; in no case will the end of the pipe be within the five foot roadway shoulder.
- i. Storm drainage 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 at most equal to ninety (90) degrees. Rip-rap, 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.
- j. Storm drainage pipe discharging into a wet pond or lake shall have the discharge invert above the permanent pool elevation and rip-rap or other energy dissipation structures shall be placed from the outlet point to pool level. Submerged systems shall be avoided and will only be permissible based upon justification and prior approval from the Town Engineer.
- k. A maintenance access point shall be available at a minimum distance of 200 feet for all drainage lines. In addition, manholes shall be placed at all intersections, grade changes, alignment changes, a pipe size or a pipe geometry change.
- l. 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.
- m. 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.
- n. Calculations should be performed for the appropriate design storm event (see Section 3.2 above).
- o. 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. The Saint-Venant equations (full dynamic wave), which are used in many common engineering programs, shall be employed in larger design situations. When the Saint-Venant equation is used the energy grade line should not be more than one (1) foot over the top of the pipe unless pipe joints are designed to for the access pressure.

- p. Storm drain profile plots shall be included in the set of construction plans.
 - q. Storm drainage systems shall be designed to convey stormwater runoff by gravity flow unless otherwise approved.
 - r. 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.
 - s. 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 Town Engineer.
 - t. In opening trenches in any street or public way, the paving or base material shall be removed in a manner directed by the Town Engineer. 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.
 - u. Notice shall be provided to the Engineering 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 Engineering Department. At the end of all projects in which pipes were installed, the entire closed system (pipes, boxes, etc.) may require to be video inspected and sent to the Engineering Department as part of the closeout procedure. Pipes shall be video inspected again at the end of the 2-year warranty period. See Chapter 2 for video specifications.
2. Culverts:
- a. Proper consideration of inlet and outlet control shall be given in the design of culverts and outlets.
 - b. The pipe, appurtenant entrance and outlet structure should properly account for water, bed-load, and floating debris at all stages of flow.

- c. There should be no unnecessary or excessive cause of property damage.
 - d. The outlet should be designed to resist undermining and washout.
 - e. 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 the Town Engineer. Designs shall be based upon SCDOT requirements where applicable.
 - f. Culverts under roadways shall be designed using the fifty (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 Town of Summerville Engineering Department.
 - g. Additional hydraulic capacity shall be required, as necessary, to prevent backwater effects that may adversely impact upstream properties or structures.
 - h. Acceptable models for designing culverts include, but are not limited to:
 - ICPR
 - HY8
 - Pond Pack
 - HEC-RAS
 - Flow Master
 - HydroCad
 - i. A complete study of culverts and design considerations can be found in USDOT 2001a.
 - j. Culvert installation should follow the standards outlined in SCDOT Standard Specifications, Section 714.
3. Headwalls and Outlets:

All exposed ends of pipes shall be protected by a flared end section (limited to pipes 36" or less in diameter) or one of the following type headwalls:

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

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- b. A rip-rap headwall is acceptable for pipes 24" or less 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.
 - c. Storm drainage or pond outfalls must be carried to an existing drainage outfall such as a pipe, ditch, etc.
 - d. If feasible, provided a 20-foot minimum buffer between the property line and the end of all pipes or energy dissipation measures installed.
 - e. 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.
 - f. Outlets will not be allowed to discharge on fill slopes.
4. Energy Dissipation:
 - a. All outlets should be sufficiently stabilized. Calculations shall be provided justifying the design and material used (e.g. riprap aprons geometry and diameter).
 - b. If riprap aprons are used, filter fabric is to be installed beneath all riprap.
 - c. Level spreaders, plunge pools, etc. shall be properly designed and installed at the proposed outlet(s).
 5. Catch basins, yard inlets, manholes, and junction boxes.
 - a. Materials and construction shall be as specified in Section 719 of the SCDOT specifications.
 - b. When the depth of a catch basin or junction box exceeds four and one-half (4.5) feet, rungs/steps shall be provided for ascent and descent. (Steps are to be ASTM-C-478, or equivalent.)
 - c. The box top shall be a minimum of three (3) feet by three (3) feet. Sides shall be plastered with grout.

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- d. 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.
 - e. All roadway catch basins shall be a standard SCDOT type approved by the Town Engineer based on the application.
 - f. 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 15% factor of safety shall be used to account for debris/clogging. For inlet on grade, theoretical capacity shall be considered in the design the longitudinal and cross slopes, and gutter depression. The length of the gutter opening must be such that the gutter efficiency is 80% 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.

- g. SCDOT inlets shall be designed to accommodate a projected flow such that ponded water dissipates within 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 6 inches for the appropriate design storm.
- h. Catch basins will 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.
- i. Catch basins shall contain a minimum drop of 0.1 feet from invert in to invert out.
- j. Within a catch basin, the elevation at the crown of any inlet pipe shall be equal to or greater than the crown of the outlet pipe.
- k. Catch basins shall be field staked to ensure proper catch basin inlet alignment with the street gutter line.
- l. Area around all catch basins shall be backfilled in eight (8) inch loose lifts, compacted to 95% Standard Proctor maximum density.
- m. Inlet protection shall be provided at all inlets into the stormwater system during construction and until project closure procedures have been completed or notification from the Town Engineer 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 (2005).

- n. Inlet spacing shall be based partly on the maximum spread of water into the road way. 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 inlets, 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.
- o. 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.
- p. Inlets placed in roadway gutter lines must be spaced to prevent flow from entering road intersections and to not exceed a maximum spread of 6-feet, or one-half of a travel lane, whichever is greater, and based on maximum inlet capacity.
- q. In depth design procedures for inlet and storm sewer design may be referenced in AASHTO (1999), USDT (2001b), Mays, L., (2001), and Yen (2001). Culvert design guidance is found in USDT (2001a).
- r. Catch basins that are proposed in series shall include the last catch basin prior to discharge to a ditch/pond with a minimum of a 12" sump. The location of the catch basin shall be such that access can be provided by Town of Summerville personnel for maintenance purposes

3.7 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 the Town Engineer. A number of acceptable techniques are shown in the current version of the SCDHEC (2005).
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) ft/sec (two and one-half (2.5) ft/sec in bare sandy soils) or the channel surfaces must be adequately lined, e.g., rip-rap, concrete.
3. The minimum channel grade shall be 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 or Turf Reinforcement Matting shall be no steeper than 3H to 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. The Town of Summerville allows vegetated channels. Guidance on the design of these type channels can be found in Haan et. al. (1995) or by using computer software that is capable of calculating channel stability and capacity.
8. Additional hydraulic capacity shall be required as necessary to prevent backwater effects that may adversely impact upstream property or structures.
9. Acceptable models for designing open channels include, but are not limited to:
 - ICPR
 - HY8
 - Pond Pack
 - HEC-RAS
 - Flow Master
 - HydroCAD

Table 3.16 Maximum Permissible Velocities for Vegetated Channels

Cover	Permissible Velocity (ft./sec.)*					
	Erosion Resistant Soils			Easily Eroded Soils		
	% Slope			% Slope		
	0-5	5-10	> 10	0-5	5-10	> 10
Bermuda Grass	8	7	6	6	5	4
Buffalo Grass						
Blue Gamma						
Centipede Grass						
Tall Fescue	7	6	5	5	4	3
Kentucky Bluegrass						
Red Canary Grass						
Grass-legume Mixture						
	5	4	NR	4	3	NR
Lespedeza Sericea						
Weeping Lovegrass						
Kudzu						
Alfalfa						
Small Grains	3.5	NR	NR	2.5	NR	NR
Temporary Vegetation						

* Allow velocities over 5 ft/sec only where good cover and maintenance will be provided. If poor vegetation exists due to shade, climate, soils or other factors, the permissible velocity shall be reduced by 50 percent.

NR = Not Recommended

Sources: Elementary Soil and Water Engineering, Shwab et. al. and Hann et. al. (1995)

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

3.8 Special Protection Areas

In an effort to address some of the most critical water resource problems that exist in the Town, Special Protection Areas have been established. Those wishing to develop or redevelop lands within these protected areas will 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)). At such times that maps are made available to the public, the Town Engineer will 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 maps are not included in the manual due to expected changes in the designated areas, particularly those associated with TMDLs.

3.8.1 Water Quantity Issues

Flooding problem areas exist in many locations around the Town 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. In an effort to relieve existing flooding problems, the following list of design criteria will be required in designated areas. The requirement 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 is restricted to half (½) the pre-development rates for the 2 and 10-year storm event or to the downstream system capacity, whichever is less.
2. The post-development runoff volumes for the 2-year frequency 24-hour duration storm events above the predevelopment level shall be stored for a period of 24-hours on average before release.

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

3.8.2 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 bi-annual report of the impaired waterbodies. Waters listed on the 303(d) list will 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 at <http://www.scdhec.gov/HomeAndEnvironment/Water/ImpairedWaters/Overview/>.

CHAPTER 4 - INSPECTIONS & ENFORCEMENT

This chapter establishes inspection and enforcement guidelines to be followed by the Town.

4.1 Stormwater Management Inspections

The Town will inspect applicable construction sites from initial land clearing to final stabilization. The purpose of these inspections will be to check for compliance with the Town stormwater management plan approved by the Town Engineer. Maintenance inspections will also be performed on stormwater management systems and facilities throughout their useful life. For each system or facility installed or retrofitted during an approved construction project, the applicant must have submitted a maintenance schedule or plan. Town inspectors will be checking for adherence to this plan and any necessary changes that may arise after installation. Town inspections are not to be construed as a relaxation of the requirements on owners/operators to conduct self-inspection in accordance with any applicable local, state or federal stormwater requirements

4.1.1 Inspector Duties/Responsibilities

The Town of Summerville's Stormwater Management Inspectors shall inspect and enforce the requirements of the Town Stormwater Management Ordinance. The job duties/responsibilities of a Town Stormwater Inspector shall include, but not be limited to, the following:

1. Conduct and document construction site inspections to ensure compliance with the approved Town Approval or stormwater management plan (see Appendix E for checklist). Frequency of inspections will be determined by Town staff on an as needed basis.
2. Ensure that the Town Approval or stormwater management plan, the SWPPP, and the construction plans are on the project site and are properly being followed and implemented.
3. Conduct post-construction inspections to ensure that permanent maintenance is being performed in accordance with the maintenance schedules for the various stormwater management facilities in the Town or approved stormwater management plan.
4. Provide the owner/operator of the project a written report within seven (7) days after every during construction or post-construction site inspection.
5. Issue enforcement orders, as necessary, to the owner/operator when any portion of the work does not comply with the Town Approval and/or stormwater management plan or work is occurring without appropriate Approval. The enforcement process and types of orders is detailed in Section 4.3.

