



Charleston County Stormwater Program

Permitting Standards and Procedures Manual



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Date

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CHAPTER 1 GENERAL INFORMATION

1.1 Purpose

Charleston County has developed this Manual and the Charleston County Ordinance #1518 (Ordinance) to protect, maintain, and enhance the water quality and the environment of the County, and enhance the short-term and long-term public health, safety, and general welfare of its citizens. This Manual is for stormwater management purposes only. The requirements herein are specific to the Charleston County Stormwater Management Program and do not preclude either the Planning and Building Services 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 Public Works Director to implement the Ordinance and the County's Stormwater Management Plan (SWMP). These standards and procedures will:

1. Describe the requirements of construction activity applications and the approval process as it relates to stormwater management
2. Convey the technical design standards to the engineering community, to include standards which address runoff flow rates, volumes, and pollutant load/concentration, as well as specific standards during construction, and post-construction for long-term performance
3. Provide information on avenues 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, the SCDHEC Construction General Permit (CGP), these design standards and County ordinances should be reviewed carefully to ensure that all requirements are being met. Developments may also be impacted by applicable state and federal requirements. For projects that require coverage by the South Carolina National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Large and Small Construction Activities (CGP) the County will not issue approvals until notice of coverage from the South Carolina Department of Health and Environmental Control (SCDHEC) is received by the Public Works Director.

1.2 Scope

The scope of this Manual is limited to the requirements related to stormwater management as reviewed and approved by the Charleston County Administrator. 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.

The design standards are not intended to restrain or inhibit engineering creativity, freedom of design, or the need for engineering judgment. When 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, landscape architect, or Tier B Land Surveyor who 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 four (4) chapters, organized to present recommended technical and engineering procedures along with criteria obtained from local, state, and federal requirements. The remainder of this chapter provides information on the County's authority to develop and enforce design requirements with some background information on stormwater management and its importance, as well as definitions for terms used throughout this Manual. Chapter 2 describes the application process for obtaining a construction permit. Chapter 3 contains specific design criteria. Chapter 4 describes the inspection and enforcement process.

1.4 Authorization

This Manual has been prepared under the direction of the Public Works Director, who has been granted the authority to develop engineering design standards and enact programs, policies and procedures to ensure compliance with state and federal laws for the purposes described above. Description of stormwater related laws, regulations, and assigned authorizations to Charleston County are provided below.

1.4.1 Clean Water Act

The Federal Water Pollution Act, as amended by the Clean Water Act (CWA) requires the reduction of water pollution and gave the Environmental Protection Agency (EPA) the congressional authority to develop programs to improve the health of navigable waters. In response, the EPA developed regulations that created a program of discharge permits as part of the NPDES Permit to regulate point source from a variety of discharges. The 1987 amendments to the CWA extended NPDES permits to industrial discharges, including stormwater runoff associated with land disturbing activity. The 1987 CWA Amendments also require NPDES permitting for stormwater runoff from urbanized areas. A Municipal Separate Storm Sewer System (MS4) NPDES permit is required based on population.



Authority to administer the NPDES permit program was delegated to state agencies, such as SCDHEC, by the EPA.

1.4.2 South Carolina Pollution Control Act

The South Carolina Pollution Control Act (PCA) was originally enacted in 1950 and was last amended in 1970. It can be applicable to any activity that could negatively impact the environment. It requires attainment of a permit and implementation of measures to mitigate potential impacts.

1.4.3 South Carolina Stormwater Management and Sediment Reduction Act

The South Carolina Stormwater Management and Sediment Reduction Act was enacted to address the increase in stormwater runoff rate and quantity, the decrease of rainwater infiltration, and the increase in erosion associated with the extensive urban development occurring throughout the state. The Act gave legislative authority to SCDHEC to enact programs to meet its purpose.

1.4.4 NPDES Permit for Stormwater Discharges Associated with Industrial Activity

All stormwater runoff from “industrial activities,” as defined by the EPA, is considered an illegal discharge without NPDES discharge permit coverage. These permits require certain industries to develop and implement a Stormwater Pollution Prevention Plan (SWPPP), which must include appropriate BMPs to minimize pollution to the receiving natural waterbodies. There are two general types of industrial activity permits: “construction related” and “other.”

1.4.5 NPDES MS4 General Permit

Charleston County is an MS4 community which is regulated by the provisions of the NPDES Phase II MS4 program. The NPDES MS4 permit requires that Charleston County encourage, promote, implement, and enforce certain practices, programs, and procedures for the purpose of reducing or limiting discharge of pollutants to Waters of the State (WoS). The permit requires that Charleston County develop and implement a Stormwater Management Plan (SWMP) to control the discharge of pollutants from its MS4 to the maximum extent practicable (MEP).

The SWMP has numerous components that must be met and this Manual provides compliance with several, including construction and post-construction management, public education, and enforcement. The SCDHEC MS4 permit can be found at <http://www.scdhec.gov/Environment/WaterQuality/Stormwater/TechnicalDocuments/>.

1.4.6 Charleston County Ordinances, Regulations, and Standards

Charleston County has developed and adopted ordinances and standards largely based on state and federal regulations which address concerns associated with uncontrolled stormwater runoff. The principle ordinances and standards for the County that affect stormwater control measures are:

1. Charleston County Ordinance #1518 (Ordinance): established the engineering design standards and procedures for obtaining a construction permit within Charleston County. The Public Works Director 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. South Carolina Department of Health and Environmental Control (SCDHEC) NPDES General Permit For Stormwater Discharges from Construction Activities.
 3. 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.
 4. Building and Building Regulations: these regulations permit and enforce all applicable provisions of the building codes and floodplain management ordinances.

1.5 Updates to the Design Standards

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's general welfare. Updates will be approved by the County Administrator. Users of this Manual are encouraged to provide comments on the content of this Manual at any time. This Manual can be found on the Charleston County website at www.charlestoncounty.org.

1.6 Stormwater Management

Development and redevelopment of properties has the potential to alter the natural drainage patterns, flow rates, volumes, and quality of the County's water resources. The following sections discuss these impacts and the design considerations that are available and encouraged.

1.6.1 Urban Stormwater Runoff

This section provides background information on both the major sources of pollutants commonly found in stormwater flows and those that impact County waterbodies.

In Table 1.1, these sources and the pollutants most commonly associated with them are presented. Table 1.2 shows some of the common stormwater runoff pollutants and their sources. This is followed by a detailed discussion of the most common pollutants found in stormwater discharges.



Table 1.1. Average Pollutant Loading for Various Land Uses

Land Use	Pollutant Loading (mg/L)											
	BO D	CO D	TS S	TD S	TP	DP	TK N	NO ₂ / NO ₃	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 | NO ₂ /NO ₃ = 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 SCDHEC and NURP (1983) should be sought when estimating existing and post-development bacteria loads and the reduction requirements.



Table 1.2: 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-Stormwater 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.



1.6.1.1 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 which results in decreased activity and growth of photosynthetic organisms. Also, elevated concentrations of suspended sediment alters stream nutrient biogeochemistry which impacts nutrient adsorption and desorption, processes which are very important to primary production and overall ecosystem health (Lee, 1996; Dent and Henry, 1999). Increased turbidity also detracts from the aesthetics of natural waters. In addition, 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 which results 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, wash off 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 associated 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.

1.6.1.2 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 waters are unable to sustain certain forms of aquatic life and can further cause the water to become foul. Bacteria may enter the stormwater drainage systems typically from the wash off 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, industrial or commercial drains, etc.) and malfunctioning septic systems, all of which are deemed illicit discharges and illegal by the 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 SCDHEC to date.



1.6.1.3 Nutrients

Nitrogen and phosphorus are nutrients that promote the growth of plants and protista (e.g., algae) and are the second leading stressor of impaired rivers and streams and the leading stressor of impaired lakes (US EPA, 1997). Such nutrients contribute to the eutrophication of water bodies resulting in a list of associated liabilities, such as 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, from industrial sites, from municipal wastewaters (of more concern for combined sewer overflows), or from 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 two (2) to twenty (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 planting in stormwater quality control ponds.

Most models of nutrient loadings that include an extensive data base included have been based on agricultural and forest operations. These have applicability to wash off from fertilized lawns and forested areas but not to the impervious areas. Models of nutrient loading in urban runoff are typically based on wash off 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 nutrients loads and removal using isothermic relationships that define adsorbed to dissolved nutrient ratios.

1.6.2 Effects of Development on Watershed Hydrology

Development and urbanization can potentially have the following impacts on receiving waterbodies:

- Changes to channelized flows
 - Increased runoff volumes
 - Increased peak runoff discharges
 - Greater runoff velocities
 - Increased flooding frequency
 - Lower dry weather flows (base flow)
- Changes to channel geometry
 - Channel enlargement
 - Erosion of banks
 - Changes in channel bed due to sedimentation
- Degradation of aquatic habitat



- Degradation of habitat structure
- Decline in channel biological functions
- Water quality impacts
 - Reduced oxygen in waterbodies
 - Microbial contamination
 - Hydrocarbons and toxic materials
 - Sedimentation
 - Other pollutant loadings
- Property damage and safety concerns
- Unsightly aesthetic channel conditions and restricted use of waters

1.6.3 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
- Stormwater quality controls
- Erosion and sediment 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 impact(s) the stormwater system may have on the watershed
- Creation of a Master Plan to address drainage and stormwater issues or concerns



- Design aspects of the stormwater management plans
- Approval and completion of the stormwater permit application

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

1.6.4 Innovative Design Approach

When designing for land disturbance activities, the design must address the following four (4) 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 effects). If an innovative stormwater design approach is to be used, the design professional should take the following considerations in mind, in addition to meeting the above 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 by preventing pollution from entering the stormwater system rather than by removal.
- BMPs aid in stormwater management 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.

1.6.5 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 minimization of adverse stormwater runoff impacts by the use of BMPs and site planning is 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. Effective BMPs can reduce the amount of total post-development impervious areas and maintain natural characteristics of the pre-development site conditions are encouraged. Therefore, the post-development curve numbers and time of concentrations are maintained more closely to the pre-development conditions. This reduces the overall hydrologic and hydraulic impact of the development.



1.6.5.1 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 examples are, but not limited to:

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

1.6.5.2 Low Impact Site Layout Techniques

Low impact site layout techniques involve identifying and analyzing the location and configuration of structures on the site to be developed. Some options are, but not limited to:

- Fitting the design layout to follow the natural contours of the site to minimize clearing and grading and preserving natural drainage ways and patterns
- Limiting the amount of clearing and grading by identifying the smallest possible area on the site that would require land disturbance
- Placing development areas on the least sensitive areas of the site and avoiding steeply sloped areas when possible
- Utilizing nontraditional designs to reduce the overall imperviousness of the site by providing more undisturbed open space and minimizing clear-cutting
- Considering the utilization of cisterns and rain barrels to collect stormwater for reuse
- Using energy dissipation devices at all discharge points. Level spreaders can be considered for discharge points into ponds and other basin-type BMPs. More information on these devices is provided in Chapter 3.

1.6.5.3 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

1.6.5.4 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 may be considered as potential stormwater drainage systems, and 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 drainage ways may be maintained and not disturbed to provide a natural stormwater drainage system to carry runoff to an existing outlet. The use of natural drainage ways allow for more storage of stormwater runoff, lower peak flow rates, a reduction in erosive runoff velocities, and the capture and treatment of pollutants
- Use vegetated swales instead of curb and gutter applications where applicable. This application allows for more storage of stormwater runoff, lower peak flow rates, a reduction in erosive runoff velocities, and the capture and treatment of pollutants which does not occur with curb and gutter systems
- Where ditched roadways are not practical, 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

1.6.5.5 Manufactured Treatment Devices

Charleston County is aware of the potential benefit in using a number of engineered stormwater control devices currently available on the market, such as baffle boxes, cartridge filters, and sock and tube erosion control devices. The Public Works Director may evaluate any and all such devices specified for a given product and require for each appropriate drawings, specifications, and discussions as to the applicability of the product, expected performance, and required maintenance. The Public Works Director reserves the right to request that certain devices be installed and maintained or limit the use of



such devices related to achieving water quality objectives for a specific project. See Section 3.4.11 in Chapter 3 for more information.

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 Charleston County. For applicable projects, construction plans submitted for review and approval must be stamped and signed by a professional engineer, landscape architect, or Tier B land surveyor 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 his 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 Charleston County. Charleston County requires a level of design expertise for stormwater calculations and flooding analyses. Stormwater design criteria are based upon current scientific knowledge and engineering judgment. Engineering designers should recognize that floods and flooding may occur at any time due to any number of factors beyond the reasonable control of Charleston County, such as: greater amounts of precipitation or different rainfall patterns than used in design storms, wet soil conditions, debris or blockage of key stormwater channels, high groundwater tables, etc.

1.8 Severability

If any provision of this Manual or its application to any circumstance is held by a court of competent jurisdiction to be invalid for any reason, this holding does not affect other provisions or applications of this Manual which can be given effect without the invalid provision or application, and to this end, the provisions of this Manual are severable.

1.9 Contact Information

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

Primary Contact for Stormwater Issues:
Stormwater Management Division



4045 Bridge View Drive
North Charleston, SC 29405-7464
(843) 202-7600
Fax: (843) 202-7601

General Stormwater Email: stormwater@charlestoncounty.org
Stormwater Community Service Line: (843) 202-7639
Office Hours: Monday-Friday, 8:00 a.m. - 5:00 p.m.

Submissions for Projects in Unincorporated Charleston County should be made to:

Charleston County Planning Department
4045 Bridge View Drive
North Charleston, SC 29405
(843) 202-7200
(843) 202-7222 (Fax)
Office Hours: Monday-Friday, 8:00 a.m. - 5:00 p.m.