6. Perform a final inspection upon the completion of the stormwater system to determine if the system is constructed in accordance with the Town Approval and/or, stormwater management plan.
7. Take immediate action if the owner/operator fails to comply with the Town Approval or the approved stormwater management plan and an imminent hazard exists as a result. The inspector should address the situation and notify any applicable local, state and federal agencies.
8. Maintain accurate and comprehensive project inspection files ensuring all relevant information is entered in the files to be maintained in the Engineering Department.

4.1.2 Inspection Process and Procedures

As per the Town’s Stormwater Ordinance, the Town Engineer or an authorized representative/designee (inspector) may enter upon all properties for regular inspections, periodic investigations, enforcement and to effectuate the provisions of the Ordinance. Upon refusal by any owner/operator or property owner to permit an inspector to enter upon the property or continue an inspection, the inspector shall terminate the inspection or confine the inspection to portions of the property to which no objection is raised.

Upon completion of a during construction site inspection, the Town inspector should, at a minimum, include the following in his inspection report to be provided to the owner/operator:

1. Date and location of the site inspection.
2. Whether the Town Approval or stormwater management plan, SWPPP, and construction plans have been properly implemented and maintained.
3. Identification of any approved plan or BMP deficiencies.
4. Any corrective actions needed.

Upon completion of a post-construction maintenance inspection, the Town inspector should, at a minimum, include the following in this inspection report to be provided to the owner/operator:

1. Date and location of the site inspection.
2. Whether the activities identified in the approved maintenance schedule have been properly implemented and completed.
3. Identification of any maintenance deficiencies.
4. Any corrective actions needed.

4.2 Owner Inspection Responsibilities

In accordance with any applicable local, state and federal stormwater requirements including, but not limited to, the NPDES Construction General Permit (CGP), owner/operators are responsible for conducting during construction and post-construction site inspections. Records of such inspections should be kept for a minimum of five (5) years and must be made available to the Town upon request.

4.3 Enforcement

If the Town determines that a project is in non-compliance with the Town's Stormwater Management Ordinance, then the Town may direct conformity by proceeding with the appropriate enforcement action. The types of enforcement tools available to the Town include a Correction Order, Notice of Violation (NOV), Stop Work Order and/or Civil/Criminal Penalties. The enforcement mechanism to be utilized will depend on the circumstances as described in the following sections. See Appendix F for the Town enforcement forms.

4.3.1 Correction Orders

The Town Engineer shall issue a Correction Order for first offenses of non-compliance with the Town Ordinance, the Town Approval or the approved stormwater management plan. The purpose of the Correction Order is to give notice of the deficiencies, identify expected corrective results and provide a reasonable timeframe to the contractor prior to the Town taking further action to get a problem resolved. Correction Orders shall be submitted in writing, but a verbal notice may be given if the deficiency needs immediate correction to prevent offsite or downstream impacts. The Town Engineer shall issue Correction Orders within five (5) working days of an inspection. All Correction Orders, verbal or written, shall be noted in the project file.

Correction Orders may be issued in such cases, but not be limited to, when there is:

1. Failure to comply with the approved stormwater design plans to include failure to have properly installed and/or maintained BMP measures.
2. Failure to properly maintain permanent stormwater management structures.
3. Failure to notify the Town Engineer before beginning work on a phase of an approved project.
4. Failure to call for a final site inspection.

A Correction Order should at a minimum include, but not be limited to, the following:

1. Nature of the violation(s).
2. Proposed penalty.
3. Required corrective actions.

4. The time period for correcting the violation(s).

4.3.2 Notices of Violation (NOV)

If a Correction Order has been previously issued and there is either subsequent non-compliance issues or failure to complete the items on the Correction Order within a specified time period, then a Notice of Violation may be issued. In addition, for violations that do not involve a safety issue or an imminent threat of serious damage to the environment and/or public or private property, a Notice of Violation may be issued for, but are not limited to, the following:

1. If construction activities have been initiated and no BMP measures are in place, or are not working to prevent sediment from leaving the site.
2. Failure to have work inspected and approved before restarting construction activities after a stoppage of work.

A Notice of Violation (NOV) should at a minimum include, but not be limited to, the following:

1. Nature of the violation(s).
2. Proposed penalty.
3. Notification that a Stop Work Order may be issued or that Approvals for the site may be suspended or revoked if there is continued non-compliance.
4. Required corrective actions.
5. The time period for correcting the violation(s).

4.3.3 Stop Work Order

A Stop Work Order may be issued for, but are not limited to, the following:

1. Construction activities are occurring without Town Approvals and/or an approved stormwater plan.
2. Past enforcement actions taken by the Town (Correction Orders, Notice of Violations) to remedy a situation(s) have not been properly addressed with appropriate and prompt action to the satisfaction of the Town Engineer.
3. Non-compliance with the plans has resulted in a health or safety issue.
4. Offsite sedimentation resulting from non-compliance with the approved stormwater plan has eliminated or severely degraded a use in a downstream waterbody or that such degradation is imminent.

5. Offsite sedimentation resulting from non-compliance with the approved stormwater plan has caused severe damage to adjacent land.

A Stop Work Order may allow or require correction of violations, but no other construction activities may occur. The Stop Work Order shall state that failure to comply may result in the suspension or revocation of any remaining Approvals issued for the site and/or civil penalties being issued.

4.3.4 Civil Penalties

The Town Engineer may issue a Civil Penalty if a Notice of Violation and/or Stop Work Order has not been complied with or there has not been substantial progress in complying with the Notice of Violation and/or Stop Work Order. In addition, a Civil Penalty may be issued when there are repeated, recurring violations at the same site or when there are repeated, recurring violations by the same responsible party. Violations may subject the owner/operator to Civil Penalties in accordance with the Stormwater Management Ordinance, Division 6. Each separate day of a violation constitutes a new and separate violation.

4.3.5 Criminal Penalties

In addition to any applicable civil penalties, any person who negligently, willfully, or intentionally violates any provision of the Stormwater Management Ordinance shall be guilty of a misdemeanor and shall be punished within the jurisdictional limits of the Town's court. The Town Engineer may issue a uniform summons citation for a violation of the Stormwater Management Ordinance in accordance with Division 6. Each day of a violation shall constitute a new and separate violation.

CHAPTER 5 REFERENCES

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

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Yen, B., (2001). “Hydraulics of Sewer Systems,” in L. W. Mays, ed., *Storm Water Collection Systems Design Handbook*. McGraw-Hill, NY, p. 6-1 – 6-113.

APPENDIX A
APPLICATION FORMS



STORMWATER CONSTRUCTION APPROVAL APPLICATION

(Applicable for single family homes that disturb one (1) acre or more and commercial, industrial, or major subdivisions that disturb one-half (0.5) acres or more)

DATE: ___/___/_____

PROJECT/SITE NAME: _____

I. Project Information

Project Owner/ Operator (Company or person): _____

Contact Person: _____ Company EIN: ___ - _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Phone: (Day) ___ - ___ - ___ (Mobile) ___ - ___ - ___ (Fax) ___ - ___ - ___

Email address: _____

Person Financially Responsible: _____

(If different than above, a person must be named in both spaces)

Mailing Address: _____

City: _____ State: _____ Zip: _____

Phone: (Day) ___ - ___ - ___ (Mobile) ___ - ___ - ___ (Fax) ___ - ___ - ___

Email address: _____

Agent or Contact Person (if applicable): _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Phone: (Day) ___ - ___ - ___ (Mobile) ___ - ___ - ___ (Fax) ___ - ___ - ___

Email address: _____

Engineer, Technical Representative or Firm: _____

(If different from Agent)

Mailing Address: _____

City: _____ State: _____ Zip: _____

Phone: (Day) ___ - ___ - ___ (Mobile) ___ - ___ - ___ (Fax) ___ - ___ - ___

Email address: _____

II. Property Information

A. Site Location (street address, nearest intersection, etc.): _____

City/ Town: _____ Latitude: ___° ___' ___" N Longitude: - ___° ___' ___" W

Tax map # (list all): _____

B. Property Owner (if different from section I above): _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Phone: (Day) ___ - ___ - ___

III. Site Information

A. Disturbed area (to the nearest tenth of an acre): _____ Total area: _____

Impervious area: _____

B. Is this project part of a Larger Common Plan for Development or Sale (LCP)? Yes No

If yes, what is the previous state permit no.? _____

Previous NPDES number: SCR10 _____

LCP/ Overall Development Name: _____



STORMWATER CONSTRUCTION APPROVAL APPLICATION

C. Start Date (MM/DD/YYYY): ___/___/___ Completion Date: ___/___/___ (estimated)

D. Type of Activity (check all that apply):

- Commercial
- Residential: Single-family
- Linear (Roads, utility lines, etc.)
- Institutional
- Residential: Multi-family
- Site Preparation (No new impervious)
- Re-development
- Other: _____

IV. Waterbody Information

A. Nearest receiving waterbody(s): _____ Distance to this waterbody (feet): _____
Next/Nearest named receiving waterbody(s): _____

B. Wetlands/ Waters of the State

Waters of the U.S./ State	On the site?	If yes, delineated/ identified?	Impacts?	Amount of impacts
a. Jurisdictional wetlands	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	___ Ac ___ Feet
b. Non-jurisdictional wetlands	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	___ Ac ___ Feet
c. Other (List): _____	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	___ Ac ___ Feet

- If yes for delineation, has documentation of the delineation from the USACOE been provided?
 Yes No N/A
- If yes for impacts, has a USACOE permit been applied for or obtained for those impacts?
 Yes No N/A If yes, provide copy of the approved USACOE permit.

C. Special Protection Areas

- Are there any known flooding problems downstream of or adjacent to this site? Yes No
If yes, see attached instruction.
- Are any portions of the site located in a designated floodplain? Yes No If yes, which zone? _____
If yes, what are the FIRM Numbers? _____
- List the nearest DHEC water quality monitoring station(s) [WQMS(s)] to which stormwater (SW) discharges will drain: _____ Waterbody(s): _____
 - Is this WQMS listed on the most current 303(d) List for Impaired Waters? Yes No
 - If yes for (3.1), list the impairment(s). _____
 - If yes for (3.1), will construction SW discharges from your site contain the pollutant(s) of impairment?
 Yes No
 - If yes for (b), will use of the proposed BMPs ensure that the site's discharges will not contribute to or cause further water quality standard violations? Yes No
 - Has a TMDL(s) been developed? Yes No
 - If yes for (3.2), list the waterbody: _____
list the impairment(s): _____
 - Has the standard been attained for the impairment(s)? Yes No
 - If no for (b), will construction SW discharges from your site contain the pollutant of impairment?
 Yes No
 - If yes for (c), are your discharges consistent with the assumptions and requirements of the TMDL(s)?
 Yes No
 - If no for (d), will use of selected BMPs ensure that the site's discharges will not contribute to or cause further water quality standard violations? Yes No



STORMWATER CONSTRUCTION APPROVAL APPLICATION

V. Preparer/Operator Information

A. Plan Preparer: _____ S.C. Registration #: _____
 Company/ Firm: _____ S.C. COA #: _____
 Mailing Address: _____
 City: _____ State: _____ Zip: _____
 Phone: (Day) _____ (Mobile) _____ (Fax) _____
 Email address: _____

B. Operator of Day-to-Day Site Activities (Company or person): _____
 Site Contact (if ODSA is company): _____
 Mailing Address: _____
 City: _____ State: _____ Zip: _____
 Phone: (Day) _____ (Mobile) _____ (Fax) _____

VI. Signatures and Certifications

- A. One copy of the stormwater plan, all specifications and supporting calculations, forms, and reports are herewith submitted and made a part of this application. I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of the Town of Summerville Stormwater Management Ordinance and the Stormwater Management Design Manual. (This should be the person identified in Section V.A.)
 Please check one.

Printed name of Plan Preparer

Signature of Plan Preparer

S.C. Registration Number

- B. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I hereby certify that all construction and associated activity pertaining to this site shall be accomplished pursuant to and in keeping with the terms and conditions of the approved plans. I also certify that a responsible person will be assigned to the project for day-to-day control. I hereby grant authorization to the Town of Summerville Engineering Department the right of access to the site at all times for the purpose of on site inspections during the course of construction and to perform maintenance inspections following the completion of the land-disturbing activity.

Printed name of Owner/Operator

Signature of Project Owner/ Operator

Title/ Position

- C. Designer Certification-One copy of the plans, all specifications and supporting calculations, forms, and reports are herewith submitted and made a part of this application. One copy of the plans, all specifications and supporting calculations, forms, and reports shall be submitted upon approval. I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the Town of Summerville Stormwater Management Ordinance and the Design Manual.

Signature

S.C. Registration Number



STORMWATER CONSTRUCTION APPROVAL APPLICATION

Instructions

Completing the Application:

You must type or print legibly. You must include the original, signed application form, required fees, one copy of the stormwater plan, and one copy of all other supporting documentation with the initial submittal. Additionally, the checklist must be completed and attached. List how and where each item on the checklist was addressed (e.g., page 4 of the calculations).

Who Must Submit an Application:

Anyone submitting a project that is an individual single family home that disturbs one (1) acre or more or any commercial, industrial, or subdivision project that disturbs one-half (0.5) acre or more.

Projects located in the TOWN OF SUMMERVILLE submit to:

The Town of Summerville
Engineering Department
200 South Main Street
Summerville, S.C. 29483
(843) 851-4226
Fax 832-8182

Project/ Site Name: The Project/ Site Name should be a unique or distinguishing name (e.g., not Proposed Subdivision). The Department should be notified in writing if the Project/ Site Name changes.

I. Project Information

- The official or legal name of the Project Owner/ Operator should be listed. If the Project Owner/ Operator is a company, then a Permit Contact person should be listed. This can be someone other than the person that has signatory authority for the company. All correspondence regarding this permit application will be sent to Permit Contact at the address listed.
- The Company EIN is the Employer Identification Number as established by the U.S. Internal Revenue Service.
- The Project Owner/ Operator is responsible for all portions of the site until a Project Closeout or Transfer of Ownership form is submitted.

II. Property Information

- A. List a city/town only if the site is within the city/ town limits. See the following website for assistance in obtaining latitude/ longitude coordinates: <http://water.epa.gov/polwaste/npdes/stormwater/Latitude-Longitude.cfm>. Latitude (from 32° to 35°) and longitude (78° to 83°) should be for the center of the site to the nearest 15". Minutes (') should be from 0 to 59, and seconds (") should be 0, 15, 30, or 45.
- B. If the Project Owner/ Operator does not own the project site, then list the official or legal name of the current Property Owner of the site. Permit coverage will be issued to the Project Owner/ Operator (Section I), not the Property Owner, unless same entity.

III. Site Information

- A. The total and disturbed areas should be rounded to the nearest tenth of an acre. For subdivisions, if the exact build-out is not known, the disturbed area can be estimated using the following equation:
Disturbed area = 2(Maximum Footprint of House)(# of lots) + Road/ Right-of-Way areas + Other easements/ disturbance.
Please note that the Town must be notified if the actual disturbed area is greater than the disturbed area listed on the application.
- B. If master stormwater calculations have been prepared and/ or submitted for an entire site, then all phases and parcels at that site would be considered part of a LCP. If this project is the first phase of an LCP, then this item should be answered yes and the LCP/ Overall Development name should be listed. This LCP/ Overall Development name should also be listed on all applications for future projects that are part of this LCP, including subsequent phases. If the project is part of an LCP, then list the previous state permit number and previous NPDES coverage number (not SCR100000).
- C. List the estimated start and completion dates of the construction activity.



STORMWATER CONSTRUCTION APPROVAL APPLICATION

- D. Institutional includes schools and other publicly owned projects, except linear projects. Site Preparation includes clearing, grubbing, and grading only; no new impervious areas should be proposed if this activity type is checked.

IV. Waterbody Information

- A. The nearest receiving waterbody is the nearest waters of the State to which the site's stormwater will discharge. If this waterbody is unnamed, then provide a description that references the nearest, named waterbody (e.g., tributary to Grove Creek). If the site's stormwater discharges to multiple waterbodies, then list all such waterbodies and attach additional sheets, if necessary.
- B. Complete the "On the Site?" column for items a-c. If yes is selected for that column, then the next 3 columns must be completed. If there are other waters of the U.S./ State (WoS) on the site not listed in items a and b (e.g., stream, river, lake, pond), then list those in item c. Delineation means identification by U.S. Army Corps of Engineers (USACOE) or wetlands consultant. If there are WoS within 100' of the disturbed area that were not delineated/identified, then explain this in the narrative; this includes WoS that are not on the project site but are within 100' of the disturbed area. If construction activities will occur in and/ or will impact WoS, then select yes for "Impacts?" and list the amount of impacts to WoS. Provide an additional, separate plan sheet that shows all WoS on the site and the impacted areas. If there are proposed impacts to WoS, please contact USACOE (866-329-8187) and S.C. DHEC Water Quality Certification, Standards & Wetlands Programs Section (803-898-4300) to determine additional requirements before submitting this NOI. In the **SCCZ**, also contact S.C. DHEC Page 7 OCRM Wetlands Section (843-953-0200). Please note that it is the Project Owner/ Operator's responsibility to ensure that all WoS are shown and identified in the SWPPP. USACOE is U.S. Army Corps of Engineers. If there are impacts to waters of the U.S./ State (should be listed in item IV.B), then list all permits and certifications that have been applied for or obtained for those impacts. Describe the activity(s), whether the impact is permanent or temporary, and any other relevant information. Provide a copy of all permits and certifications for and correspondence with USACOE and DHEC for the impacts. Make sure to include all plats referenced in the permits or correspondence.
- C1. If there are flooding problems, the extent of the flooding problems and the effect of this project on those problems must be explained in the Project Narrative.
- C2. If the site falls within a designated flood plain, list the zone and FIRM number.
- C3. Maps showing WQMS locations are available at the following website for each watershed:
<http://www.scdhec.gov/HomeAndEnvironment/Water/ImpairedWaters/Overview/#5>. List the nearest DHEC WQMS(s) and corresponding waterbody(ies).
- 3.1 See the following website for the most current 303(d) List for Impaired Waters and related information:
<http://www.scdhec.gov/HomeAndEnvironment/Water/ImpairedWaters/Overview/#5>. To search this document to determine whether a WQMS is listed, select "Edit" from the top toolbar. Then, select "Find". Enter the WQMS exactly as listed on the map and hit enter. If none of the WQMS(s) are found, then select no for item 3.1 and proceed to item 3.2. If any of the WQMS(s) are found within the document, then select yes and proceed to item 3.1.a.
- a. List the cause(s) of the impairment (see last column labeled "CAUSE") for the WQMS(s) and proceed to item b.
- b. DHEC has determined that construction SW discharges are expected to contain pollutants causing the following impairments: TURBIDITY, BIO (Macroinvertebrate), TP (Total Phosphorus), and TN (Total Nitrogen). You should carefully evaluate whether the site's constructions SW discharges will contain any pollutants causing other impairments, not explicitly listed above. You should also consider previous land uses at the site in answering this question. For example, if the previous land use was a copper processing facility and the impairment at the nearest WQMS is copper, then you should carefully evaluate whether the site's construction SW discharges would contain copper. If this question is answered yes and the disturbed area is less than 25 acres, then provide an evaluation of the site's proposed Best Management Practices (BMPs) as described in section 3.2.12.B of the CGP. If this question is answered yes and the disturbed area is greater than or equal to 25 acres, then provide a written qualitative and quantitative assessment of the site's proposed BMPs as described in section 3.2.12.B.II of the CGP. **See item 20 on the checklist.**
- c. If the answer to this question is no, then the site is not eligible for coverage under the CGP.
- 3.2 See the following website for a list of all WQMS with Approved S.C. Total Maximum Daily Loads (TMDLs):
<http://www.scdhec.gov/HomeAndEnvironment/Water/ImpairedWaters/ApprovedTMDLs/>. To search this



STORMWATER CONSTRUCTION APPROVAL APPLICATION

document to determine whether a WQMS is listed, select “Edit” from the top toolbar. Then, select “Find”. Enter the WQMS exactly as listed on the map and hit enter. If none of the WQMS(s) are found, then select “No” for item 3.2 and proceed to item V. If any of the WQMS(s) are found within the document, then select yes and proceed to item (a). The same document will be used for item 3.1a.