Submittal Information for Projects in Municipalities

Town of Folly Beach
Public Works Department
Post Office Box 48 (Town Hall is located at 21 Center Street)
Folly Beach, SC 29439
(843) 588-2447 ext. 4
(843) 588-7016 (Fax)
Office Hours: Monday-Friday, 8:00 a.m.- 4:00 p.m.
<http://www.cityoffollybeach.com>

City of Isle of Palms
Post Office Box 508 (City Hall is located at 1207 Palm Blvd.)
Isle of Palms, SC 29451
(843) 886-6428 - main office
(843) 886-8005 (Fax)
Office Hours: Monday-Friday, 8:00 a.m. – 5:00 p.m.
www.isle-of-palms.sc.us/

Town of James Island Public Works Department
1238-B Camp Road
P.O. Box 12240
James Island, SC 29412
(843) 795-4141
<http://www.jamesislandsc.us/>

Town of Lincolnton
Post Office Box 536 (Town Hall is located at 141 W. Broad Street)
Lincolnton, SC 29484



(843) 873-3261
(843) 873-3267 (Fax)
<http://www.lincolnvillesc.com/>

Town of Sullivan's Island
Design Review Board
Post Office Box 427 (Town Hall is located at 1610 Middle Street)
Sullivan's Island, SC 29482
(843) 883-3198
(843) 883-3009 (Fax)
www.sullivanisland-sc.com/

1.10 Definitions

The Public Works Director 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 Ordinance apply to this Manual.

1. Amended Permit: when changes to the originally permitted plans, hydrology, or hydraulics have occurred.
2. Best Management Practices (BMPs): activities, prohibition of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
3. Buffer: an area left undisturbed between neighboring property lines or wetlands.
4. Charleston County Stormwater Permit (stormwater permit): a supplement to the Planning Permit and/or Building Permit obtained from appropriate officials; this is not an independent permit allowing construction to begin.
5. Common Plan of Development: used to determine the total disturbed acreage of a project.
6. Conditional Permit: a proof of acceptance in order to obtain other Local, State, or Federal permits before a Final Permit is issued.
7. Contour: an imaginary line, or its representation on a contour (topographic) map, joining points of equal elevation.
8. 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.
9. Datum: a reference from which measurements are made.
10. Detention: the collection and storage of stormwater runoff in a surface or sub-surface facility for subsequent controlled discharge to a watercourse or waterbody.



11. Development or Re-Development: any of the following actions undertaken by a person, a firm, a governmental agency, a partnership, a limited liability company, or any other individual or entity, without limitation:
 - i. any division or subdivision of a lot, tract, parcel, or other divisions by plat or deed;
 - ii. the construction, installation, or alteration of land, a structure, impervious surface or drainage facility;
 - iii. clearing, scraping, grubbing or otherwise significantly disturbing the soil, vegetation, mud, sand, or rock of a site; or,
 - iv. adding, removing, exposing, excavating, leveling, grading, digging, burrowing, dumping, piling, dredging, or otherwise disturbing the soil, vegetation, mud, sand, or rock of a site.
12. Ditch: a drainage channel in earth created by natural or artificial means to convey surface and/or subsurface water, flowing continuously or intermittently.
13. 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 so to remove water, and is commonly applied herein to surface water.
14. Elevation: height in feet above a given known datum, such as mean sea level.
15. Embankment or Fill: a deposit of soil, rock or other material placed by man.
16. Engineered Device: a structural device that is designed to improve stormwater quality and/or quantity by controlling runoff volumes, rates, pollutants, etc.
17. Erosion Prevention Sediment Control: any practice that protects the soil surface and prevents the soil particles from being detached by rainfall or wind.
18. Grading: any displacement of soil by stripping, excavating, filling, stockpiling, or any combination thereof, including the land in its excavated or filled state.
19. Illicit Discharge (illegal discharge): any activity which results in a discharge to a Charleston County stormwater management system or facility or receiving waters that is not composed entirely of stormwater except (a) discharge pursuant to an NPDES permit (other than the NPDES for Charleston County) and (b) discharges resulting from the fire-fighting activities
20. 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.
21. Intergovernmental Agreement: An agreement between two municipalities allowing one municipality to charge utility fees and complete stormwater related work within the other municipality.



22. Mean Sea Level (MSL): the average (mean) height of the sea or ocean, in reference to NAVD29 or NAVD88.
23. Mean High Water (MHW): the average of all the high water heights observed over a period of several years, in reference to NAVD29 or NAVD88.
24. Municipal Separate Storm Sewer System: a system of conveyances that include, but are not limited to, catch basins, curbs, gutters, ditches, man-made channels, pipes, tunnels, and/or storm drains that discharge into waters of the state.
25. Operating Permit: operational permit of the real property, including any permanent BMP's related to land disturbance, construction, or post-construction Stormwater quality or quantity.
26. Outlet Facility: stormwater management facility designed to regulate the elevation, rate, and volume of stormwater discharge from detention facilities.
27. 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 system(s) and facility(s). May be referred to as owner, owner/operator or agent. Certification signatures must be provided by this person.
28. Pervious Surface: a surface type that allows water to penetrate through the surface and drain to the ground below at a rate greater than 0.1 in/hr.
29. Pollutant: dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.
30. 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 construction, development or re-development activity.
31. Pre-Development Conditions: those conditions, in terms of the existing topography, vegetation and rate, volume or direction of stormwater runoff, which exist prior to the time the applicant commences any construction, development or re-development activity.
32. Project: improvements and structures proposed by the applicant to be constructed on a defined site as part of a common plan of development.
33. Public Works Director: means the director of the Department of Public Works of Charleston County, South Carolina or an authorized representative or designee.
34. Rate: volume of water passing a point per unit of time, generally expressed in cubic feet per second (cfs).



35. Re-Development: See Development.
36. Retention: the collection and storage of stormwater runoff without subsequent discharge to surface waters.
37. 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 County to address TMDLs (retrofitting systems to include a water quality/runoff treatment device).
38. Runoff: that part of rainfall that is not absorbed into the site but flows over and/or off the site as surface waters.
39. 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.
40. Sedimentation: the tendency for particles, debris, and other materials in suspension to settle out of the fluid in which they are entrained, and/or come to rest against a barrier or BMP.
41. Sedimentation Facility: any structure or area which is designed to retain suspended sediments from collected stormwater runoff, to include sediment basins.
42. Shallow Concentrated Flow: stormwater flow after approximately 300 feet of sheet flow and before channelized flow.
43. Sheet Flow: flow over plane surfaces, usually within the headwaters of streams.
44. Single Family Residential: buildings containing one (1) dwelling unit located on a single lot. This classification includes mobile home and factory-built housing.
45. 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.
46. Site Construction: See Development
47. Special Protection Areas: designated areas within the County within which more stringent design standards have been established to address an existing problem, such as flooding or water quality. Construction activities occurring within these areas will be required to comply with additional or more stringent design criteria.
48. Storm Frequency: rate of likely recurrence of a rainstorm.
49. 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 Manual and pertaining ordinances 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 receives



approval as detailed in this document and includes, but not limited to, the engineering calculations, construction drawings, etc.

50. 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 combination of lots of record.
51. Swales: a graded landscape feature appearing as a linear, shallow, open channel with trapezoidal or parabolic shape with the purpose of conveying surface water.
52. Undisturbed Area: an area still in its natural state in which no clearing, grading, or other construction activity has occurred.
53. Vegetation: all plant growth, especially trees, shrubs, mosses, and grasses.
54. Vegetative Buffer: an area of existing, dense vegetation intended to slow runoff, trap sediment and pollutants, and provide some infiltration into underlying soils.
55. 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/or delineated as wetlands by the U.S. Army Corps of Engineers.



CHAPTER 2 STORMWATER PERMITTING PROCEDURES

This chapter provides developers, owners, engineers, contractors, and others with the information needed to obtain approval of a stormwater management plan from the Public Works Director as required for certain construction activities within unincorporated Charleston County and encompassed municipalities as authorized under intergovernmental agreements. This section describes the conditions when a permit is needed, the types of applications that apply to different situations, application package requirements, and when and if waivers of such requirements are applicable for certain exempted activities. The Public Works Director reserves the right to require additional information for any permit application for the purposes of public safety and health and the preservation of the environment.

2.1 Duty to Comply

Unless otherwise allowed by the Charleston County Ordinance #1518 (Ordinance), this Manual, or the SCDHEC Construction General Permit the surface of land in Charleston County shall not be disturbed or altered for any purpose whatsoever, nor any major drainage channel or component of the stormwater system impeded or encroached upon without approval from the Public Works Director. Land disturbance activities cannot commence prior to approval from the Public Works Director and issuance of a Charleston County Stormwater Permit. This permit must be on site throughout the course of construction.

2.2 Stormwater Permit Application and Approval Procedures

A stormwater permit is required for all land disturbing activity including, but not limited to, new single family residential construction, commercial, industrial, institutional, multi-family residential, new development, and redevelopment projects. All stormwater permit applications shall be submitted to the Charleston County Planning Department (see the contact information in Section 1.9). Applications for review and approval may be initiated by: (1) property owner(s); (2) the owners' authorized agents; or (3) review and decision-making bodies. The application package will then be distributed to other necessary County departments for their review. The remainder of this Manual describes the procedures and application requirements of the Public Works Department. The submittal requirements of other County departments are not given in this Manual. The Public Works Director will require applicants that need permit coverage from any local, state or federal agency to have such permits in hand prior to County permit issuance. Applications are included in Appendix A of this manual, or can be obtained directly from the Public Works Department in person or by email. Applications are also available online at http://www.charlestoncounty.org/departments/public-works/files/TECH_MANUAL.pdf . In addition, digital application submissions can be accepted.

If wetlands are suspected to exist on the property, they must be investigated and delineated as per State and Federal requirements. The US Army Corps of Engineers (USACE), or South Carolina Department of Health and Environmental Control Ocean and Coastal Resource Management (SCDHEC-OCRM) must make a determination as to whether or not the wetlands fall under their respective jurisdictions. All efforts will be made to reduce or eliminate impacts such as using a buffer and/or installing a silt fence around the wetlands. If the wetlands fall under the jurisdiction of the USACE or OCRM, a permit is needed before any disturbance of the wetlands is allowed. Charleston County will accept certified delineations. In addition, Charleston County will require any applicable local, state or federal permit prior to disturbance.



The Public Works Director has established several categories of applications. Each category is outlined below. All applications must be completed in their entirety to be considered for approval. The full requirements for all application types are included in sections (2.3.3 – 2.3.10). The full requirements of the general design standards for all permit types are included in Chapter 3.

1. **Clearing and Grubbing Application** – Clearing and grubbing permits are not applicable to sites on which future development is planned. See Section 2.3.3 for full requirements.
2. **Single Family Residential (SFR)/Townhome /Modular Home Application** – The SFR application will be for most single family residential structures. For Townhomes, an individual SFR application will need to be completed for each TMS number. See Section 2.3.4 for full requirements.
3. **Mobile Home Application** – The Mobile Home application will be required before moving a mobile home onto a property in Charleston County. See Section 2.3.5 for full requirements.
4. **Small Commercial Application** – The small commercial application will be required for small commercial projects that disturb less than one half (1/2) acre of land. See Section 2.3.6 for full requirements.
5. **Utility and Linear Application** – The utility and linear application is for linear projects such as road, utility, or sidewalk installation. See Section 2.3.7 for full requirements.
6. **Type I Application** – The Type I application is for development or redevelopment projects that disturb one half (1/2) acre and less than one (1) acre of land. See Section 2.3.8 for full requirements.
7. **Type II Application** – The Type II application is for development and redevelopment projects that disturb one (1) acre or more but less than five (5) acres of land. See Section 2.3.9 for full requirements.
8. **Type III Applications** – The Type III application is for all development and redevelopment projects that disturb five (5) acres or more of land. See Section 2.3.10 for full requirements.

Each category has a different list of submittal requirements. In general, the larger the project area and potential impact on the County's stormwater system and waters of the state, the more in-depth the stormwater management plan must be and hence the more information that must be submitted for review.

Applications required in this Manual shall be considered complete only if they are submitted in the required format and include all mandatory information. Any application that is determined to be incomplete shall be returned to the applicant along with an explanation of the application's deficiencies. No further processing of the application shall occur until the deficiencies are corrected. Once the deficiencies are corrected, the application may be resubmitted provided that it is resubmitted within six (6) months of the date that the application was returned to the applicant. An application resubmitted more than six (6) months after the date that the application was returned is considered dormant.



Whenever the procedures of the County expressly state that applications are to be submitted after a "pre-application conference," applicants shall be responsible for scheduling and attending such meetings. When pre-application conferences are required, an application shall not be accepted until the pre-application conference has been conducted, and any errors or omissions noted in review of the application for completeness have been addressed by the applicant. The pre-application conference should be scheduled in conjunction with the applicable Planning Department pre-application conferences.

2.2.1 Final Approval

As mentioned, in **all** cases, one complete permit application for a construction project shall be submitted to Charleston County via the Planning Department or if applicable, the municipal agency (see contact information in Section 1.9) along with required components (Section 2.3.3 to 2.3.10). The permit application is given a brief review by the Planning Department at the time of submission to check for the required submittal components. Failure to provide all of the required information shall be considered an incomplete application and the package will be returned to the applicant. If mailed, the applicant will be notified by mail requesting further information needed to complete the package. In some cases, a new permit application package will have to be resubmitted. The Public Works Director will begin the review process once the application package is received from either the Planning Department or independently. The Public Works Director has twenty (20) working days to either approve, deny, provide comments, or request further information from the applicant.

If a Type III permit is being sought, the review will not begin until after it has been verified that the pre-application meeting was held or until the Stormwater Master Plan has been discussed with the Public Works Director. Plan review checklists for the various approval types are provided in Appendix B.