- a. List the cause(s) of the impairment (see 7th column labeled “CAUSE”) and proceed to item b. If the WQMS(s) is impaired for more than one parameter, then the WQMS will be listed multiple times on successive rows. The same document will be used to answer item b.
- b. See the 8th column labeled “USE SUPPORT” to determine if the standard has been attained for each impairment for each WQMS. “FULLY SUPPORTED” means the standard has been attained for the impairment listed in the “CAUSE” column. “NOT SUPPORTED” means that the standard has NOT been attained for that impairment. If the standard has NOT been attained for all impairments for all WQMS(s), then select no and proceed to item c. If the standard has been attained for all impairments for all WQMS(s); select yes and proceed to item d.
- c. DHEC has determined that construction SW discharges are expected to contain pollutants causing the following impairments: TURBIDITY, BIO (Macroinvertebrate), TP (Total Phosphorus), and TN (Total Nitrogen). You should carefully evaluate whether the site’s constructions SW discharges will contain any pollutants causing other impairments, not explicitly listed above. You should also consider previous land uses at the site in answering this question.
- d. Check the TMDL to make sure the site meets the assumptions and requirements. If the site cannot meet the appropriate TMDL, BMPs must be used.
- e. If the answer to this question is no, then the site is not eligible for coverage under the CGP.

V. Preparer/Operator Information

- A. Enter the name and registration number of the stormwater plan preparer. S.C. COA is the company’s S.C. Certificate of Authorization. Enter N/A for S.C. COA if the firm does not have a COA or the preparer is an individual. If an email address is entered, the plan preparer may be contacted via email.
- B. Enter the name of the operator or day-to-day site operations contact and pertinent information.

VI. Certifications

- A. The same registered professional must sign and seal the application, drawings, calculations, and supporting documentation.
- B. A person with signatory authority for the Project Owner/ Operator must sign the application. The plan preparer cannot sign the application for the Project Owner/ Operator. The plans, all reports, including monthly reports, and any information requested by the Department must be signed by a person with signatory authority for the Project Owner/ Operator or a duly authorized representative.
 - Corporation: A responsible corporate officer (e.g., president, vice-president, certain managers)
 - Partnership or Sole Proprietorship: A general partner or the proprietor, respectively
 - Municipality, State, Federal or Other Public Agency: Principal executive officer or ranking elected official

Office Mechanics and Filing

This form and supporting documentation will be kept in the Town’s Engineering Department files (hard copy or digitized copy).



EROSION PROTECTION AND SEDIMENT CONTROL (EPSC) CERTIFICATION

(Applicable for single family residential (SFR) construction activities disturbing less than one (1) acre or commercial, industrial, or subdivision projects that disturb less than one-half (0.5) acre.)

Applicant Information

OWNER: _____
ADDRESS: _____
CITY: _____ STATE: _____ ZIP CODE: _____
PHONE: _____ FAX: _____ E-MAIL: _____

SIGNATURE: _____ DATE: _____
PRINTED NAME AND TITLE: _____
(If Owner is a Business)

Property Information

PARCEL/TMS #(S): _____ LOT NUMBER(S): _____
DEVELOPMENT NAME/PHASE: _____
CITY: _____ ZIP CODE: _____
TOTAL ACRES: _____ DISTURBED ACRES: _____
LOTS APPLIED FOR: _____

Contractor Information (if applicable)

COMPANY: _____
LICENSE #: _____
CITY: _____ STATE: _____ ZIP CODE: _____
PHONE: _____ FAX: _____ E-MAIL: _____

SIGNATURE: _____ DATE: _____
PRINTED NAME AND TITLE: _____

1. Is your site part of a larger common plan of development? Yes No

If yes, you must sign the certification below. If no, proceed to item 2.

I certify by my signature below that:

I certify under penalty of law that I understand and will implement the Town's construction activity management requirements specified in the Town Construction Approval issued to the owner of the larger common plan of development. I will ensure that the control measures are maintained. I further certify that Town of Summerville inspectors may enter the property as necessary to ensure compliance with all related requirements.

SIGNATURE: _____ DATE: _____

2. If not part of a larger common plan of development you must sign the certification below.

I certify under penalty of law that I understand and will implement the Town's construction activity management requirements specified in the attached document. I will ensure that the control measures are maintained. I further certify that Town of Summerville inspectors may enter the property as necessary to ensure compliance with all related requirements.

SIGNATURE: _____ DATE: _____



EROSION PROTECTION AND SEDIMENT CONTROL (EPSC) CERTIFICATION

Construction Activity Management Requirements for single family residential (SFR) construction activities disturbing less than one (1) acre or commercial, industrial, or subdivision projects that disturb less than one-half (0.5) acre.

1. The lot shall have protection around the entire boundary with allowances for no more than two entrance/exits. This protection may be silt fencing or earthen or man-made berms or dikes. These measures shall be installed within 24-hours of land disturbance and maintained until the project is stabilized as detailed below. The following guideline should be followed:
 - The maximum length from the crest of a hill to the silt fence is 100 feet. When the distance from a crest to the property boundary is greater than 100 feet, an intermediate row of silt fence shall be used or another control measure shall be employed.
 - The maximum slope steepness (normal [perpendicular] to fence line) is 2H:1V. When exceeded, slope drains shall be employed.
 - A maximum of ¼ acre drainage per 100 linear feet of silt fence should be used. When this is exceeded, an intermediate row of silt fence shall be used or another control measure shall be employed.
 - Sediment accumulated along the fence shall be removed when it reaches 1/3 the height of the fence.
 - Proper construction of these measures can be found from SC DHEC's BMP Manual, or from the Town of Summerville Engineering Department. Manufacturers recommended installation and maintenance procedures shall be followed if applicable.
2. Nearby stormwater inlets, manholes, etc. in the street or on this or adjacent property shall be protected through the use of sediment tubes, check dams, or inlet protection devices. These measures will be maintained throughout the construction process until the site is stabilized as detailed below.
3. Construction entrances shall be provided at all entrances/exits (maximum of 2). The entrance shall contain washed stone that is at least 6-inches deep, 20-feet wide, and 75-feet long. The stone shall be maintained throughout the construction process until the site is stabilized as detailed below. Sediment tracked onto streets shall be removed daily. More information on the installation and maintenance of the construction entrances can be obtained from the Town's Engineering Department.
4. All control measures shall be inspected every 7 calendar days **or** every 14 days and within 24-hours after each rainfall event that produces ½-inches or more of precipitation.
5. Construction debris and other waste shall be contained in a dumpster or covered with plastic. Covers that prevent exposure to precipitation shall also be used for stockpiles of soil. Chemicals, paints, solvents and other materials shall be stored such that exposure risk to precipitation and stormwater runoff is low. Concrete wash water shall be disposed in an area of soil away from surface waters where soil can act as a filter or evaporate the water. Remaining cement shall be disposed of in a dumpster or otherwise removed from the site. Be aware that this water can kill



EROSION PROTECTION AND SEDIMENT CONTROL (EPSC) CERTIFICATION

vegetation. De-watering water shall be disposed of in a pervious area. Discharge of sediment from dewatering operations shall be prevented from entering into storm sewers and surface waters.

6. Areas not used during construction should be vegetated with sod or grass seed. Existing/natural vegetation should be preserved as much as possible. Grass specifications are available from the Town's Engineering Department.
7. A site is considered stabilized once the entire area other the buildings, driveways, and walkways, has a vegetative cover with a density of 70%. Seeding should be accompanied or replaced with erosion control mats as necessary to achieve this density.
8. After final stabilization is achieved, all control measures shall be removed from the site.

APPENDIX B
PLAN REVIEW CHECKLIST



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

This checklist will be used by Town of Summerville Plan Reviewers or others employed by the Town Engineer, in reviewing proposed construction activities. This checklist shows the components that must be provided by the applicant for Stormwater Construction Approvals.

The submitted information typically includes three parts: the application, the technical engineering calculations and discussions, and the construction documents (plans, details, specs, SWPPP).

I. APPLICATION FORM

- All application items should be complete and answered sufficiently.
- Signatory authority (original signatures) should be provided where requested

II. TECHNICAL REPORT/ENGINEERING CALCULATIONS

1. REPORT COMPOSITION:

- Table of Contents.
- A summary table to include at least the following:
 - a. all hydrologic results (design storms and distribution type, peak discharges, pre- and post-development, CN, Tc, PRF),
 - b. results of hydraulic calculations (road overtopping, velocities, 100-yr event analysis) calculations and methodologies,
 - c. methodology/models used,
 - d. tidal considerations,
 - e. some documentation showing that peak stages are below minimum finished floor elevation and that during the 100 year storm event ponds pass this event without overtopping (including the 1 foot freeboard) and the system would not result in an increased frequency of dwelling flooding, property damage or public access &/or utility interruption, and
 - f. results of water quality calculations.
- Report should be put together in a manner that facilitates review.
- Report prepared by licensed professional.
- One Copy to be submitted.

2. MAP(S):

- Include north arrow and scale on all maps.
- Outlined project location.
- Labeled road names.
- Nearest waterbodies, discharge points, and waters of the state.
- Location of any nearby protected areas (waters, wetlands, etc.)
- Topographic information showing runoff patterns/overland flow paths.
- Soil types.
- 100-year floodplain contours.
- Wetlands.



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

3. PROJECT NARRATIVE:

- A description of the site in general, purposes of the construction activity, any issues with adjacent properties and owners, waterbodies receiving stormwater runoff, any issues with site soils, existing water quality and flooding issues, anticipated impacts (quality, downstream structures, etc.) and benefits (open space, treatment, maintenance, etc.), and reasons for waiver request.
- A summary table of existing and proposed runoff flows, volumes, and pollutant loads.
- A discussion of issues relating to other State and Federal permits needed or regulations to be followed.
- A summary of the maintenance of the stormwater system and arrangements for post-construction maintenance responsibility. Maintenance agreements and/or operating permits must be provided in the application or otherwise addressed.
- This narrative should be much more detailed for larger projects.

4. HYDROLOGIC ANALYSIS:

- Proper delineation of the site shown on maps or construction plans (preferably on 24" x 36" sheets).
- Pre- and post- development hydrologic analysis calculations for the 2-, 10-, 25-, 50-, and 100- year storm events, as necessary, at each outfall point. Analysis should be performed at the same points and with the same drainage area for both pre- and post-development conditions and correspond to the delineation. Hydrograph calculations should be provided as needed.
- Analysis performed using SCS methodology (Rational method not acceptable for Construction Approval Applications) or other if acceptable to Buildings and Codes Department.
- Use rainfall data from Chapter 3.

5. DETENTION ANALYSIS/DESIGN:

Analysis

- Pond routing using a volume based hydrograph for the 2-, 10-, 25-, 50- and 100-year SCS 24-hour rainfall event (Drain:Edge, ICPR, HEC-1, SedCAD, HYDRAFLOW, etc. perform full pond routings: TR55 does not perform a full pond routing; rational method cannot be used).
- Hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications of the proposed land disturbing activity, with and without the pond (results of analysis will determine the need to modify the pond design or eliminate the pond requirement-see note in item 10).
- Inputs and outputs from analysis program.
- Summary table of the peak inflows, peak outflows, and maximum water surface elevations (WSE) for the 2, 5, 10, 25 and 100-year storm events for each pond.
- Stage-storage-discharge relationship for the outlet structure of each detention structure.
- If a rating curve for the outlet structure must be generated externally from the analysis program (Drain:Edge, HEC-1, HydroCAD), data and equations used to rate the outlet structure.



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

Design

- Detail of outlet structure and cross-section of the dam, including elevations and dimensions that correspond to the calculations.
- Orifice constructability considered (do not specify orifice diameters with increments of less than ¼").
- Maximum water surface elevation (WSE) for the 100-year storm event below the embankment with 1-ft of freeboard between maximum WSE for the 100-year storm embankment.
- The volume within any structure used for water quantity control shall be drained from the structure within 72 hours.
- Bottom of all detention and retention ponds graded to have a slope of not less than 0.5% and side slopes no steeper than 3:1 unless adequately protected.
- If the pond is to be used for sediment control during construction, outlet structure should be sufficiently protected.
- Permanent maintenance access to all permanent detention structures (easements may be needed for structures surrounded by lots).
- Infiltration and underground detention systems designed in accordance with Chapter 3.
- Emergency spillways should not be built on fill slopes.
- If pond is to be used to meet water quality requirements, a forebay, designed in accordance with this manual, is required.
- Installation of a trash rack or other debris-screening device is recommended on all pond risers.

6. HYDRAULIC DESIGN:

- Design calculations for all conveyances, inlets, and outlets based on the contributing area, allowable velocities, and upstream and downstream conditions.
- Upstream and downstream analysis showing the project will not impact new and existing structures or reduce downstream system capacity.
- Check to make sure the proper design storms were used at the appropriate design points.

7. WATER QUALITY REQUIREMENTS:

- All sites which disturb one (1) acre or greater shall include best management practices (BMPs) to address water quality, along with an Operation and Maintenance Agreement that guarantees maintenance of all BMPs in perpetuity.
- 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) over a 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).
- Permanent water quality ponds, not having a permanent pool, shall be designed to store and release the first 1-inch (1") of runoff from the contributing watershed area over a minimum period of 24-hours.
- For areas not draining to a pond, it should be demonstrated how permanent water quality requirements will be addressed.



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

- Other non-traditional stormwater controls such as Bioretention areas and constructed wetlands may be used if adequate removal efficiencies can be demonstrated.
- Pre-fabricated or proprietary treatment devices are approved on a case-by-case basis if adequate removal efficiency can be demonstrated. Provide pollutant removal efficiency data, preferably from a third-party testing company. Type of system to be used should be based on the ability to remove the pollutants of concern in that area/situation (i.e. bacteria, hydrocarbons, etc.).
- Waters of the U.S./State shall not be used for permanent water quality control. (Alternative means of treatment must be used if an existing pond is to be used for water quantity control).

8. INLET PROTECTION:

- Provided at all inlets (no hay bales).
- Buried fabric shown for filter fabric inlet protection.
- Inlet protection details provided for pre-paving and after roadways have been paved.

9. DISCHARGE POINTS:

- The post-development discharges rates should be less than pre-development discharges for each discharge point for the 2-, 10, and 25-year storm events. If not, then a detention waiver should be requested.
- Storm drainage or pond outfalls are carried to an existing drainage outfall such as a pipe, ditch, easement, etc.
- No new point discharges onto adjacent property where there was not a point discharge previously without providing the adjacent property owner's written permission.
- Level spreaders, plunge pools, etc. provided when the proposed outlet is near the property line.
- When possible, provided a 20-foot minimum buffer between the property line and the end of all pipes or energy dissipation measures installed.
- Outlets do not discharge on fill slopes.
- Discharge pipes greater than 24" require headwall with wings.
- Headwalls required in major drainage channels.
- All outlets stabilized.
- Riprap aprons sized appropriately.
- Riprap detail shows apron dimensions and stone sizes.
- Filter fabric installed beneath all riprap.

10. SLOPE AND/OR CHANNEL STABILIZATION:

- All slopes designed and stabilized properly.
- All channels and diversion ditches must be able to handle the 10-year storm event with non-erosive velocities during construction and post-construction.
- Rock check dams provided in temporary diversion.
- Installation detail for erosion control blanket (ECB) or turn reinforcement matting (TRM) if ECBs or TRMs to be used.
- Slope drains provided where concentrated flows discharge onto a fill slope.
- For all slopes steeper than 1.5:1, identification of stabilization practice (e.g., ECB, TRM).



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

Note: Measures, in addition to grassing or hydroseeding, include synthetic or vegetative matting, diversion berms, temporary slope drains, etc.

Note: If retaining walls or fill slopes are to be constructed at the downstream property line, a 10' buffer is recommended for construction and maintenance.

11. UTILITY/LINEAR LINES:

- Limits of disturbance include areas disturbed for water, sewer, gas, and electric line installation.
- Check for coverage by SCDHEC on utility company and for coordination with permit holder.

12. SEDIMENTOLOGY:

- BMPs should be properly placed (silt fence, inlet protection, construction entrance, rip-rap at outfalls, check dams etc.).
- Trapping efficiency calculations showing that all sediment basins/ traps or other BMPs are capable of achieving a sediment trapping efficiency of 80 percent for suspended solids. The efficiency shall be calculated for disturbed conditions for the 10-year 24-hour design event.
- Sediment basins provide storage for the 10-year, 24-hour storm event for disturbed conditions if 10 acres or more drain to a common point (stream, lake, property line, etc.).
- Sediment traps only used for drainage areas of less than 5 acres.
- Trapping efficiency calculations should be complete, specifying methods, assumptions, and results.
- Sediment basins and traps designed for total area draining to them.
- Drainage area map should outline the area draining to each basin/trap.
- Copies of any figures used to determine V_{15} and trapping efficiencies. The Design Aids in SCDHEC (2003) can be used for these calculations.
- Silt fence only used in areas with drainage areas of less than $\frac{1}{4}$ acre per 100 LF of fence and not used in areas with concentrated flows.
- Clean-out stake, marked at $\frac{1}{2}$ the designed sediment storage depth, provided in all sediment basins/ sediment traps.
- Construction schedule with timeline for each activity.

Note: SCDHEC (2003) and SCDHEC (2005) provide information on the design of these and other devices.

Note: The Design Aids in SCDHEC (2003) cannot be used to determine trapping efficiencies for structures in series. If the flow for the 10-year, 24-hour storm for construction conditions overtops the structure or the structure's spillway, then the Design Aids cannot be used. If multiple soil types are in the area draining to the structure, then the soil type with the smallest D_{15} for the appropriate depth should be used to determine the settling velocity, V_{15} ; an average D_{15} should not be used.

13. WATERS-OF-THE-STATE, INCLUDING WETLANDS:

- Delineation of all waters of the State (WoS) located on the site, including wetlands, shown and labeled on plans.



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

- If impacts to WoS, outlined areas of impacts and labeled that no work can begin in this area until all necessary USACE permits and SCDHEC 401 certifications have been obtained.
- Double row of silt fence provided in all areas where a 50' undisturbed buffer cannot be maintained between the disturbed area and the WoS.
- Minimum 10' maintenance buffer provided between last row of silt fence and WoS; or, if buffer not provided, then statement from P.E. on plans indicating how silt fence will be installed and maintained without impacts to WoS.

Note: If there are proposed impacts to WoS, then applicant must contact the UCACE (866-329-8187) and/or S.C. DHEC Water Quality Certification, Standards & Wetlands Programs Section (803-898-4300) to determine additional requirements before submitting this application.

Note: If WoS are to be impacted, work cannot be performed in these designated areas until all necessary permits have been acquired.

Note: If USACE permit is required for construction of a permanent stormwater management structure, City final approval cannot be granted until all applicable State and Federal permits have been obtained. A preliminary approval is issued instead.

Note: A 50-foot buffer between a sediment trap/basin and waters of the State and wetland areas is recommended.

14. SPECIAL PROTECTION AREAS:

- List the nearest S.C.DHEC Water Quality Monitoring Station (WQMS) that the site's stormwater discharges drain to and the waterbody on which it is located.
- Qualitative and quantitative assessment (described in Section 3.4C of SCR100000), if nearest WQMS is listed on the most recent 303(d) List of Impaired Waters and if site's stormwater construction discharges contain the pollutant of impairment and if the site disturbs 25 or more acres.
- Evaluation of selected BMPs if nearest WQMS listed on the most recent 303(d) List of Impaired Waters and if site's stormwater construction discharges contain the pollutant of impairment and if site disturbs less than 25 acres.
- If an Approved TMDL has been developed for the nearest WQMS and if the site's stormwater construction discharges contain the pollutant of impairment, show that measures and controls on the SWPPP met assumptions and requirements of TMDL (may need to contact DHEC Watershed Manager for assistance).