2.2.2 Site Construction and Project Closeout

Disturbances cannot commence until the Charleston County Stormwater Permit is issued to the applicant by either the Charleston County Stormwater Division or necessary departments. Disturbance activities must adhere to the provisions agreed to in the permit. Any substantial revisions to the approved permit should be submitted in writing to the Public Works Director for review by the necessary departments. 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/operator is required to maintain onsite at least one (1) copy of all approved permits, technical reports, and construction documents, available upon request by Charleston County. The Public Works Department will conduct inspections during the construction phase. Frequency and specific times and dates of these inspections will be done at the discretion of the Public Works Director. 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, and if applicable, the NPDES permit from SCDHEC-OCRM.



2.2.2.1 Permit Transfer

A stormwater permit may be transferred from one owner/operator to another with notification to the Public Works Department. An example is when a developer readies 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 Charleston County and SCDHEC aware in writing of plans to transfer ownership of the permit and associated stormwater management issues through completion of the permit transfer form in Appendix C within five (5) business days. A transfer of permit coverage is also allowed for phases within a project. If a permit transfer is not requested using the appropriate form, the current permit holder will continue to be held responsible for stormwater management issues at the site. A transfer of ownership will result in an amended permit issued by Charleston County.

2.2.2.2 Closeout

At the conclusion of construction, the owner/operator is responsible for making sure the site is stabilized with vegetation or other appropriate ground cover which prevents sediment runoff. In addition, paved areas and stormwater conveyances must be clean of debris and sediment, temporary BMPs removed, and stormwater controls must be working properly. Proof of these will be determined by a County Inspector and a final inspection report will be provided once all stabilization measures have been completed, which will serve as the Notice of Termination (NOT). Any problems found must be corrected by the owner/operator prior to closing out a County permit. An As-built Survey for critical elements of a stormwater system will be required prior to closeout. The As-built Survey must provide, at a minimum, the following information:

- a. All existing grades/contours/depths of the structure.
- b. All elevations and dimensions of all outlet structures, including:
 - i. Pipe and orifice inverts and diameters.
 - ii. Weir elevations and dimensions.
 - iii. Riser dimensions and elevations.
 - iv. Emergency spillway dimensions and elevations.
 - v. Locations and inverts for all pipes discharging into the pond.
- c. Spot elevations along the top of the structural BMP's embankment.
- d. Contours, dimension, and locations of all structural components (e.g., forebays, level spreaders, riprap aprons, inlets structures) of the structural BMPs



A Certificate of Occupancy may be withheld until the above conditions have been met by the owner/operator and verified by the Public Works Director. The Public Works Director may require additional items in order to closeout a permit. Upon confirming any necessary corrections are completed and the site is ready, the owner/operator will notify Charleston County for project closeout.

Charleston County reserves the right to re-inspect a site over two (2) growing seasons to verify proper stabilization is maintained. In the event that ground stabilization has not been kept up to the County standards, inspectors may begin enforcement procedures to require the owner to re-stabilize the site. See Chapter 4 for enforcement measures. The Charleston County Grass Specification Manual should be utilized to help in the establishment of grass growth.

Upon the closure of a stormwater permit the stormwater operating permit automatically goes into effect if an operating permit has been issued (Section 2.2.10.2).

2.2.3 Exemptions

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

1. 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. Land disturbance, which includes the removal of the soil/root system, is not exempt from these provisions.
2. Activities undertaken by persons who are otherwise regulated by the provisions of the South Carolina Mining Act.
3. Certain livestock, including beef cattle, sheep, swine, horses, ponies, mules, or goats, including the breeding and grazing of these animals; bees, fur animals, and aquaculture. The construction of an agricultural structure that requires the disturbance of one (1) or more acres, such as, but not limited to, broiler houses, machine sheds, repair shops, and other major buildings shall require the submittal and approval of an application in accordance with the Manual prior to the start of the land disturbing activity.
4. Land disturbing activities on agricultural land for production of plants and animals, 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. The construction of an agricultural structure that requires the disturbance of one (1) or more acres, such as, but not limited to, broiler houses, machine sheds, repair shops, and other major buildings shall require the submittal and approval of a Land Disturbance Application prior to the start of the land disturbing activity.
5. Overhead line installation (including poles and towers) along with associated vehicular access that does not result in significant soil/root system disturbance to include clearing of



trees if the stumps are not removed. This exemption does not excuse those activities which impact another project and associated compliance conditions to County regulations.

2.2.4 Expiration of Permit

A stormwater permit will remain valid for up to five (5) years from the date of issuance, provided that the project is in compliance with the Ordinance and this Manual, and is not inactive for a period of twelve (12) consecutive months. Construction activity must be initiated within six (6) months of issuance of the County permit. Failure to initiate construction will render the permit invalid at the end of the sixth (6th) 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 permit, approved plan, specifications, and time schedule and in compliance with all requirements of the Ordinance and this Manual.

2.2.6 Variances

The Public Works Director may grant a variance from the requirements of this Manual if exceptional circumstances exist such that strict adherence to the provisions of this Manual will result in unnecessary hardship to the owner/operator or person and will not fulfill the purpose of this Manual (Section 1.1) and the Ordinance (Section 1.4.6).

A request for variance must be submitted in writing by the owner/operator. The request must provide details as to the nature and reason for the request and supporting technical documentation (recommend including applicable Manual sections). The owner/operator will include in writing the following information to support the request:

- a. Demonstrate that the variance will not conflict with the purposes of this Manual, the Ordinance or the regulatory requirements of Local, State, or Federal jurisdictions having authority
- b. Demonstrate extraordinary and exceptional conditions pertaining to the particular project
- c. Conditions that do not generally apply to other property in the vicinity
- d. A variance will not be of substantial detriment to adjacent property or to the public good
- e. Provide technical documentation including testing, performance, or other data that supports the requested variance

The Public Works Director shall render, in writing, a decision on the request within thirty (30) working days of the receipt of the written request for variance.

2.2.7 Encroachment Permits

An encroachment permit, which controls the impacts of traffic, storm drainage, etc., within a public road right-of-way, must be obtained from the SCDOT, Charleston County Public Works Department, or other



municipality/entity before construction begins. Applicants should be aware of Charleston County requirements which may differ from SCDOT's.

A copy of an encroachment permit application(s) to SCDOT and/or Charleston County must be included in the stormwater permit application package. It is the applicant's responsibility to comply with all SCDOT and/or Charleston County encroachment permit application requirements. Prior to final approval from the Public Works Director, approved encroachment permits are required.

Offsite Easements

Any required off-site easements shall be obtained prior to stormwater permit 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 stormwater permit will be issued.

2.3 Charleston County MS4 Permit Types

If adverse impacts are created, regardless of permits acquired by the owner, mitigation of adverse impacts shall be the owner's full responsibility. Impacts to stormwater systems will be determined to be adverse by the Public Works Director. If such mitigation is not corrected in the allotted time set by the Public Works Director, enforcement actions will be taken per Chapter 4.

2.3.1 Ownership (Private)

Residential: Ownership of all BMPs (water quantity and quality basins/devices/non-structural practices) in new and redevelopment projects belong to the owner/operator(s) of the parcel(s) or a Home Owners Association (HOA) of land under or on which BMPs exist.

Commercial: In new and redevelopment projects, ownership of the entire stormwater system (onsite conveyances, as well as all BMPs, ponds, etc.) belongs to the owner/operator.

For any project, the owner of a portion or the entire stormwater system shall be clearly designated before a stormwater permit will be issued. Ownership requires maintaining the stormwater system, including all ponds and other BMPs used for controlling runoff quantity and quality. A Charleston County Stormwater Permit does not allow the owner/operator to alter in any way the size or function of any component of the stormwater system in which adversely affects hydrology on neighboring parcels. Owners/operators found altering such components will be required to remove any alterations.

2.3.2 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 stormwater permit. The plan shall also cover temporary measures used during construction in addition to the long term maintenance of the system. Maintenance activities and recurrence intervals for water quality BMPs are discussed and referenced in Chapter 3.



The owner/operator or HOA must enter into a permanent maintenance agreement with Charleston County through the issuance of the operating permit. The operating permit is provided in Appendix C. The operating permit is prepared by the Public Works Director using information supplied by the owner and must be signed and executed prior to the issuance of a Stormwater permit. This permit allows for maintenance to be performed by a third party such as an operator or other contractor. The Public Works Director will provide oversight of the permits to ensure compliance. The Public Works Department may inspect a system to ensure maintenance is being performed in accordance with this permit. Chapter 4 provides information on the County inspection and enforcement procedures.

Any relevant design criteria mentioned in Chapter 3 may apply to any of the following permit types.

2.3.3 Clearing and Grubbing Application

Clearing and grubbing activities that disturb less than 5,000 square feet do not require an application **as long as no further construction activities, such as single family homes, modular homes, mobile homes, etc., are to follow.** All BMPs should be in place to prevent erosion, sedimentation, offsite tracking, etc. before land disturbance activities begin. If any change to the drainage patterns are to occur (i.e. stripping away topsoil, bringing in material, digging ponds, adding stormwater conveyance, etc.) A Letter of Intent must be filled out with each clearing or grubbing application.

Clearing and grubbing activities that disturb 5,000 square feet or more will require the submission of a Clearing and Grubbing Application. The application contains guidance on selecting, installing, and maintaining erosion prevention and sediment controls on site. This permit requires the owner/operator to certify that these measures will be installed and maintained to prevent the discharge of sediment-laden runoff and to prevent the construction from causing non-compliance for any adjacent construction projects that may be under another county, state, or federal permit.

Debris from clear cutting, construction, and site preparation must not impede flow or create obstructions within streams and waterbodies. Stream crossings shall be avoided when possible. When stream crossings cannot be avoided, they shall have control devices to collect and divert surface flow from the access road or skid trail into undisturbed areas or other control structures. Erosion protection and sediment control shall be in place to prevent sediment and/or illicit discharges from leaving the site and/or entering wetlands, critical areas, or other state and federally regulated areas.

2.3.4 Single Family Residential, Townhome, and Modular Application

All Single Family Residential (SFR) and Townhome site construction applicants must complete the Single Family Residential and Townhome Application. This stormwater permit requires the owner/operator to certify that BMPs will be installed and maintained to prevent the discharge of sediment-laden runoff and/or illicit discharges and to prevent the construction from causing non-compliance for any adjacent construction projects that may be under another county, state, or federal permit. This application shall include a scaled map (site plan) which includes existing and proposed drainage flow patterns and Letter of Intent, which includes a site narrative which propose means and methods to preventing adverse impacts to adjacent and/or downstream properties. Construction plans submitted for review and approval must be stamped and signed by a professional engineer or landscape architect actively licensed in the state of South Carolina. If a SFR site exceeds one (1) acre it may be required by the Public Works Director to apply for a Type 1 - Minor Application permit.



2.3.5 Mobile Home Application

All mobile home construction applicants must complete the Mobile Home Application. This stormwater permit requires the owner/operator to certify that BMPs will be installed and maintained to prevent the discharge of sediment-laden runoff and/or illicit discharges and to prevent the construction from causing non-compliance for any adjacent construction projects that may be under another county, state, or federal permit. The applicant for the mobile home site must obtain a stormwater permit prior to obtaining a building permit.

This application shall include a scaled map (site plan) which includes existing and propose drainage flow patterns and a site narrative which propose means and methods to preventing adverse impacts to adjacent and/or downstream properties. If a mobile home project exceeds one (1) acre it may be required by the Public Works Director to apply for a Type 1 - Minor Application permit. Mobile home parks will be permitted as commercial and will not be covered under this mobile home application.

A stormwater permit may not be required, under the Public Works Director's discretion, if a mobile home of similar size is replacing an existing mobile home in the same location.

2.3.6 Small Commercial Application

All small commercial construction projects that disturb less than one half (1/2) acre must complete the Small Commercial Application. This application shall include a scaled map (site plan) which includes existing and propose drainage flow patterns and a site narrative which propose means and methods to preventing adverse impacts to adjacent and/or downstream properties. The Public Works Director reserves the right to require additional information. A Letter of Intent (Appendix A) must be filled out with each small commercial application.

2.3.7 Utility and Linear Applications

Utility companies are not exempt from NPDES requirements. When applicable, Charleston County must permit and regulate utility projects just as any other type of construction. Charleston County requires that companies performing utility installations must obtain County approval prior to beginning work. This must be done whether the utility installation is done as part of another construction project (e.g., water line extension), as an independent project (e.g., gas force main) or as a linear site construction project (e.g., sidewalk construction). This permit application does not cover roadway construction above one (1) acre. A complete application must include the following items:

1. This application shall include a scaled map (site plan) which includes existing and propose drainage flow patterns and a site narrative which propose means and methods to preventing adverse impacts to adjacent and/or downstream properties. A site narrative, which should describe the installation to be performed and the erosion control measures that will be used for erosion prevention and sediment control. Inclusion of typical design details is preferred, but simple sketches may be used. Details should include at a minimum temporary and final stabilization measures and silt fencing. Supporting calculations may be required if disturbing greater than one acre.



2. If a waterbody crossing is necessary, provide a sketch of the proposed measures. If USACE permit is needed, a copy of the permit application should also be included. County approval will not be issued until a USACE approval is obtained.
3. A signed certification agreeing to the conditions of the County approval and NPDES permit if applicable. The certification form is provided in Appendix A.
4. A Letter of Intent (Appendix A)

Charleston County is aware of the importance of coordinating utility installation, particularly when the installation is part of a larger project. The various parties are encouraged to work together to ensure that these installations do not impact the permit compliance of the larger project.

2.3.8 Type I – Minor Application

Any development or redevelopment projects disturbing one half (1/2) acre but less than one (1) acre must complete the Type I – Minor Application. Each applicant must obtain a permit from the County prior to beginning land disturbance activities. Guidance on selecting necessary erosion control measures is provided in Chapter 3 (Type I Application) and Appendix D (BMP Uses). An application must provide the following:

1. An Application Form, which can be found in Appendix A.
2. A Site Narrative, which shall describe the site, the purposes of the construction activity, potential problems with adjacent properties and waterbodies receiving stormwater runoff (existing and proposed). If applicable, wetland and waterbody disturbance issues shall be identified along with proof of permit coverage by the US Army Corps of Engineers (USACE) and/or SCDHEC-OCRM.
3. This application shall include a scaled map (site plan) which includes existing and propose drainage flow patterns and a site narrative which propose means and methods to preventing adverse impacts to adjacent and/or downstream properties.
4. A Letter of Intent (Appendix A)

2.3.9 Type II – Intermediate Application

Any new or redevelopment projects disturbing one (1) acre or more but less than five (5) acre must submit a Type II application. The applicant for each project must obtain a permit from the County prior to beginning construction activities. Guidance on selecting necessary erosion control measures is provided in Appendix D (BMP Uses). An application must provide the following:

1. An Application Form, which can be found in Appendix A. A Technical Report, which shall contain all supporting design calculations for the proposed stormwater system, and a EPSC plan or SWPPP, to include, but are not limited to, the sections below. One (1) copy of a technical report must be submitted as part of the application, prepared by a certified professional as defined by state law;



- a. Maps: A map(s) of the project area must contain the following:
- i. Vicinity map 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
 - ii. Topographic information showing runoff patterns
 - iii. Soil types
 - iv. Wetlands (fresh and saltwater)
 - v. All areas within the site that will be included in the construction activities shall be identified and the total disturbed area shall be calculated
 - vi. Location of temporary and permanent stormwater management controls

Note: This information may be provided in conjunction with the construction site plan.

- b. Site Narrative: A narrative must be submitted with the permit application describing the site, purpose of the construction activity, topographic and soil information, adjacent properties and owners, waterbodies receiving stormwater runoff, summary table(s) of existing and proposed runoff flows, volumes, pollutant loads, existing water quality and flooding issues, potential impacts (quality, downstream structures, etc.) and benefits (open space, treatment, maintenance, etc.). If applicable, the narrative will contain justification for variances or other special conditions of the site. If applicable, wetland and water body disturbance issues will be identified and the status of necessary permits application to the USACE. If a TMDL(s) is in place for the receiving waterbody, the narrative must describe how the project will comply with the TMDL(s).

The narrative should identify the roles and responsibilities of all involved in the construction project.

- c. Hydrologic Design: Pre- and post-development hydrologic analysis that determines the existing stormwater peak flow rates, flow velocities, and pollutant loads for all delineated sub basin/discharge points. The existing condition will be the standard by which the stormwater plan for a construction project is evaluated. The stormwater plan must demonstrate control of runoff quantity and quality in accordance with design criteria provided in Chapter 3 (flow and volume control, maximum velocities, etc.)
- d. Detention Design: The calculations showing the flow rates from the proposed development do not exceed pre-development levels
- e. Hydraulic Design: The calculations for all conveyances showing the ability to handle anticipated flows and volumes. Provide calculations showing that the project does



not cause or increase any negative impact on downstream structures, and the upstream and downstream stormwater drainage system. The following computations shall be included: hydrographs, routing of hydrographs through system components, pipe and open channel capacity, velocity calculations, and water surface elevations. Calculations and discussion shall be provided for energy dissipation and inlet and outlet protection. All system components shall have standard details and specifications

- f. If the project is located in a Special Protection Area, a comprehensive evaluation of engineering calculations and analysis shall be included that demonstrate that the project will comply with state and federal conditions on stormwater discharges. More information is provided in Section 3.8
 - g. Erosion and sediment control plan to include:
 - i. A description of the erosion and sediment control facilities selected,
 - ii. Map showing the location of all erosion and sediment control facilities,
 - iii. Design calculations of each measure, including trapping efficiencies. Each measure shall have a standard detail and specification,
 - iv. Explanation/identification of models used in the design.
 - h. Downstream analysis calculations showing the effect of post-development design flows on downstream stormwater conveyance systems and channels. More information is provided in Section 3.2
 - i. Watershed delineation maps with consistent sequential notations
 - j. Location map showing topography and waters of the state in relation to proposed project
 - k. Discussion and calculation of any wetlands issues
 - l. Presentation of existing and proposed contours of the development site
 - m. General description of the adjacent property and description of existing structures, buildings, and other fixed improvements located on surrounding properties that can affect or be affected by storm events
 - n. Discussion of site access issues and easements to be obtained and provided to the County
3. Construction Site Plans: One (1) complete set of site 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.
- a. North arrow and scale



- b. Property lines, adjacent landowners' names, and land use conditions
- c. Legend
- d. Registered professional engineer's seal
- e. Certificate of Authorization seal, as appropriate
- f. Existing and proposed contours and land uses (1' intervals)
- g. Limits of disturbed area
- h. Delineation of wetlands and/or waters of the state
- i. Easements
- j. Stormwater system profiles with existing and proposed ground elevations
- k. Construction sequence (include implementation of all stormwater and sediment controls in the first phase of construction)
- l. Locations of all temporary and permanent control measures
- m. Details for all temporary and permanent control measures
- n. Grassing and stabilization specifications and schedule
- o. Maintenance requirements (for temporary and permanent controls, grassing, etc.)
- p. Construction entrance/exit
- q. Tree protection, preservation, and overall landscaping plan with appropriate species selection and screening for ponds and other components as required by the Planning Department
- r. Details and specifications of all necessary construction components, to demonstrate compliance with applicable laws, codes, standards regulations and ordinances
- s. Location map
- t. The cover sheet shall contain, at the minimum, the following items:
 - i. Project name
 - ii. Engineers' contact information (name, mailing address, telephone, fax)
 - iii. Contact information (name, mailing, address, telephone, fax) of the owner, operator or designated party
 - iv. Vicinity map



- v. Table of contents
- u. The following standard notes may need to be shown on the plans. This list is not meant to be inclusive and other notes may be necessary:
 - i. 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.
 - ii. After construction activity begins, 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. An inspection is recommended within 24 hours of the end of a storm event of 0.5 inches or greater.
 - iii. 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 or other appropriate groundcover which prevents sediment runoff as soon as practicable after disturbance has occurred.
 - iv. 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.
 - v. The contractor must take action to minimize the tracking of mud onto the paved roadway construction areas. The contractor shall daily remove mud/soil from pavement, as may be required.
 - vi. Residential subdivisions require erosion control features for infrastructure as well as for individual lot construction. Individual property owners shall follow these plans during construction.
 - vii. 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.
 - viii. 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 fifty (50) foot buffer can't be maintained between the disturbed area and all WoS. A ten (10) foot buffer shall be maintained between the last row of silt fence and all WoS.



- ix. Litter, construction debris, oils, fuels, and building products with significant potential for impact (such as stockpiles of freshly treated lumber) and construction chemicals (concrete washdown areas, paint brush cleaners, etc.) that could be exposed to stormwater must be prevented from becoming a pollutant source in stormwater discharges.
- x. Provide written proof that all off-site easements have been obtained.

Note: Some items may be included in other components of the permit application package, but should be adequately noted. Size D (24" X 36") Plan sheets/drawings are preferred. Digital submittals can be accepted (.pdf format only).

- 4. Subdivision projects shall have a complete set of plans and specifications to include, but not limited to, the following items: 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 one (1) foot. Contour lines should be extended beyond the site boundary lines. The lot layout sheet should show a tie distance from the primary entrance of the proposed project to the nearest existing intersection.
- 5. All available or used benchmarks shall be shown on this or other applicable sheet. At least one benchmark shall be available or established on/near (within survey instrument sight distance) the site. The benchmark shall be referenced to mean sea level (MSL.). If necessary, the Public Works Director will assist in locating the nearest established benchmark.
- 6. The applicant will provide a tentative construction time schedule for the development. The schedule will provide for coordination with the responsibilities of the permittee and all other contractors, including those installing utilities.
- 7. Specifications for all components of construction activities related to grading, utilities, sediment and erosion control, temporary and permanent vegetation, water quality BMPs, etc.
- 8. Maintenance Schedules and Operating Permits:

The owner/operator responsible for maintenance must be identified in the recorded application found in Appendix C. The application shall include the maintenance schedule for the stormwater system components. When stormwater management facilities and system components are to be maintained by Charleston County, the County must consent and construction must be completed in accordance with all Charleston County standards.

- 9. Stormwater Pollution Prevention Plan (SWPPP):

A SWPPP is a stand alone document (not in the engineered drawings) that provides guidance to owners, contractors and 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 Charleston County. The stormwater pollution prevention plan requirement applies to both development and redevelopment sites. A SWPPP template is provided in Appendix E.

2.3.10 Type III – Medium/Large Construction Applications

Any new or redevelopment projects which disturb an area that is five (5) acres or greater must submit a Type III application. A complete application is accomplished by submitting the items listed for Type II applications (Section 2.3.9, Items 1-9) plus some additional requirements detailed below.

2.3.10.1 Pre-application Meeting

The first step for Type III applications is to conduct a pre-application meeting by contacting the Public Works Department. This meeting is intended to coordinate stormwater management submittal requirements. Design professionals are urged to inspect the site prior to this meeting to understand existing runoff patterns and identify areas on the site that may require greater attention to meet the intent of the requirements. The Public Works Director may waive this requirement. Refer to Section 2.2.6 for details.

2.3.10.2 Phased Plan Requirement

For non-linear construction sites disturbing five (5) acres or greater, the Construction Site Plans must include a phased stormwater management plan. This phased plan identifies all BMPs and grading work implemented during a specific portion of a site's construction sequence (e.g., initial grading and perimeter controls, interim land disturbances through final grading, post-construction and final stabilization). One sheet showing all BMPs and grading work for the entire course of the construction project will not be considered a complete phased plan.

2.3.10.3 Stormwater Master Plan

For Type III applications, a Stormwater Master Plan is required to be submitted prior to the submittal of the complete package as detailed below. Special Protection Areas are areas within the County 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. This master plan is to be created to give the design professional the opportunity to propose a site layout and proposed stormwater controls to the Public Works Director. The master plan should be submitted by hand or mail, and can be incorporated for discussion at the pre-submittal meeting. The Public Works Director may waive the requirement for a master plan for some permit applicants on a case by case basis. See Section 2.2.6.

The Master Plan can be a preliminary sketch of the site and shall contain the following items, when applicable:

1. Site layout showing buildings, roads, parking areas, utilities, and grassed or landscaped areas.
2. Vicinity map.



3. Pre- and post-development primary runoff patterns and discharge points.
4. Location/distances to WoS and all other existing natural features such as wetlands, ponds, lakes, floodplains, and stream buffers.

In addition, the applicant should be prepared to discuss the following items, when applicable:

1. All modeling methodologies to be used.
2. 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.
3. Preliminary waiver or variance requests.
4. Others as requested by the Public Works Director.

Upon submittal and discussion of the Master Plan and related concerns, the applicant can create and submit a complete permit application (Section 2.3.9, Items 1-9).

The Public Works Director reserves the right to require additional information and/or BMPs for large clearing and grubbing activities that are phased.



CHAPTER 3 DESIGN STANDARDS

3.1 Purpose and Intent

This chapter, as well as the SCDHEC Construction General Permit, includes information for engineers and designers to use while designing adequate stormwater management systems that will control the rate, volume, and pollutant loads released from a new or redevelopment project where the Public Works Director has been authorized by law or agreement to enforce engineering standards. These design standards, and those set forth in the SCDHEC Construction General Permit have been developed based on common engineering practices, state and federal requirements, scientific research, engineering publications, and other municipal and academic guidance.

The design standards included in this chapter should be incorporated along with proper planning, installation and maintenance methods to mitigate the impact of land development on existing/natural hydrologic and hydraulic processes and minimize the further degradation of the water resources in Charleston County. The design professional shall use all means necessary to develop land in a manner consistent with all County ordinances and this Manual. Specific methods and applications not covered in this section can and should be discussed with the Public Works Director for applicability. The following section details the criteria that shall be followed in the absence of designated specific watershed master plan criteria.

Water quantity and quality are integral and required components of stormwater management. Requirements have been added to improve and preserve the water resources in Charleston County. Section 3.4 outlines the standard design procedures for water quantity and quality along with the design criteria for accepted Best Management Practices (BMPs), Low Impact Development (LID) designs and Manufactured Treatment Devices (MTDs).

3.2 General Design Standards

The Charleston County design storm is a **twenty-five (25) year**, twenty-four (24) hour, SCS Type III storm event with a shape factor of 454, low terrain.. General requirements for all stormwater systems and facilities will include, but are not limited to, the following requirements, as well as those set forth in the SCDHEC Construction General Permit:

1. Site designs 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. Tracts of land vary in suitability for different uses. Knowing the major characteristics of the land area and kinds of soil helps in identifying and evaluating potential problems.
 - 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 below.
- 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.
- f. For non-linear construction sites disturbing more than five (5) acres, the application package must be submitted with a phased erosion protection and sediment control plan. This plan identifies all BMPs and grading work implemented during certain portions of a site's construction. A separate plan sheet is to be used for each phase according to the following requirements:
 1. For site disturbances of less than ten (10) acres, but more than (5) acres, a minimum of two (2) phasing plans shall be developed, which include the initial land disturbance phase and stabilization phase. Each phase should be addressed on a separate plan sheet and should indicate all conditions and BMPs necessary to manage stormwater runoff, erosion and sediment control during construction.
 2. For site disturbances of ten (10) acres or more, a minimum of three (3) phasing plans shall be developed, which include the initial land disturbance phase, construction phase and stabilization phase. Each phase should be addressed on a separate plan sheet and should indicate all conditions and BMPs necessary to manage stormwater runoff, erosion and sediment control during construction.
2. Annual groundwater recharge rates will 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 a risk-based approach using several design storms. Greater detail is provided in the next section.
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
 - c. maintained regularly
5. Stormwater discharges to special protection areas with sensitive resources or that have existing flooding or water quality problems, such as Total Maximum Daily Loads (TMDLs), may be subject to additional performance criteria. Section 3.9 contains more specific information and design requirements and the areas that will receive this additional set of protection criteria.