15. POST-CONSTRUCTION MAINTENANCE PLAN:

- Signed agreement from a responsible party accepting ownership and maintenance of the stormwater management structures (Operating Permit).
- Description of maintenance plan to be used.
- Schedule of maintenance procedures, including time to replacement.
- Detailed or manufacturer-specific maintenance items for proprietary control devices (oil-water separators, etc.), underground detention structures, and non-traditional stormwater controls (constructed wetlands, bioretention, etc.).
- Typical maintenance items to be addressed:



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

- Grass to be mowed.
- Trees to be removed.
- Trash to be removed from within and around the pond outlet structure and outlet pipes to be cleaned, inspected, and repaired, sediment accumulation to be removed from pond(s).
- Energy dissipator to be cleaned and repaired.
- Pond bottom to be regraded to provide proper drainage towards the outlet discharge point and/or energy dissipator to be cleaned and repaired.
- Emergency spillway, if applicable, to be inspected and erosion repaired on side slopes, if present.
- The Town Engineer must be notified in writing of any changes in maintenance responsibility for the stormwater devices at the site (include this statement in agreement).
- Specific maintenance items particular to more complex structures.

16. ACCESS:

- Project layout has considered access for maintenance and inspection during and after construction.

17. DETENTION WAIVER:

- If the 2-, 10-, and 25-year post development flow rates exceed the pre-development rates, waivers from detention may be granted in accordance with Chapter 2 on a case-by-case basis.
- Justification should be provided in a separate written request and demonstrate that:
 - The proposed project will have no significant adverse impact on the receiving natural waterway or downstream properties; or
 - The imposition of peak control requirement for rates of stormwater runoff would aggravate downstream flooding.
- Waiver signed by the project's Professional Engineer.
- Waiver from water quality criteria is not allowed, however, another equivalent method or criteria will be reviewed (applicant should provide all the necessary information to make a decision).

III CONSTRUCTION PLANS

- One complete set of plans and one complete set of engineering calculations should come to the Town of Summerville Engineering Department.
- Two full size and two half size set of plans and one set of calculations once review is complete and approval is to be granted.

1. GENERAL ITEMS:

- All sheets 24" x 36".
- Engineer stamp and signature on every sheet.
- Engineering Firm's Certificate of Authorization seal on Grading plan.
- Correct Scale and North Arrow.



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

- Existing and proposed contours are to be tied to a NAVD 88 datum, no **assumed** elevations (1' interval is the minimum).
- Lot Layout.
- Property lines, adjacent landowners' names, and land use conditions (locate houses, driveways, etc. onsite/offsite), critical or protected area.
- Legend.
- Existing and proposed contours for entire disturbed area and off-site areas.
- Limits of disturbed area.
- Delineation of waters of the state, including wetlands with letter from US Army Corps of Engineers, if applicable.
- Easements and any offsite easements that will be used.
- Road profiles with existing and proposed ground elevations.
- Construction sequence (include implementation of all stormwater and sediment controls in the first phase of construction).
- Locations of all temporary and permanent control measures.
- Details for all temporary and permanent control measures.
- Grassing and stabilization specifications.
- Construction entrance/exit.
- Location map.
- Individual lot erosion control plan (applicable to subdivisions).
- Revision block utilized.

2. STORMWATER/DRAINAGE SHEETS

- 24" x 36" sheet.
- Provide drainage area map for existing and proposed conditions, including pathways, outlining delineated sub basins, sub basin characteristics (watershed identifier, Curve Number, Tc, Area length, Slope), and the areas draining to all BMPs on site. Off-site drainage areas should be included.
- Labeling should be consistent with Technical report.
- Indicate high and low points for the site.
- Catch basin locations should be outside intersection curve radii, uphill of intersection.
- Easements for storm drainage.
- 10-foot wide riding surface around entire pond for Town of Summerville maintenance, install gravel if needed (e.g. clay soils).
- 20-foot wide access road to pond, dedicated with pond.
- Discharge pipes greater than 24-inch require a headwall.
- Label all storm drainage structures.
- Water surface elevation in pond/BMPs for all necessary storm events.
- Cut/Fill volumes for the site.
- Utility crossings (water, sewer, storm drainage) to have one foot of cover minimum.
- 15-inch minimum pipe size (no decreases in pipe size in the downstream direction).
- Pipes should flow freely and not rely on imposition of upstream head.
- 20% maximum pipe slope.
- Minimum fall across boxes of 0.1-feet.



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

- When possible, inside top surfaces (soffit) of pipes should be lined up at pipe size changes.
- Crown elevation of inlet pipes equal or greater than crown elevation of outlet pipe.
- Steps required for boxes greater than 4.5 feet deep.
- Minimum inside box measurements are 3' x 3'.
- Label calculated design flows on each pipe.
- Hydraulic grade lines on profiles of storm pipe.
- Existing and proposed grade on profiles of storm pipe.
- Catch basins field staked to ensure proper alignment with the street and gutter.

3. DETAILS

- Reference the SCDHEC BMP Manual for some details
- Curb (rolled, barrier, expulsion).
- Typical road cross section(s) with underdrains at low points and 100 foot up hill or as directed by Town of Summerville.
- Silt fence.
- Inlet protection.
- Lot to lot sediment and erosion control.
- Headwalls.
- Rip-rap apron.
- Construction entrance.
- Swale/ditch.
- Typical detail for all BMPs (sediment traps, ponds, water quality devices, etc.).
- Catch basins, manholes, junctions, etc.

4. STANDARD NOTES:

- Notes as required by State and Federal agencies and any additional notes for compliance with Town of Summerville requirements.
- SWPPP, inspection records, and rainfall data must be kept onsite or within thirty (30) minutes of the site at all times from the commencement of construction activities to the date that final stabilization is achieved. These items are to be in a designated area that is accessible to the inspectors.
- The Town of Summerville shall not maintain Stormwater detention or retention ponds. The property owner shall maintain all stormwater detention facilities shown herein. The inspection frequencies, maintenance activities and other responsibilities as necessary to ensure the system's proper long-term functioning are defined in the Operating and Maintenance Agreement of Stormwater Facilities.
- A certified Stormwater As-built must be submitted to the Town of Summerville prior to letter of occupancy, Closeout Package, and to SCDHEC prior to receiving a Notice of Termination.
- The project/site must be built according to approved Town and SCDHEC plans unless SWPPP documents are updated by the original SWPPP preparer, otherwise permits and approvals will be invalidated.



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

- 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 by 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 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-



TOWN OF SUMMERVILLE PLAN REVIEW CHECKLIST

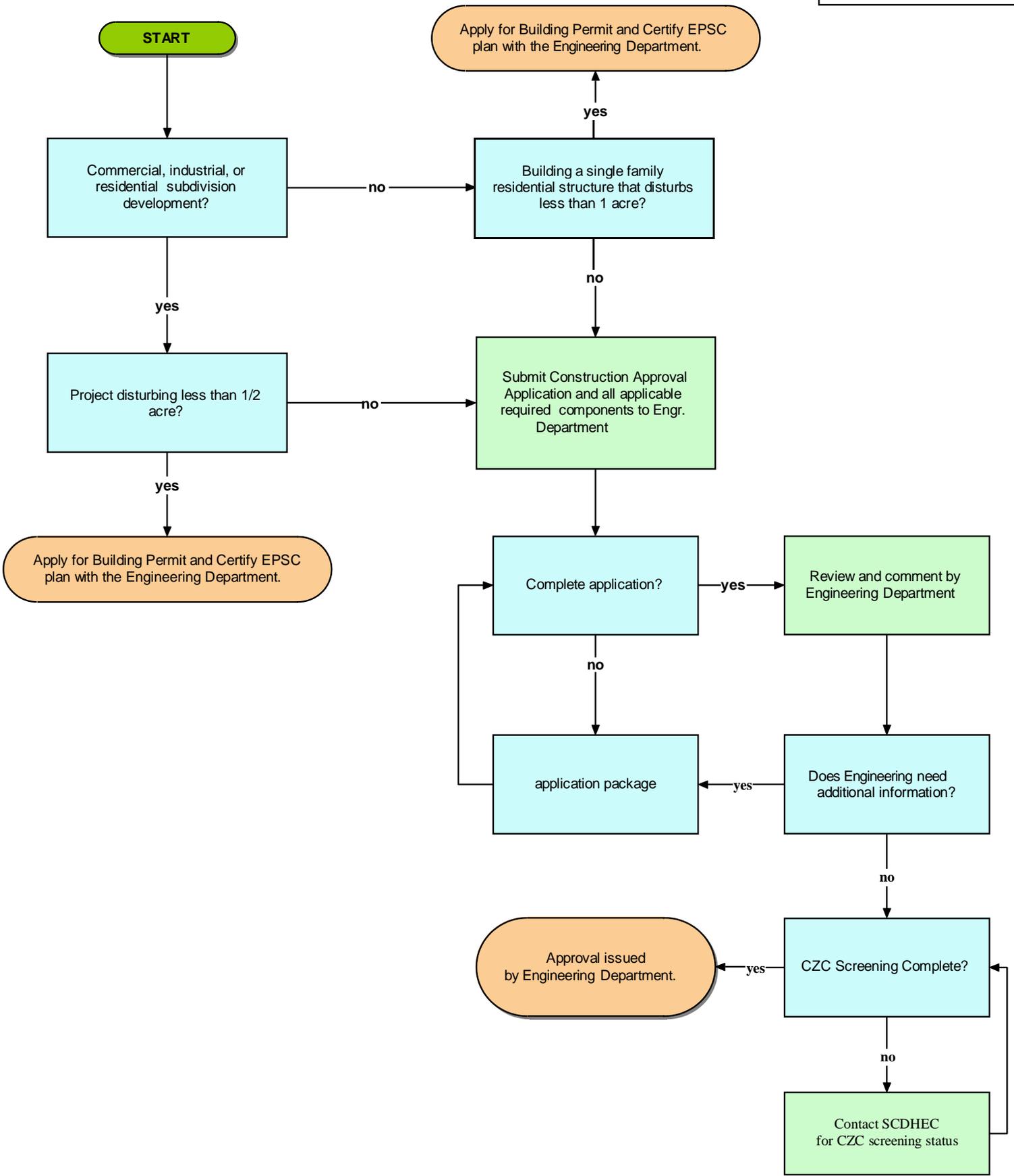
foot buffer can't be maintained between the disturbed area and all WoS. A 10-foot buffer should be maintained between the last row of silt fence and all WoS.