6. BMPs are required for the control and management of stormwater runoff and pollution. All permanent BMPs shall have a recorded operating permit (Appendix C) to ensure the system functions as designed in perpetuity. These agreements are referred to in this Manual as an operating permit.
7. Redevelopment on sites where existing land use is commercial, industrial, institutional, or multi-family residential is governed by the same design criteria as new developments.
8. Clear cutting for installation of utilities and roads or for development may be allowed. However, the total disturbed area shall never exceed ten (10) acres unless otherwise approved by the Public Works Director. The Public Works Director may reduce the total area that may be disturbed at a given time. Project areas exceeding ten (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 Public Works Director, but will normally be defined as the removal of vegetation and disturbance of soil prior to grading or excavation in anticipation of construction and/or non-construction activities.
9. Debris from clear cutting, construction, and site preparation must not impede flow or create obstructions within streams and waterbodies. Stream crossings shall be avoided when possible. When stream crossings cannot be avoided, they shall have control devices to collect and divert surface flow from the access road or skid trail into undisturbed areas or other control structures.
10. Vegetative cover is the process of applying sod or growing, from seed, a vegetative cover on disturbed areas for erosion control during construction and soil-disturbing activities. Permanent vegetative cover and the long-term erosion protection structures shall be installed as soon as practical in the development process.
11. If wetlands are suspected to exist on the property, they must be investigated and delineated as per State and Federal requirements. The US Army Corps of Engineers (USACE), or South Carolina Department of Health and Environmental Control Ocean and Coastal Resource Management (SCDHEC-OCRM) must make a determination as to whether or not the wetlands fall under their respective jurisdictions. All efforts will be made to reduce or eliminate impacts such as using a buffer and/or installing a silt fence around the wetlands. If the wetlands fall under the jurisdiction of the USACE or OCRM, a permit is needed before any disturbance of the wetlands is allowed. Charleston County will accept certified delineations. In addition, Charleston County will require any applicable local, state or federal permit to be in hand prior to start of land disturbances.
12. 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.
13. All stormwater management and sediment control practices shall be designed, constructed, and maintained with consideration for the proper control of mosquitoes and other vectors. Design criteria are provided in sections below.



14. 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 (for that particular boundary), as outlined below.
- a. Collector Systems and Minor Drainage Systems: 0 - <100 Acres

All street drainage, pipe systems, culverts, ditches and channels which drain less than twenty-five (25) acres will be designed to carry flows resulting from a twenty-five (25) year frequency storm event. Minimum allowable pipe diameter shall be fifteen (15) inches. Curb and gutters can be designed to the ten (10) year frequency storm event. Once in a closed system, the twenty-five (25) year storm will be the design standard.
 - b. Major Drainage Channels: 100 - <300 Acres

All drainage systems draining at least 100 acres but less than 300 acres, such as channel improvements, culverts or bridges along these channels, shall be designed to carry a flow resulting from a fifty (50) year frequency storm event. Encroachment upon Major Drainage Channels and the adjacent overflow land shall be avoided to the extent practicable.
 - c. Large Watersheds: 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 100 year frequency storm event. Encroachment upon these channels and the adjacent overflow land shall be avoided as much as practicable.

The floodplain provisions for Charleston County can be found in the Charleston County Flood Damage Prevention and Protection Ordinance and any other applicable federal, state or local laws. This ordinance can be obtained from the Building Services 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 the project area or disturbed area.
15. Performing a hydrologic-hydraulic study for developments disturbing great than one (1) acre downstream from stormwater management facilities and urban developments is an important part of urban stormwater management. Often design conditions can be met at the exit of a development but downstream problems can occur due to many factors including constrictions in the downstream conveyance system, changing of the timing of downstream flows due to increased impervious surfaces or the installation of stormwater management structures, or anything that changes the natural characteristics of the drainage system. Thus it is important for the engineer to perform some downstream analysis. The basic steps in this downstream analysis would include the following:



- (1) Develop hydrographs for the design storms at the discharge point(s) from the proposed development. The proposed developed land use conditions within the development should be used to develop these hydrographs.
- (2) Route these hydrographs through the downstream drainage system to a point downstream where the size of the proposed development represents 10-percent or less of the total drainage area that contributes runoff to this point. This point is called the 10- percent point.
- (3) For all points of interest in the downstream drainage system, between the exit of the proposed development to the 10-percent point, develop hydrographs from the contributing areas. Existing land use conditions should be used for this analysis for all areas not included in the proposed development. Points of interest would include locations where drainage from sub-watersheds intersect, where known drainage and flooding problems exist, where structures might be affected by storm runoff, etc. As a minimum, hydrographs at the 10-percent point should be developed with and without the proposed development.
- (4) A comparison of the routed hydrograph from the proposed development with the other downstream hydrographs should indicate whether or not the proposed development will increase downstream peak flows or have little or no effect on these peak flows.
- (5) If major constructions (e.g., storage facilities, undersized culverts) are present in the downstream analysis area that will affect the general characteristics of the hydrographs, the associated engineering parameters of these constructions should be included in the analysis.
- (6) In most cases, general topographic maps, soils information, and a field check of the drainage system will provide the data needed for this analysis.

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.

16. As-built drawings for critical elements of a stormwater system may be required prior to closeout. Critical elements may include, but are not limited to, outfall structures, conveyance systems and components, Manufactured Treatment Devices (MTDs), and inlet boxes. This is required to ensure that the systems are constructed in accordance with the design. If the elevations or dimensions of the structures do not match those to be used in the approved plans, a certification statement by the project's engineer indicating that the structure(s), as built, will function within all applicable standards (e.g., new analysis of the pond routing may be necessary). A copy of as-built drawings shall be submitted to Charleston County Stormwater upon project completion (digital submission preferred).



3.3 Hydrologic Computation Methods

All hydrologic computations shall be completed using volume-based hydrograph methods acceptable to the Public Works Director. The design storm duration for these computations shall be the twenty-four (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
- 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 widely accepted standards. This Manual does, however, reference suggested materials as necessary for detailed discussions of related topics.

3.3.1 Inputs

A. The precipitation depths/intensities corresponding to various return periods to be used for projects in Charleston County are shown in Table 3.1.

Table 3.1: Design Storm Precipitation Data for Charleston County, South Carolina

County	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Charleston	3.8	4.6	5.9	7.0	8.0	8.9	10.2

Source: South Carolina State Climatology Office

B. Soil types in Charleston 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.

3.3.2 Drainage Design Methodologies

The Charleston County recommended methods and corresponding design circumstances are listed in Table 3.2 and 3.3 below. If other methods are used, applicant must submit in writing the following information to support the request in order to obtain written approval by the Public Works Director:

- a. Demonstrate that the request will not conflict with the purposes of this Manual, the Charleston County Ordinance #1518 or the regulatory requirements of Local, State, or Federal jurisdictions having authority
- b. Demonstrate extraordinary and exceptional conditions pertaining to the particular project



- c. Conditions that do not generally apply to other property in the vicinity
- d. The request will not be of substantial detriment to adjacent property or to the public good
- e. Provide technical documentation including testing, performance, or other data that supports the request

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 sub-watershed size to the point where a stormwater system component (e.g., culvert, inlet, BMP) is located.

Details of and guidance on the 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
Large Watersheds		+
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.

3.3.3 Hydrographs

Hydrographs shall be used to evaluate entire systems by routing storm events through pipe or storage systems. The use of a hydrograph will provide modeling of the system performance rather than simply using the peak discharge. The Public Works Director will accept commonly used computer models. New models may be accepted with appropriate documentation.

3.4 Water Quantity/Quality Control Standards

3.4.1 Water Quantity Design Standards

Water quantity control is an integral component of overall stormwater management. Quantity control is effectively flood control, reducing potential damages and health risks. However, 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 storage facilities utilized for stormwater quantity control shall be designed to address runoff from the entire site when applying for a Charleston County Stormwater Permit. This includes any development or redevelopment, regardless of the size of the project or site, that has an outfall control structure in place and is being retrofitted, reconfigured, or having additional volume directed to it, must meet the following requirements:

1. All discharges from a development or redevelopment site shall be modeled with a tail water condition elevation equal to that of Mean Sea Level of a nearby data station, and/or with accurate survey information that is approved by the Public Works Director, within the watershed area. Refer to <https://tidesandcurrents.noaa.gov/datums.html>.
2. Controls shall be designed by a traditional reservoir routing procedure. Time of concentration (T_c) flow paths shall be provided for each watershed and include slope, length, surface roughness, and type of flow.
3. The post condition peak outflow for the 2, 10, and 25-year 24 hour storm events must not exceed the peak outflow for the existing condition. The peak outflow for the 50 and 100-year 24-hour storm event must be provided.
4. All ponds shall have an emergency spillway designed to pass the design storm event if the storage capacity is exceeded.
5. All discharge points may be no closer than twenty (20) feet from property boundary, where applicable.
6. All quantity controls that are also used for quality control will 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 geotextiles. 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.
7. A project may be eligible for a variance from the stormwater management requirements for water quantity control if the applicant can justly verify the items listed below. Final approval of a variance request will be given at the discretion of the Public Works Director. A water quantity variance does not excuse water quality considerations.
- a. The proposed project will not create any significant adverse effects on the receiving stormwater system downstream of the property
 - 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

3.4.2 Accepted Water Quantity Control Devices

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 development or re-development project. Structural detention stormwater controls accepted by Charleston County are shown in Table 3.4.



Table 3.4: Accepted Quantity Controls

General Structural Control	Description
<p>Dry Detention/Dry Extended Basins</p>	<p>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.</p>
<p>Wet Stormwater Detention Basins</p> <ul style="list-style-type: none"> • Wet Pond • Wet Extended Detention Pond • Multiple Pond System 	<p>Wet detention basins are constructed stormwater basins that have a permanent pool of water. Runoff from each rain event is detained above the permanent pool and released at a designed flow rate to reduce downstream water quantity impacts. Permanent pool depths should be ≥ 6 feet to prevent mosquito breeding.</p>
<p>Multi-purpose Detention Areas</p>	<p>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.</p>
<p>Underground Detention</p>	<p>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. Applicant is to verify the existing water table. These structures are designed to completely drain to a dry condition within 72 hours.</p>
<p>Infiltration Basins</p>	<p>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.</p>



3.4.3 Water Quality Design Standards

Water quality control is an integral and required component of overall stormwater management systems. Redevelopment as well as new development projects must include controls that treat or otherwise limit the discharge of pollutants. These requirements have been added due to new local, state and federal requirements, but also due to the need to improve and preserve the water resources in Charleston County. Background information and references are provided in the sections below, followed by the design standards for addressing water quality.

The following design criteria are established for water quality control and must be incorporated in one or more BMPs for a given sub basin. In the case of redevelopment projects, the design standards will be required for the improved area instead of the entire site. Incorporation of the following requirements shall constitute adequate control of the discharge of pollutants.

Some sites may require water quality calculations. There are two options for demonstrating compliance with this requirement. The default method is to capture the first flush volume from the site and discharge it over a minimum twenty-four (24) hour period where a minimum of 10% of the 25 year 24 hour design storm peak discharge rate is still discharging at or after 24 hours. The alternative method is to size water quality treatment devices to trap 80% of total suspended solids (TSS) based on annual loading. The 1.8-inch, 1-year, twenty-four (24) hour storm event is the allowed water quality event (WQE). If using something other than this WQE, evidence must be provided to show that the results of this WQE are equivalent.

First Flush Volume

- 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 inch (1/2") of runoff (first flush) released over a minimum twenty-four (24) hour period where a minimum of 10% of the 25 year 24 hour design storm peak discharge rate is still discharging at or after 24 hours. The "first flush" volume should be determined from the contributing watershed area (impervious and pervious) that drains to the water quality pond (s).
- b. Permanent water quality ponds, not having a permanent pool, shall be designed to store and release the first one inch (1") of runoff from the contributing watershed area and release it over a minimum twenty-four (24) hour period where a minimum of 10% of the 25 year 24 hour design storm peak discharge rate is still discharging at or after 24 hours.
- c. Permanent water quality infiltration practices shall be designed to accommodate at a minimum the first one inch (1") of runoff from the contributing watershed areas located on the site.

80% TSS Trapping

- a. The WQV requirement may be waived if treatment is instead provided by Low Impact Development (LID) practices, Manufactured Treatment Devices (MTD), or a



combination of both. For such projects the designer must demonstrate that the water quality controls will achieve, at a minimum, an 80% trapping of total suspended solids (TSS) on an annual loading basis.

- b. For constructed LID BMPs and treatment trains, calculations can be made with one of the following methodologies*:
 - i. IDEAL Model
 - ii. Georgia Stormwater Management Manual (Bluebook)
 - iii. WinSLAMM
 - iv. Schueler Simple Method (Center for Watershed Protection)

** Alternative programs or methods not listed above may be used if approved by the Public Works Director prior to submission.*

- c. With the exception of the IDEAL model, MTDs cannot be modeled with the methods above. Refer to Section 3.4.11 for MTD design criteria and calculation methods.
2. 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. 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.
 3. All BMPs must have a maintenance plan. The SCDHEC BMP Manual (2005) <http://www.scdhec.gov/Environment/WaterQuality/Stormwater/BMPHandbook> and Charleston County Maintenance Template can be a reference source for maintenance schedules and routine activities.
 4. For areas not draining to either a pond or being treated by the above mentioned BMPs, the applicant should demonstrate how water quality requirements will be addressed.
 5. The Public Works Director reserves the right to require specific effluent limits for any pollutant from a site if necessary to ensure the water quality standards and other local, state and federal water quality regulations are met.