- 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 7 calendar days.
- Minimize 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 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 10 acres or more this conference must be held on-site unless the Department has approved otherwise.

APPENDIX C
PERMITTING PROCESS FLOWCHART

Town of Summerville

Approval Process Flow Chart



APPENDIX D

**OPERATING AND MAINTENANCE AGREEMENT OF
STORMWATER FACILITIES**



OPERATING AND MAINTENANCE AGREEMENT OF STORMWATER FACILITIES

I hereby certify that I will perform the duties as the owner(s) of the Stormwater Management Best Management Practices (BMPs) listed below that includes the listed maintenance activities and others not listed to ensure the systems' proper long-term functioning. I further certify that if ownership is transferred that I will ensure the continued maintenance of these facilities through the proper transfer of ownership responsibilities.

Property Information

PARCEL/TMS #(S): _____
(Obtain from Registrar of Deeds office)

NAME & TYPE OF BMP(S): _____

LOCATION OF BMP(S): _____

PROPERTY DEED BOOK & PAGE, AND RECORDED DATE: _____

TITLE OF SITE PLAN: _____
(Should exactly match the title given on application for a construction permit)

PROJECT ENGINEERING FIRM: _____

PROJECT CONSTRUCTION FIRM: _____

NUMBER & DATE OF CONSTRUCTION PERMIT: _____

Property Owner(s)

OWNER #1: _____

ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP CODE :** _____

PHONE: _____ **FAX:** _____ **E-MAIL:** _____

SIGNATURE: _____ **DATE:** _____

PRINTED NAME AND TITLE: _____
(If Owner is a Business)

OWNER #2: _____

ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP CODE :** _____

PHONE: _____ **FAX:** _____ **E-MAIL:** _____

SIGNATURE: _____ **DATE:** _____

PRINTED NAME AND TITLE: _____
(If Owner is a Business)



OPERATING AND MAINTENANCE AGREEMENT OF STORMWATER FACILITIES

Responsibilities

1. Regular Inspections: Inspections shall be performed at least twice a year and more regularly as listed below or as specified by a manufacturer. Inspection reports shall be generated and kept on file for two (2) years. Reports are to be made available to the Town of Summerville upon request. If generated by a third party, it shall remain the owner's (or owners') responsibility to maintain the reports.
2. Routine Maintenance: Some maintenance activities are needed on a routine basis, as listed below. The activities listed should be performed on a monthly basis or more frequently if needed or unless specified below or by a manufacturer.
 - a. Vegetation Management: if applicable, grass should be mowed bimonthly or more frequently if needed.
 - b. Inlet and Outlet Structures: any blockage of inlets and outlets structures should be removed. Inlet and outlet protection should be repaired or replaced as needed.
 - c. Debris and Litter: trash and other debris that collects in the BMP should be removed.
3. Sediment Removal: BMPs will trap sediments and other settleable material over time and this material should be removed once the storage capacity has been reduced by 33%. Removal of the sediment shall occur no less frequently than once every year or as specified by the manufacturer. If a forebay exists, any trash, sediment, or other debris should be completely removed as discovered through routine maintenance activities or inspections.
4. Slope Stabilization/Structural Integrity: Slope erosion, sink holes, or other structural issues should be repaired as soon as discovered through routine maintenance activities or inspections.

Additional Responsibilities

List any additional routine or long-term activities to be performed on the BMP(s). This area may also be used to replace the list of maintenance activities listed above or to list manufacturer requirements.

Note: The Town of Summerville reserves the right to alter the maintenance schedule and activity as necessary to ensure the proper functioning of the BMP.

APPENDIX E
CONSTRUCTION SITE INSPECTOR CHECKLIST



CONSTRUCTION SITE INSPECTOR CHECKLIST

Project Name: _____

Stormwater Plan Review Approval Date: _____

Parcel/TMS# _____

Date of Inspection: _____

Inspected by: _____

Weather Conditions:

1. Weather conditions during inspection: _____

2. Was the Inspection conducted within 24 hours of a significant rain event (>1/2"):

Yes No Precipitation amount in inches: _____

Below are the items that Town Inspectors will address during each site inspection.

1. Are Contractor's maintenance logs available? Yes No

2. Is Contractor's set of plans and SWPPP, if applicable, available on-site? Yes No

a. If No, is it accessible within 30 minutes of site? Yes No

3. What is the current status of construction?

Beginning Middle Nearing Completion Completed

4. What is the status/condition of the construction entrance? Working: Yes No

Comments: _____

5. Are there any roadway impacts (sediments, damaged asphalt, etc.)? Yes No

If so, explain: _____

6. Are there any waterbody impacts (sediment, oil, grease, etc.)? Yes No

If so, explain: _____

7. Have any adjacent properties been negatively impacted? Yes No

If so, explain: _____

8. Are there any air/dust impacts? Yes No

9. Are all tree protections in place and maintained? Yes No

Comments: _____

10. Are all channels stabilized? Yes No



CONSTRUCTION SITE INSPECTOR CHECKLIST

11. Is there any evidence of channel erosion? Yes No
12. Are all inactive areas stabilized? Yes No
13. Are all inactive slopes stabilized? Yes No
14. Are all inactive stock piles stabilized? Yes No

Comments on stabilization needs: _____

15. Is a concrete washout located and maintained on site? Yes No
16. Are all erosion prevention and sediment control (EPSC) devices properly installed and maintained? Yes No
17. Do the EPSC devices provide adequate protection? Yes No
18. Are there any unneeded controls or are there any that need to be removed (closeout)? Yes No

Comments on EPSC devices: _____

19. Are there any instances of erosion across the site? Yes No

Ponds

20. Do inlet and outlet pipes have rip-rap in the appropriate locations? Yes No
21. Are pond banks less than twenty (20) feet in height? Yes No
22. Are pond side slopes steeper than 3:1? If so, do they have appropriate stabilization? Yes No
23. Is an emergency spillway built? Yes No
24. Is pond outfall/orifice free of trash and debris? Yes No
25. Does the sediment storage volume need to be cleaned out? Yes No
26. Is the pond causing any flooding problems either onsite, or downstream of the site? Yes No
27. Is pond built to plan specifications? Yes No
28. If a forebay is used, are they built per plans? Yes No
29. Is any enforcement action necessary? Yes No

30. If so, what type? Corrective Order Notice of Violation Stop Work Order

Re-inspection date: _____



CONSTRUCTION SITE INSPECTOR CHECKLIST

Additional Notes:

APPENDIX F
ENFORCEMENT FORMS



CORRECTIVE ORDER

Date: _____

Name: _____

Address: _____

City, State, Zip Code: _____

Project: _____

Stormwater Plan Review Approval Date: _____

This corrective order serves as a warning concerning activities on the above referenced site.

This warning is based on the results of a Town of Summerville inspection on _____. A verbal warning was also given to _____ at the time of the inspection. A copy of our inspection report detailing the deficiencies is enclosed with this warning.

You have until _____ to correct the deficiencies noted on the inspection report. At that time our inspector will re-visit your site. Failure to comply with this warning is considered a violation of the Town of Summerville Stormwater Management Ordinance and will result in the issuance of a **Notice of Violation and/or Stop Work Order**.

If you have any questions concerning this warning you may contact our office at 843-871-6000, or 843-851-4226.

Signed by: _____

Printed Name: _____



NOTICE OF VIOLATION

Date: _____

Name: _____

Address: _____

City, State, Zip Code: _____

Project: _____

Stormwater Plan Review Approval Date: _____

You are hereby served notice that you are in violation of the Town of Summerville's Stormwater Management Ordinance at the above referenced site.

This violation is due to failure to comply with a corrective order issued on _____ and the results of a Town of Summerville follow up inspection completed on _____. A copy of our inspection report is enclosed with this notice of violation.

These deficiencies noted on the inspection report must be corrected within three **(3) working days** of the date of this letter. Failure to comply with this Notice of Violation will result in an immediate **Stop Work Order** issued for your site and/or a **civil penalty in the amount of \$1,000/day for each deficiency**.

If you have any questions concerning this violation you can contact our office at 843-871-6000, or 843-851-4225.

Signed by: _____

Printed Name: _____



NOTICE OF VIOLATION – STOP WORK ORDER

Date: _____

Name: _____

Address: _____

City, State, Zip Code: _____

Project: _____

Stormwater Plan Review Approval Date: _____

You are hereby served notice that you are in violation of the Town of Summerville's Stormwater Management Ordinance at the above referenced site. A **"STOP WORK"** order is being posted on this property effective **IMMEDIATELY.**

This violation is due to failure to comply with a Notice of Violation issued on _____ and the results of a Town of Summerville follow up inspection completed on _____. A copy of our inspection report is enclosed with this violation.

Your site must be inspected by a Town of Summerville Inspector prior to resuming any construction activity. Any activity other than work leading to compliance with this Stop Work Order can result in the issuance of a civil penalty in the amount of **\$1,000/day for each deficiency and/or 30 days in jail.**

If you have questions concerning this violation you can contact our office at 843-871-6000, or 843-851-4226.

Signed by: _____

Printed Name: _____

APPENDIX G
AS-BUILT CHECKLIST

STORMWATER AS-BUILT CHECKLIST

ROADS

- Centerline
- Bearing
- Distances
- Horizontal curve centerline
- BOC radius information at intersections, cul-de-sacs, islands
- Centerline elevations every 100' stationing as on the proposed plans
- Typical road cross-section
- Typical pavement section
- Road profiles

STORMWATER DRAINAGE

- Plan and profile view of system (pipe size, length, slope, cfs)
- Cross-section of drainage swales and ditches
- Pond stage storage discharge information
- Outlet structure elevation information (orifices, weirs, dimensions of structures)
- Routing of all storms using the As-Built information
- Cross-section of emergency spillway
- French drain locations

APPENDIX H
CLOSE-OUT APPLICATION



CLOSE-OUT APPLICATION FORM

This form must be filled out for Town of Summerville Stormwater Construction Projects requiring a Stormwater Construction Approval upon completion of construction.