3.4.4 Standard Design Procedures for Water Quality BMPs

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 impairment that may exist.
2. Low impact development (LID) BMPs should be considered when applicable. LID practices can require less structural conveyance systems therefore reducing the construction cost while at the same time maintaining water quality and quantity standards.
3. If the receiving water of the project is impaired or has an adopted TMDL (see Appendix F for a TMDL Map for Charleston County), the applicant must show that water quality standards are being met and designated uses are not impacted. This proof must be a quantitative and qualitative analysis for sites which disturb greater than twenty-five (25) acres.
4. Calculations are provided in Appendix G. For engineered devices (MTD), alternative calculations other than those detailed in Appendix G shall be provided. Refer to Appendix H for information on the 1.8-inch design storm details for MTDs.

3.4.5 Detention Ponds/Reservoirs Standards

1. Ponds with vegetated embankments shall be less than fifteen (15) feet in height and shall have side slopes (inside and outside) 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 that are both greater than eight (8) feet in height with steeper slopes than those indicated above. Access to the inside of a pond shall be provided with at least one interior side slope at 3H:1V or flatter.
2. The flow path between the pond inlet and outlet must be maximized to ensure sufficient time to allow for sedimentation of pollutants. A pond length-to-width ratios of 3:1 or greater is required.
3. Ponds shall include one or more forebays that trap coarse sediment, prevent short-circuiting, and facilitate maintenance.
4. A minimum freeboard of one (1) foot above the twenty-five (25) year, twenty-four (24) hour design storm high water elevation shall be provided for all impoundments.
5. 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.
6. 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) feet is reasonable unless County Mosquito Control requirements dictate otherwise. Aeration or other means shall be used as necessary to prevent anaerobic conditions for ponds less than one half (1/2) acre.



3.4.6 Infiltration Standards

The following criteria shall be followed in the design of any BMP utilizing infiltration.

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 five (5) year storm event. For evaluating the ten (10) year and twenty-five (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 one hundred (100) year storm event must be analyzed, but only to the extent that no structure flooding or damage results.
 - a. The feasibility of infiltration shall be evaluated by a soil scientist geotechnical engineer, or other individual certified by the State of South Carolina in water table estimation.
 - b. Water table estimation should be based on the first occurrence of two chroma features.
 - c. Infiltration device design shall be based on soils characteristics of the first six (6) inches below the proposed bottom of the device (not necessarily the first six (6) inches below ground surface).
 - d. Areas draining to these practices 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 practice. 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 practice. Forebays or other engineered devices for sediment removal may be prudent.
 - e. Each system shall be designed to prevent clogging by fine material and for ease of maintenance.
 - f. The bottom of the infiltration practice shall be at least six (6) inches above the “zone of seasonal saturation” and infiltration interface.
 - g. The infiltration practice shall be designed to completely drain off water within seventy-two (72) hours.
 - h. Soils must have adequate permeability to allow water to infiltrate. Infiltration practices are limited to soils having an infiltration rate of at least 0.30 inches per hour. If the infiltration rate is greater than 0.30 inches but less than 4.0 inches per hour, then an underdrain system must be installed. In water quantity calculations, the maximum infiltration rate shall be seven (7) inches per hour. Initial consideration will be based on a review of the appropriate soil survey, and proposed depths of excavation. The survey may serve as a basis for rejecting approval of using an infiltration device. 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.

- i. Infiltration practices greater than three (3) feet deep shall be located at least ten (10) feet from basement walls.
 - j. Infiltration practices 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.
 - k. The design of an infiltration practice 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 release to a watercourse to meet water quality requirements.
 - l. The slope of the bottom of the infiltration practice shall not exceed five (5) percent. Also, the practice shall not be installed in fill material because piping along the fill/natural ground interface may cause slope failure.
 - m. An infiltration practice shall not be installed on or atop a slope whose natural or existing angle of incline exceeds twenty (20) percent.
 - n. If an underdrain system is required, clean outs will be provided at a minimum of every one hundred (100) feet along the infiltration practice to allow for access and maintenance.
2. 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 Public Works Director shall be contacted for guidance on the appropriate controls to employ or other mutually accepted best management practices.

3.4.7 Underground Detention Devices

1. Underground detention facilities shall be designed using the following criteria:
 - a. If using infiltration practices, refer to the design criteria in section 3.4.6 Infiltration Device Standards.
 - b. The Public Works Director reserves the right to require that the feasibility of underground devices be evaluated by a soil scientist, geotechnical engineer, or other individual certified by the State of South Carolina in water table estimation.
 - c. Underground detention systems are to be located downstream of other stormwater controls providing treatment of the water quality volume.



- d. The maximum contributing drainage area to be served by a single underground detention vault or tank is five (5) acres.
 - e. All systems shall be designed and laid out to facilitate maintenance. Systems should be cleaned out (sediment removal) at least once a year, but more frequently, if necessary. As with all stormwater controls, a maintenance schedule shall be submitted.
 - f. Underground detention systems must meet structural requirements for overburden support and traffic loading if appropriate.
 - g. 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.
 - h. All underground detention systems shall accommodate a volume reduction of at least 20% due to sediment storage.
2. Any development that uses a parking area or other feature for detention storage capacity shall clearly identify the limits and depths of the expected detention pool.
 3. Basin configurations which create stagnant water conditions are to be avoided.
 4. Post-development discharge rates shall not exceed pre-development discharge rates for the two (2), ten (10), and twenty-five (25) year frequency twenty-four (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 ten (10) year, twenty-four (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 seventy-two (72) hours.
 7. The Public Works Director reserves the right to require phased inspections from the manufacturer or authorized representative at critical install points (e.g., installation of inspection ports, installation of bedding, and prior to covering the device) and provide documentation of the inspection to Charleston County.

3.4.8 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. 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. Charleston County's current approved lists of stormwater quality BMPs, listed in Table 3.5 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), Coastal South Carolina LID Manual (under development 2014).



Table 3.5: Accepted Water Quality Controls (BMPs)

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.
Stormwater 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 Areas¹	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 infiltrate into the soil.
Sand Filters¹	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 infiltrated into the soil.
Infiltration Trenches¹	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 Swales¹	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.



General Structural Control	Description
<p>Engineered Devices²</p> <ul style="list-style-type: none"> • Vortex Separator • Baffles • Cartridges • Skimmers • Gravity Oil-Grit Separator • Filter Material • Inlet inserts 	<p>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 Defender¹. This is by no means a complete list and the Public Works Director will evaluate any such device if included in designs, provided evidence is provided as to its effectiveness. Such evidence must include applicability and proof of third-party testing on trapping efficiencies.</p>

¹ This is an infiltration design and must meet infiltration standard requirements.

² 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 3.5. Limited application structural controls may be designed and used only in development situations where regular maintenance is guaranteed. Popular limited stormwater controls are shown in Table 3.6.



Table 3.6: Limited Structural Controls (BMPs)

Limited Structural Control	Description
<p>Vegetated Filters</p> <ul style="list-style-type: none"> • Filter Strip • Grassed Channels and Swales 	<p>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.</p>
<p>Submerged Gravel Wetland Systems</p>	<p>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.</p>
<p>Small Sand Filters</p> <ul style="list-style-type: none"> • Surface Sand Filter • Perimeter Sand Filter 	<p>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 infiltrated the soil.</p>
<p>Porous Paver Systems</p>	<p>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.</p>

Regardless of the type of control, maintenance schedules will be included for each BMP proposed.

Listed below are some non-structural BMPs that are encouraged 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 HOAs to educate and train themselves and homeowners on the impact they can have on water quality and the activities necessary to maintain structural controls. These efforts are particularly critical in LID designs.

3.4.9 Low Impact Development (LID) Concepts

A site incorporating LID design generally produces a much smaller peak rate and volume of runoff than traditional stormwater management methods. In a traditional design, the increased rate and volume of runoff is concentrated into pipes conveyed and detained in a single large structure typically at the “end-of-pipe” situation. In an LID approach, stormwater runoff is managed near the source (“source-controlled”) in a number of small, landscaped features. These features encourage infiltration, lengthen the time of concentration, and retain flow to create a hydrologic landscape functionally equivalent to the pre-development conditions. These source treatment structures should ideally connect to natural drainage ways. The goal of LID is to combine this hydrologically functional site design with pollution prevention integrated management practices (IMPs) to reduce the impacts of development on the quality and quantity of runoff. The term IMP is used in place of BMP or best management practices as IMPs are integrated throughout the development providing source treatment as well as landscape amenities. More information on LID techniques can be found in the Low Impact Development in Coastal South Carolina: A Planning and Design Guide (2014) (<http://www.northinlet.sc.edu/lid/>). Some examples of LID site planning considerations are listed below:

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



- Avoid concentrating flow into pipes or channels

To assess the hydrologic functionality of a site, designers use the curve number (CN), time of concentration (Tc), and other factors. By maintaining the pre-development values of these parameters: a developed site will behave similarly to its pre-developed state, meeting stormwater management requirements, as well as preserving natural habitats and features, reducing thermal flow, pollutant shocks to downstream environments, and utilizing runoff to supply groundwater recharge and landscaped areas.

3.4.9.1 Runoff

The CN is used to determine the volume of runoff from a site. Developed LID sites try to emulate the runoff characteristics of their pre-developed condition, in essence maintaining the same curve number.

Changes in land cover can increase the amount of runoff from a site by reducing infiltration. Therefore, reduction of land cover changes is the first step in limiting changes to the CN. There are a number of ways to reduce changes in land cover, including:

- Reduce the size of cleared area (i.e. preserve as much woodland as possible) and increase reforestation areas
- Locate cleared/graded areas outside permeable soils and vegetated areas
- Design roads, sidewalks, and parking areas to minimize land cover impacts
- Reduce or disconnect site imperviousness

3.4.9.2 Reduce Limits of Clearing and Grading

The limits of clearing and grading refer to the area of the site to which development is directed. This development area will include all impervious areas such as roads, sidewalks, rooftops, graded lawn areas and open drainage IMPs. To reduce the change in land cover and minimize hydrologic impact to the existing site, the development area should be located where impact on the predevelopment CN is less sensitive (e.g., on barren C and D type soils which will have less impact than developing forested A and B type soils).

3.4.9.2 Preserve Permeable Soils and Vegetated Areas

Addition of impervious surfaces and compaction due to construction traffic over soils creates the greatest possible change in infiltration (e.g. CN) between pre- and post-development conditions. Therefore the preservation of existing soils should be promoted in all unpaved areas throughout the site. Areas with well drained soils are generally good sites for bioretention areas and help sustain groundwater recharge and stream base flows.

Preservation of woodland areas can help reduce impacts on existing land cover. Woodland areas promote infiltration, distribute flow, reduce velocities, provide wildlife habitat, and help maintain stream bank and bed stability. Saving existing trees on a development site is a cost-effective and quality-enhancing practice. Expansion of vegetated areas adds to the benefits of preservation by further reducing CN changes. Trees and other native species should be kept in groups large enough to maintain soil moisture, sunlight, wind and other growth characteristics. Retaining mature trees of a single species is seldom successful (Hinman,



2005). For best results flag tree preservation area at least three (3) feet outside of the existing edge of tree canopy.

3.4.10 Alternative Roadway Design

Roadways, sidewalks, driveways, and parking areas are the greatest contributors to increasing CN and the size of the required detention/ retention structure. The increase in CN due to impervious areas and the associated land clearing increase both the amount and rate of runoff over pre-development conditions. LID designs minimize the effective imperviousness of roadways and parking areas by using minimal grading and clearing techniques, minimizing impervious areas, and using open drainage sections. Site constraints can limit the applicability of LID designs. Table 3.10 outlines site constraints for commonly used LID practices. The following features can be incorporated into a roadway design to minimize land cover impacts:

Narrow Road Sections: Small road sections reduce impervious area and clearing and grading impacts. Reducing pavement widths will result in a reduction of overall pavement area. Traffic reduction techniques can also be used to minimize pavement while maintaining safety. Porous pavers may also be used where appropriate. Using queuing streets or pull-out parking in parking lots with porous pavers in peak overflow areas can reduce the size of parking lots.

Open Drainage Sections: Grassed swales and infiltration trenches can be used in place of curb and gutter where allowed to distribute and attenuate the flow as well as enhance water quality and result in reduction of drainage pipes and associated infrastructure.

Road Layouts: Local and collector streets with curves and alignment changes allow the roadway to fit into existing topography, minimizing earthwork and hydrologic impacts. Curvilinear road layouts must meet current AASHTO design requirements. Looped road layouts provide open areas in the center for bioretention as well as a visual break for houses facing the street. Minimizing frontage widths and providing green streets or open space pathways between homes for walking and biking will also reduce impervious areas.

Sidewalk Applications: Constructing sidewalks using porous pavers, reducing sidewalk widths, or only building sidewalks on one side of the street, where allowed, will decrease site imperviousness.



Table 3.7: LID Planning Techniques to Reduce the Post-Development LID Runoff

Suggested Options Affecting Runoff	Reduce Length and Width of Roads	Conserve Natural Resources Areas	Minimize Limits of Clearing and Grading	Preserve Permeable Soils	Preserve Natural Depressions	Use Transition Zones	Use Vegetated Swales	Provide for Bioretention
Land Cover Type		X	X			X	X	X
Percent of Imperviousness	X					X		
Hydrologic Soils Group		X		X				
Hydrologic Condition		X	X	X				
Disconnectivity of Impervious Area	X							
Storage and Infiltration					X			X

3.4.10.1 Time of Concentration

Time of concentration (T_c) describes the time it takes for runoff to flow from a site's most hydrologically remote point to the outlet. The time of concentration in conjunction with the CN determines the peak discharge rate for a storm event. The time of concentration is a function of flow velocity which in turn is affected by:

- Travel distance (flow path)
- Slope of the ground and/or water surface
- Ground surface roughness
- Channel shape and pattern

These factors can then be manipulated to modify the T_c of an LID site by modifying the following aspects of the flow:

- Maximize sheet flow
- Modify/ lengthen flow path
- Site and lot slopes



- Open swale geometry
- Site and lot vegetation (roughness)

Sheet Flow: The site should be graded to maximize overland sheet flow distance and minimize the disturbance of woodlands along the Tc flow path. Where graded areas flow to natural drainage ways, velocities should not exceed one (1) ft/sec to the extent practicable, as faster velocities may provide insufficient contact time for settlement of suspended solids. The installation of a stable level spreader along the upland edge of the natural drainage way buffer or flat grassy area upland of the buffer which will allow the runoff to spread out.

Flow Path: Increasing the flow path or travel distance will increase the time of concentration and allow more time for infiltration reducing not only the peak flow but the total volume of runoff as well. In residential areas, rooftop and driveway runoff can be continually infiltrated or stored within infiltration trenches, dry wells, or cisterns strategically located to capture the runoff prior to it reaching the lawn. Strategic lot grading can increase both the surface roughness and the travel length of the runoff lengthening the time of concentration along that particular flow path. Time of concentration flow paths shall be provided for each watershed and include slope, length, surface roughness, and type of flow.

Site and Lot Slopes: Flatten lot slopes to approach a maximum of one (1) percent. This will increase infiltration and travel time. While codes may require a positive drainage perimeter around the building, lot areas outside the pad should contain at least one (1) percent positive slope. Also, soil compaction of original soils (not fill) in the lot should be avoided to maximize infiltration.

Open Swales: Open drainage conveyances are preferred in LID designs over conventional storm drainage structures. To alleviate flooding problems, vegetated or grassed open drainage IMPs should be provided as the primary means of conveying surface runoff between lots and along roadways. Swales can be made wider and flatter to decrease velocity and increase Tc. Infiltration can be used to reduce the quantity of the surface runoff as the need arises. The site should be graded as to minimize the quantity and velocity of surface runoff within the open drainage IMPs.

Site and Lot Vegetation: Re-vegetate and/ or plant areas to promote natural retention and increase travel time. Re-vegetating graded areas or preserving existing vegetation can reduce peak discharge by increasing surface roughness. Connecting vegetated buffer areas with existing vegetation or forest allows designers to avoid “paved areas” as the Tc flow path for the “shallow concentrated flow” part of the Tc calculation. The benefits of these practices minimize the need for bioretention facilities.

In summary, a site Tc is very important in determining the peak rate of runoff that will occur during a rain event. LID techniques help to reduce Tc. Table 3.8 summarizes which LID techniques affect the factors governing the Tc .



Table 3.8: LID Planning Techniques to Increase Post-development T_c

LID Objective	Disconnect Impervious Areas	Wider and Flatter Swales	Maintain Sheet Flow	Clusters of Trees and Shrubs in Flow Path	Provide Tree Conservation Zones	Minimize the Use of Storm Drain Pipes	Preserve Existing Topography	Provide for Bioretention
Minimize disturbance	X		X	X	X	X	X	
Flatten grades		X	X			X	X	X
Reduce height of slopes						X	X	
Increase flow path	X	X	X	X		X		
Increase roughness	X		X	X	X	X		X

*Adopted from (MDDNR, 1999)

3.4.10.2 LID Hydrologic Analysis

The goal of LID is to create a post-development landscape that has similar hydrologic functionality to the pre-developed site. This is done by minimizing the post-development CN and T_c as much as possible and using a number of small scale retention structures near sources of increased runoff to make up the difference in runoff volume and peak rate between the pre- and post-developed conditions. The LID design approach focuses on the following hydrologic analysis and design components:

CN: Minimizing change in the post-development CN by reducing impervious areas, preserving trees, meadows and well drained areas to reduce storage requirements.

T_c: Maintaining the pre-development T_c to minimize the increase in peak runoff rate by lengthening flow paths and reducing the length of conveyance systems.

Retention: Providing retention storage for volume, peak and water quality control, near the source of increased runoff.

Detention: Providing additional detention storage, if required, to maintain peak runoff control and prevent flooding.

Table 3.9 provides a summary of LID techniques that can be used to manipulate the above design and analysis components.



Table 3.9: LID Techniques for use with Design and Analysis Components

LID Hydrologic Design and Analysis Components	Flatten Slope	Increase Flow Path	Increase Sheet Flow	Increase Roughness	Minimize Disturbance	Flatten Slopes On Swales	Infiltration Swales	Vegetative Filter Strips	Constricted Pipes	Disconnected Impervious Areas	Reduce Curb And Gutter	Rain Barrels And Cisterns	Rooftop Storage	Bioretention	Revegetation	Vegetation Preservation
Lower Post-development CN					X		X	X		X	X			X	X	X
Increase T_c	X	X	X	X		X		X	X	X	X	X	X	X	X	X
Retention							X	X				X	X	X	X	X
Detention						X			X			X	X			

3.4.10.3 Low-Impact Development Integrated Management Practices (LID IMPs)

Low-impact development uses distributed source control techniques to achieve the desired post-development hydrologic conditions. The previous sections highlight how site planning techniques can be used to minimize hydrologic effects of development; as well as, assess the need for storage due to increases in runoff volume, or peak rate. LID IMPs are used to satisfy these storage volume requirements. The design goal is to locate the IMPs at the source or lot, ideally on level ground within individual lots of the development or providing a green space connection to existing woodlands. Management practices that are suited to low-impact development include:

- LID-01 Green Roofs
- LID-02 Rain Barrels, Cisterns, & Dry Wells
- LID-03 Pervious Pavement
- LID-04 Planter Box
- LID-05 Driveways
- LID-06 Vegetated Swales
- LID-07 Full Dispersion
- LID-08 Urban LID Applications
- LID-09 Disconnect Impervious and Green Space Preservation



3.4.10.4 LID IMP Selection Process

The selection and design process must be conducted to meet all the constraints and design considerations for a particular project. It is up to the developer's/designer's judgment to decide which design is the most appropriate for their particular site and land use.

Hydrologic functions such as infiltration, frequency and volume of discharges, and groundwater recharge become essential considerations when identifying and selecting IMPs. Table 3.10 provides a summary of potential site constraints for various IMPs.



Table 3.10: Site Constraints of LID IMPs

	Bio-retention	Dry Well	Filter/Buffer Strip	Swales	Rain Barrels	Infiltration Trench
Space Required	Minimum surface area range: 50 to 200 ft ² Minimum width: 5 to 10 ft Minimum length: 10 to 20 ft Minimum depth: 2 to 4 ft	Minimum surface area range: 8 to 20 ft ² Minimum width: 2 to 4 ft Minimum length: 4 to 8 ft Minimum depth: 4 to 8 ft	Minimum length of 15 to 20 ft	Bottom width: 2 ft minimum, 6 ft maximum	Not a factor	Minimum surface area range: 8 to 20 ft ² Minimum width: 2 to 4 ft Minimum length: 4 to 8 ft
Slopes	Usually not a limitation, but a design consideration	Usually not a limitation, but a design consideration. Must locate down gradient of building and foundations	Usually not a limitation, but a design consideration	Swale side slopes: 2:1 or flatter Longitudinal slope: 1.0% minimum; 5% maximum based on permissible velocities	Usually not a limitation, but a design consideration for location of barrel outfall	Usually not a limitation, but a design consideration. Must locate down gradient of buildings and foundations
Water Table	12" clearance above water table recommended	2 to 4 ft clearance above water table recommended	2ft clearance above water table recommended	2ft clearance above water table recommended	Generally not a constraint	4 ft clearance above water table recommended
Proximity to building foundations	Minimum distance of 10 ft down gradient from buildings and foundations recommended	Minimum distance of 10 ft down gradient from buildings and foundations recommended	Minimum distance of 10 ft down gradient from buildings and foundations recommended	Minimum distance of 10 ft down gradient from buildings and foundations recommended	Not a factor	Minimum distance of 10 ft down gradient from buildings and foundations recommended
Max. Depth	2 to 4 ft depth depending on soil type	6 to 10 ft depth depending on soil type	Not applicable	Not applicable	Not applicable	6 to 10 ft depth depending on soil type and water table
Maintenance	Low requirement, property owner can include in normal site landscape maintenance	Low requirement	Lower requirement, routine landscape maintenance	Low requirement, routine landscape maintenance	Low requirement	Moderate to high

*Adopted from (MDDNR, 1999)



3.4.11 Stormwater Manufactured Treatment Devices

Manufactured Treatment Devices (MTDs) function as stormwater treatment devices before stormwater runoff is discharged off-site or to receiving water bodies, and may be incorporated into a series of water quality best management practices to remove pollutants from stormwater runoff. MTDs are not designed, or intended to store a volume of water for water quality treatment. MTD Pollutant removal efficiencies are variable and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity and other factors.

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

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

Shop plans, working drawings, detailed specifications, and structural design calculations from the manufacturer must be submitted for approval prior to the MTD installation. Shop plans and specifications must include installation drawings and instructions that completely describe the MTD. Manufactures' specifications with certified third party testing results must be submitted and approved by the Public Works Director prior to any permit approval. No substitution or equivalent will be allowed without approval from the Public Works Director. MTD devices must be bypassed during construction and other best management practices in place until the system is completely installed and functional.

The Public Works Director reserves the right to require phased inspections at critical install points (e.g., installation of inspection ports, installation of bedding, and prior to covering the device) and may require certification from the manufacturer that the device was installed properly.

Design Criteria

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

MTDs are to be designed to treat the entire water quality event (WQE) with no by-pass for a minimum 80% Total Suspended Solids (TSS) removal efficiency. The WQE flow rate is a separate flow rate from the Level of Service (LOS) flow rate.

In addition to meeting the required treatment efficiency for the WQE, the MTD must be capable of passing the specified LOS flow rate (i.e. ten (10) year storm event) without causing adverse hydraulic impact to upstream portions of the drainage system and without causing any re-suspension or scour of previously trapped pollutants, or the MTD may be required to be placed off-line.



Ensure site constraints (available right of way and available depth) allow the installation of a single MTD for design peak water quality flow rates up to 8 cfs. Additional MTDs may be required for water quality event flow rates greater than 8 cfs.

The drainage area contributing to an MTD must be 85% impervious or greater in order to use this calculation methodology.

Ensure tail water conditions are accounted for in the MTD design.

3.4.12 MTD Components and Performance Requirements

3.4.12.1 Stormwater Manufactured Treatment Devices (MTDs) Type 1

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

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

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

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

MTD Type 1 must have the following properties:

1. Designed for a minimum 80% Total Suspended Solids (TSS) removal efficiency (ASTM D-3977-97 SSC) of coarse sand (125-micron-mean size, OK-110, or F-95 Silica Sand) for the peak flow rate from the water quality event for average influent concentrations ranging from 100 mg/L to 300 mg/L.
2. Use settling, separation, swirling, and centrifugal force techniques to remove pollutants from stormwater runoff.
3. Contain no moving components that require an external power source such as electricity, gas powered engines or generators.



3.4.12.2 Stormwater Manufactured Treatment Devices (MTDs) Type 3

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

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

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

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

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

1. Designed for a minimum 80% Total Suspended Solids (TSS) removal efficiency (ASTM D-3977-97 SSC) for:
 - a. Coarse sand (125-micron-mean size, OK-110, or F-95 Silica Sand) with average influent concentrations ranging from 1,500 mg/L to 2,000 mg/L (6% target sediment to water concentration) using ASTM 7351 or equivalent laboratory testing methods.
 - b. Street sweeping sediment load (average particle size of 200 micron) with average influent concentrations ranging from 24,000 mg/L to 26,000 mg/L (2.5% target sediment to water concentration) using ASTM 7351 or equivalent laboratory testing methods.
2. Use separation, settling, swirling, centrifugal force, and filtering techniques to remove pollutants from stormwater runoff.
3. Contain no moving components that require external power sources such as electricity, gas powered engines or generators.
4. Are capable of removing the pollutants of concern for the unique project requirements.

Drawing Requirements

As part of the permit submittal, applicants must submit working drawings, material certification, and certification that the MTD meets the requirements of this specification to the Public Works Director. Ensure the working drawings contain at a minimum, MTD name and model and/or serial number, MTD dimensioning, MTD and storm sewer invert elevations, installation drawings, and instructions that completely describe the MTD bearing the seal and signature of a South Carolina registered Professional Engineer.



3.5 Stormwater Drainage System Design Standards

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

1. Storm drain pipes:
 - a. Storm drainage lines shall be staked at each box or at intervals that will 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 four tenths (0.4%) percent [0.004 ft/ft] or a minimum flow velocity of three (3) feet per second at all flow levels, except where specifically approved in writing by the Public Works Director. Maximum allowable slope for storm drainage pipe is twenty (20) percent.
 - d. Drainage system installation must be such that stormwater discharge is not concentrated on adjacent property 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.
 - e. Type and class of storm drainage pipe, as well as the construction of pipe culverts, shall be in accordance with the Charleston County Transportation Committee specifications. The proposed use of any type of storm drainage pipes other than reinforced concrete pipe (RCP) shall be specifically approved in writing by the Public Works Department.
 - f. A minimum of one (1) feet of cover shall be provided for all RCP storm drainage pipes under unpaved roads or any other situation in which no roadway or other structure is to cover the pipe or unless otherwise stated by a pipe manufacturer. For pipes under any paved surface, the minimum cover is six (6) inches, excluding base and surface course depth. Contact the Public Works Director for minimum depths in other situations (e.g. other pipe types). RCP Class IV or V pipe may be requested by the designer and/or Public Works Director in special conditions be specifically approved in writing by the Public Works Director.
 - g. Storm drainage pipe shall be placed to minimize length running under pavement. Where it is necessary for pipe to cross the roadway, it preferably shall be placed at a ninety (90) degree angle, and in no case at less than thirty (30) degrees. All cross lines in the roadway shall be compacted in six (6) inches lifts to ninety-five (95)



percent Standard Proctor maximum density and to ninety-eight (98) Standard on the last six (6) inches.