A. Name of Project: _____

Disturbed Area (to nearest tenth of an acre): _____

B. Stormwater Plan Review Approval Date: _____

C. NPDES Permit Coverage Number (if applicable): SCR10 _____

D. Owner/Developer Name: _____

Address: _____

City: _____, State: _____ Zip: _____

Phone: _____ - _____ - _____ Mobile: _____ - _____ - _____ Fax: _____ - _____ - _____

Email Address: _____

E. Property Info: Check Box if same as above

Address: _____

City: _____, South Carolina Zip: _____

Tax Map Number(s): _____

F. Previous Owner Name: _____

Address: _____

City: _____, State: _____ Zip: _____

Phone: _____ - _____ - _____ Mobile: _____ - _____ - _____ Fax: _____ - _____ - _____

Email Address: _____

G. Engineer, Technical Representative or Firm: _____

Address: _____

City: _____, State: _____ Zip: _____

Phone: _____ - _____ - _____ Mobile: _____ - _____ - _____ Fax: _____ - _____ - _____

Email Address: _____

H. Closeout Information: Date construction completed (MM/DD/YYYY): __/__/____

a. Is the entire site sufficiently stabilized? YES NO

b. Are all stormwater facilities working properly & ready for long-term functioning? YES NO

I. Record/As-built information:

a. Is a PDF and/or digital copy of the site plan (in state plane coordinates, NAD 83 international feet) showing the as-built stormwater management system attached to this form? YES NO

Applicant's Certification:

I hereby certify that all construction, development, and/or re-development have been completed in accordance with the Town requirements and the Town approved project application and all information is truthful to the best of my knowledge. I realize that I am now responsible for the long-term maintenance of all stormwater management facilities until a transfer of ownership has been approved by the Town of Summerville Engineering Department in accordance with the Stormwater Management Ordinance.

Applicant's Printed Name

Applicant's Signature

Date

APPENDIX I
TRANSFER OF OWNERSHIP APPLICATION



TRANSFER OF OWNERSHIP APPLICATION

A. Name of Project: _____
 B. Stormwater Plan Review Approval Date: _____
 C. NPDES Permit Coverage Number (if applicable): SCR10 _____
 D. Owner/Developer Name: _____
 Address: _____
 City: _____, State: _____ Zip: _____
 Phone: _____ - _____ - _____ Mobile: _____ - _____ - _____ Fax: _____ - _____ - _____
 Email Address: _____

E. Property Info: Check Box if same as above
 Address: _____
 City: _____, South Carolina Zip: _____
 Tax Map Number(s): _____

F. Previous Owner Name:
 Address: _____
 City: _____, State: _____ Zip: _____
 Phone: _____ - _____ - _____ Mobile: _____ - _____ - _____ Fax: _____ - _____ - _____
 Email Address: _____

G. Engineer, Technical Representative or Firm: _____
 Address: _____
 City: _____, State: _____ Zip: _____
 Phone: _____ - _____ - _____ Mobile: _____ - _____ - _____ Fax: _____ - _____ - _____
 Email Address: _____

F. Other Information:
 a. If there are no modifications being made to the plans, include one (1) set of plans with signed Designer and Applicant's certification statements. (This set of plans maybe submitted on 11x17 as long as it is legible.)
 b. If this is a subdivision where a lot or group of lots are being transferred, include a plat sheet with the lot or group of lots that are being transferred clearly outlined. (This set of plans maybe submitted on 11x17 as long as it is legible.)

Original Applicant's Certification

I hereby relinquish the responsibility and ownership of the Town of Summerville Permit listed in Item B above. I realize that the construction activity responsibility for the identified project/lots/group of lots now belongs to the new applicant.

 Original Applicant's Printed Name

 Original Applicant's Signature

 Date

New Applicant's Certification

I hereby certify that all construction and/or development will be done pursuant to this plan and I am responsible for the construction activities and related maintenance thereof. Town of Summerville authorities will be allowed to enter the project site for the purpose of on-site inspections.

 New Applicant's Printed Name

 New Applicant's Signature

 Date

APPENDIX J
TABLE OF BMP USES

EROSION PREVENTION BMP SUGGESTED USES

BMP	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Erosion Prevention Measures	X	X	X	X	X	X	X
Surface Roughening	X		X				
Bench Terracing	X		X				
Temporary Seeding	X		X		X	X	X
Mulching	X				X	X	
Erosion Control Blankets and Turf Reinforcement Mats	X	X	X			X	
Final Stabilization	X		X		X		X
Topsoiling			X		X		
Permanent Seeding and Planting of Grasses	X		X		X		X
Permanent Ground Cover Plants	X		X				X
Sodding	X		X		X		X
Riprap or Aggregate	X	X	X				
Outlet Protection		X		X			X
Dust Control					X	X	X
Polyacrylamide (PAMs)	X		X	X	X	X	X

TEMPORARY SEDIMENT CONTROL BMP SUGGESTED USES

BMP	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Temporary Sediment Control Structures	X	X	X	X	X	X	X
Storage Volumes and Maintenance Schedules		X		X			X
Temporary Sediment Basin		X	X	X			X
Multipurpose Basin		X	X	X			X
Temporary Sediment Trap		X	X				X
Silt Fence	X	X					X
Rock Ditch Check			X				X
Stabilized Construction Entrance					X		
Storm Drain Inlet Protection		X		X			X
Vegetated Filter Strips		X					X
Rock Sediment Dike		X	X				X

RUNOFF CONTROL AND CONVEYANCE BMP SUGGESTED USES

BMP	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Pipe Slope Drains	X		X				
Temporary Stream Crossing		X	X				X
Runoff Conveyance Measures	X					X	X
Construction De-watering		X		X	X	X	
Level Spreader			X		X		X
Subsurface Drains			X		X		

STRUCTURAL STORMWATER QUALITY BMP SUGGESTED USES

BMP	Land Requirement	Single Family	Multi Family	Low Density Commercial	High Density Commercial	Low Density Industrial	High Density Industrial
Wet Stormwater Ponds	Moderate-High	X	X	X	X	X	X
Wet Extended Pond	Moderate-High	X	X	X	X	X	X
Micropool Extended Pond	Moderate-High	X	X	X		X	
Shallow Wetland	Moderate-High	X	X	X		X	
Extended Detention Shallow Wetland	Moderate-High	X	X	X		X	
Pond/Wetland System	Moderate-High	X	X	X		X	
Pocket Wetland	Moderate	X	X		X		X
Bioretention Areas	Moderate	X	X	X	X	X	X
Sand Filtration Facilities	Low			X	X	X	X
Infiltration Trenches	Moderate	X	X	X	X	X	X
Enhanced Dry Swales	High	X	X	X		X	
Pre-Fabricated Control Devices	Low		X	X	X	X	X

STRUCTURAL STORMWATER QUALITY BMP CHARACTERISTICS

BMP	Maintenance Burden	Costs	Aesthetically Pleasing	Provide Habitat	Drainage Area	Soils
Wet Stormwater Ponds	Low	Low	X	X	10 Min. 25 Preferred	HSG A Soils may require pond liner
Wet Extended Pond	Low	Low	X	X	10 Min. 25 Preferred	
Micropool Extended Pond	Moderate	Low	X	X	10 Min.	HSG B Soils may require infiltration testing
Shallow Wetland	Moderate	Moderate	X	X	20 Min.	HSG A and B Soils May require liner
Extended Detention Shallow Wetland	Moderate	Moderate	X	X	20 Min.	
Pond/Wetland System	Moderate	Moderate	X	X	20 Min.	
Pocket Wetland	High	Moderate	X	X	5 Min.	
Bioretention Areas	Low	Moderate	X	X	5 Max.	Clay or Silty Soils May
Sand Filtration Facilities	High	High			5 Max. 2 Preferred	Require Pretreatment
Infiltration Trenches	High	High			5 Max.	Infiltration Rate > 0.5 in/hr.
Enhanced Dry Swales	Low	Moderate			5 Max.	Permeable Soil
Pre-Fabricated Control Devices	High	High	X(Hidden)	X	Varies	No Requirement

STRUCTURAL STORMWATER QUALITY BMP SUGGESTED USES

BMP	Water Quality	Channel Protection	Flood Protection	TSS Removal	Nutrient Removal	Metal Removal	Bacterial Removal
Wet Storm Water Ponds	X	X	X	High	Moderate	Moderate	Moderate
Wet Extended Pond	X	X	X	High	High	Moderate	Moderate
Micropool Extended Pond	X	X	X	High	Moderate	Moderate	Moderate
Shallow Wetland	X	X	X	High	High	Moderate	High
Extended Detention Shallow Wetland	X	X	X	High	High	Moderate	High
Pond/Wetland System	X	X	X	High	High	Moderate	High
Pocket Wetland	X	X		High	High	Moderate	High
Bioretention Areas	X			High	Moderate	Moderate	No Data
Sand Filtration Facilities	X			High	Moderate	Moderate	Moderate
Infiltration Trenches	X			High	Moderate	High	High
Enhanced Dry Swales	X			High	Moderate	Moderate	Low
Pre-Fabricated Control Devices	X			High	Low-High	Low-High	Low-High

STRUCTURAL STORMWATER QUALITY BMP TRAPPING EFFICIENCY

Pollutant Removal Efficiency %							
BMP	Monitoring	TSS	TP	TN	Nitrate Nitrogen	Other	
Surface Sand Filters	Yes	85	55	35	Neg	Bacteria	40-80
						Metals	35-90
Perimeter Sand Filters	Yes	80	65	45	Neg	Hydrocarbons	80
Organic Sand Filters	Yes	95	40	35	Neg	Hydrocarbons	80
						Soluble P	Neg
						Metals	85
Gravel Filter	Yes	80	80	65	75	Hydrocarbons	85
						Metals	50-75
Dry Enhanced Swales	Yes	90	65	50	80	Metals	80-90
Wet Enhanced Swales	Yes	80	20	40	50	Metals	40-70
Plain Drainage Canal	Yes	30	10	0	0	Bacteria	Neg.
Vegetated Drainage Canal	Yes	65	20	15	Neg.	Hydrocarbons	65
						Metals	20-50
						Bacteria	Neg.
Vegetated Filter Strip	Yes	70	10	30	0	Metals	40-50

This table should be used as a general guide to expected effectiveness and not for design purposes.