- h. Any storm drainage pipe shall extend out to or beyond 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 bottom of the outlet to one foot below the normal permanent pool level.
- k. A maintenance access point shall be available within every three hundred (300) feet for fifteen (15) to eighteen (18) inch diameter pipe, every four hundred (400) feet for twenty-four (24) inch pipe and every five hundred (500) feet for larger storm drainage lines.
- l. Hydraulic grade line and head loss calculations for determining water surface elevations shall be performed for all systems connections.
- m. Calculations shall be performed for the appropriate design storm event
- n. Storm drain profile plots will be included in the set of construction plans.
- o. Storm drainage systems shall be designed to convey stormwater runoff by gravity flow unless otherwise approved.
- p. 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.

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 shall properly account for water, bed-load, and floating debris at all stages of flow;
- c. There shall be no unnecessary or excessive cause of property damage;
- d. The outlet shall 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 approved for these calculations are listed below. Other widely accepted models may be used, but must be approved by the Public Works Director
- f. Culvert 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 Public Works Director.
- g. Additional hydraulic capacity shall be required as necessary to prevent backwater effects that may adversely impact upstream property or structures.
- h. Acceptable models for designing culverts include, but are not limited to:
 - ICPR by Streamline Technologies
 - HY-8 by the Federal Highway Administration (FHWA)
 - Pond Pack by Bentley
 - HEC-RAS by the US Army Corps of Engineers
 - FlowMaster by Bentley
 - XPSWMM by XP Solutions

*This list is not intended as preference or to exclude others.
- i. A complete study of culverts and design considerations can be found in USDOT 2001a.

3. Headwalls and Outlets:

All exposed ends of pipes may 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 with non-shrink grout, headwall is preferred; it is required on culverts located in major defined drainage channels.
- b. A rip-rap headwall is acceptable for pipes twenty-four (24) inches or less in a number of situations; if used. Note that this technique requires the use of filter fabric and grout and/or concrete.
- c. Storm drainage or pond outfalls must be carried to an existing drainage outfall such as a pipe, ditch, etc.



- d. No new point discharge onto adjacent property, where there was not an existing point discharge, is allowed without the adjacent 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 should 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.
 - e. Outlets will not be allowed to discharge on fill slopes.
4. Energy Dissipation:
- a. All outlets shall be sufficiently stabilized. Calculations will 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. When the depth of a catch basin or junction box exceeds six (6) feet, rungs/steps shall be provided for ascent and descent. (Steps are to be ASTM-C-478, or equivalent.)
 - b. The box top shall be a minimum of three (3) feet by three (3) feet. Sides shall be plastered with grout.
 - c. All pipes entering or leaving shall not protrude more than four (4) inches into the box.
 - d. Maximum roadway catch basin inlet capacity for an inlet shall be determined based on the following:

For inlets at sag, capacity shall be based on weir flow (unsubmerged). The depth flow shall be limited to the curb depth, but may be further limited by the allowed spread, detailed below. In sag conditions, a fifteen (15) percent factor of safety shall be used to account for debris/clogging. Ponding at the sag location shall be limited to twenty-four (24) hours after the storm event.

For inlet on grade, theoretical capacity shall consider 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 eighty (80) percent of the theoretical capacity. Several equations and nomographs are available in the literature for determining the theoretical capacity. Maximum flow depth shall be limited to the depth of curb.



- e. Inlets shall be designed to accommodate a given flow such that ponded water is removed within twenty-four (24) hours and does not cause flooding to adjacent buildings or other interests. 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.
- f. 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 (2) points on the curve radius located by projecting lines from the sides of the catch basin box.
- g. Floors of drop boxes/manholes/junction boxes are to be of concrete and contain "formed troughs" to help channel flow.
- h. 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.
- i. Catch basins shall be field staked to ensure proper catch basin inlet alignment with the street gutter line.
- j. Area around all catch basins shall be backfilled in six (6) inch to eight (8) inch lifts, compacted to ninety-five (95) percent Standard Proctor maximum density.
- k. 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 Public Works Director has been given stating that an acceptable level of stabilization has been achieved.
- l. 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.
- m. 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.
- n. Inlets placed in roadway gutter lines shall be spaced to prevent flow from entering road intersections and to not exceed a maximum spread of six (6) feet, or one-half of a travel lane, whichever is greater, and based on maximum inlet capacity.
- o. 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).
- p. All manhole lids and catch basins will contain a water quality logo. Contact the Stormwater Division for information on how to obtain logos.



3.5.1 Easement Ownership (Public)

The following section provides the required easement widths for various components of the stormwater system. This section applies to easements that are publicly dedicated and accepted by Charleston County Council. There will be an allowance for offset easements, in which the pipe, channel, or other stormwater system component does not 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 on the plans and additional width may be required as prescribed by the Public Works Director.

3.5.2 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 3.11: Storm Drain Pipe Easements

Pipe Size (maximum)	Maximum Depth to Invert (ft)	Width of Drainage Easement (ft)
18" \geq and \leq 24"	5.0'	12' – 16'
24" $<$ and \leq 42"	5.0' – 7.0'	16' – 20'
42" $<$ and \leq 54"	7.0'	20' – 24'
54" $<$ and \leq 72"	7.0' – 9.0'	24' – 30'

- Notes:
- (1) For depths greater than shown, add two (2) 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, e.g., the easement width for a thirty-six (36) inch pipe is the same as those for a forty-two (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.

Swales and Ditches

A minimum easement width for a swale type ditch is fifteen (15) feet with a maximum width of twenty (20) feet. Maximum depth of the swale type ditch shall be two (2) feet where approved by the Public Works Director. The minimum easement width for trapezoidal ditch will be five (5) feet of shoulder area plus the top width of the ditch plus a twenty (20) foot maintenance shelf. When the depth of the ditch exceeds four (4) feet, the maintenance shelf shall be provided along both sides of the ditch. The minimum bottom width of the ditch shall be three (3) feet.

Detention Ponds

All detention facilities that require public maintenance shall be provided with access for maintenance via a constructed thirty (30) foot wide drainage right-of-way from the nearest road to the facility. Plans shall include a barrier structure at the primary road right-of-way to limit vehicular access. The detention facility



or pond shall include a twenty (20) foot wide cleared shelf with easement around the top perimeter of the facility for maintenance access.

Other Stormwater Facilities & 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 Public Works Director may request or allow other easement widths on a case-by-case basis given site constraints or special conditions.

3.6 Open Channel Hydraulics

Open channels 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 are to be uniform and shall be stabilized to prevent erosion in a manner approved by the Public Works Director. 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 tail water is not present. Flow velocities for the ten (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 may 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 two (2) year storm event and a high flow section to carry storms of larger frequencies.
7. Charleston County 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 by Streamline Technologies
 - HY-8 by the Federal Highway Administration (FHWA)



- Pond Pack by Bentley
- HEC-RAS by the US Army Corps of Engineers
- Flow Master by Bentley
- XP SWMM by XP Solutions

*This list is not intended as preference or to exclude others.



Table 3.12: 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
Bahia						
Buffalo Grass						
Blue Gamma	7					
Centipede Grass		6	5	5	4	3
Tall Fescue						
Kentucky Bluegrass						
Red Canary Grass	5					
Grass-legume Mixture		4	NR	4	3	NR
Lespedeza Sericea	3.5					
Weeping Lovegrass						
Kudzu						
Alfalfa		NR	NR	2.5	NR	NR
Small Grains						
Temporary Vegetation						

* Allow velocities over five (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 fifty (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).

3.7 Erosion Prevention and Sediment Control Standards

Charleston County requires that a stand alone erosion prevention and sediment control (EPSC) plan be submitted and approved prior to initiating construction on construction activities that are in excess of one (1) acre or require a building permit or as otherwise directed by Charleston County Public Works Director. A SCDHEC Stormwater Pollution Prevention Plan (SWPPP) (see Appendix E) may be considered a sufficient substitution for the EPSC plan. The EPSC plan describes the practices and controls that will be used during and after construction to meet the following goals:

1. Minimize the extent and duration of disturbed soil exposure
2. Stabilize disturbed areas promptly
3. Protect off-site and downstream locations, drainage systems, and natural waterways from the impacts of erosion and sedimentation
4. Limit the exit velocities of the flow leaving the site to non-erosive or pre-development conditions



5. Design and implement an ongoing inspection and maintenance plan

3.7.1 Accepted EPSC BMPs

The various types of EPSC BMPs that are acceptable for use in Charleston County are presented below. These generally fall into three categories: erosion prevention measures, temporary sediment controls, and runoff control and conveyance measures. Runoff from sites shall contain controls that fall into at least one of these categories.

3.7.1.1 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 3.12. Details on each of these measures are not discussed in this Manual. Guidance documents that can be used as reference if necessary include: SCDHEC (2003), Haan, C. T., Barfield, B. J., and Hayes, J. C. (1995) and Shwab, 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.



Table 3.13: Erosion Prevention BMP Suggested Uses

BMP	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
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

3.7.1.2 Temporary Sediment Control Measures

Charleston County 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 may be utilized as appropriate during the project's construction phase. Table 3.13 contains a list of some of the suggested controls of this type along with their intended use. Details on these and others measures are again not discussed in detail in the Manual; however, areference is Haan, Barfield, and Hayes (1995). Other practices, such as engineered devices, will be allowed as long as sufficient evidence is presented as to their effectiveness.



Table 3.14: Temporary Sediment Control BMP Suggested Uses

BMP	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
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

3.7.1.3 Runoff Control and Conveyance Measures

This category of EPSC BMPs may be used as necessary during and following construction. Suggested varieties and their corresponding uses are provided in Table 3.14.

Table 3.15: Runoff Control and Conveyance Measures 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

3.7.1.4 Seeding and Vegetation

See Appendix L.



3.7.2 Design Standards

General Standards

1. EPSC plans shall be developed to achieve an eighty (80) percent design removal efficiency goal. Simply applied, when a site is completely denuded of vegetation, the structural and nonstructural EPSC measures are designed to trap eighty (80) percent of the total suspended solids (TSS) that are generated by the site. The design storm event associated with this level of control is the twenty-five (25) year twenty-four (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. The mention of these design aids is not intended as preference or to exclude others.
2. SCS procedures shall be used to determine runoff amounts. It is important to note that when a BMP is designed for the twenty-five (25) year twenty-four (24) hour storm event, the BMP will have a greater trapping efficiency for more frequent events such as the two (2) year twenty-four (24) hour storm event.
3. A sediment detention 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 an eighty (80) percent trapping efficiency for TSS for the twenty-five (25) year twenty-four (24) hour storm event to pre-development conditions, and successfully pass the one hundred (100) year twenty-four (24) hour storm event. Sediment basins shall be limited to controlling runoff for twenty (20) acres. Sediment traps shall not have more than five (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 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 one hundred (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:
 - o. Minimize site disturbance to preserve and maintain existing vegetative cover,
 - p. Limit the number of temporary access points to the site for land disturbing activities,
 - q. Protect off-site and downstream locations, drainage systems and natural waterways from the impacts of erosion and sedimentation,
 - r. Phase and sequence construction activities to minimize the extent and duration of disturbed soil exposure, and



- s. 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 Public Works Director. 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 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 will be minimized and must be approved by the Public Works Director and possibly the USACE. Encroachment into stream buffers riparian areas and wetlands will 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 fourteen (14) 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 seventy (70) percent or more of the entire site with permanent coverage in good condition.
 - 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 permit application/engineering calculations. All temporary structural controls shall be designed to control the peak runoff resulting from the twenty five (25) 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 water body shall include measures and controls which adequately protect the water body from undue impact. Such work shall not be performed without approval from USACE. In addition, such work shall 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. See Appendix I for more details regarding linear applications.
9. The grading plan shall 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 may 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 may 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 shall be included as part of the grading plan.



- g. Adequate channels and floodways shall 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 shall be graded to direct flows to appropriate controls.
10. EPSC plan shall have the following information contained within 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.
1. All necessary certifications by the person responsible for the activity. This includes the NOI application signatures and maintenance agreement/operating permit. Proper preparation of the EPSC Plan and/or the SWPPP, if necessary, by a registered engineer, landscape architect, Tier B land surveyor, or a qualified Federal Government employee.

Typical Design Procedures

The design procedures will vary depending on the EPSC BMP. Many of the BMPs listed in Tables 3.9 – 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 thru 3.16. 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 these provisions of this section.

3.8 Special Protection Areas

In an effort to address some of the most critical water resource problems that exist in the County, Special Protection Areas may be established. These areas may be established by County Council or by written direction by the Public Works Director or by the establishment of specific local, state or federal requirements (TMDL, State Anti-Degradation, etc.). 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 set of design criteria detailed below.

Design criteria within Special Protection Areas may impose water quantity (reduces or prevents frequent and/or extreme flooding) or a water quality criteria that prevents or reduces degradation of riverine, estuarine, coastal ecosystems or maintains a designated use(s). Water quality impairments may be identified through the County's Stormwater Management Program and/or any other local, state or federal requirements. The Stormwater Division will inform permit applicant(s) when submitted applications and/or proposed projects are located within a Special Protection Area. This does not relieve the applicant(s) of other local, state or federal requirements (State approved TMDL's, etc.) Due to the dynamic nature of these Special Protection Areas, the applicant will meet with the Public Works Director to discuss specific design criteria.

3.8.1 Water Quantity

Flooding problem areas exist in many locations around the County to the point that stormwater controls have become overwhelmed where controls were never adequately designed or installed to control runoff. The ability to maintain a system is also suspected to contribute to some of the frequent flooding. In an effort to relieve existing flooding problems, Charleston County may require additional design criteria during the construction site permitting process.

3.8.2 Water Quality

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. These 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 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).



3.8.3 Shoreline Protection

Shorelines are environmentally sensitive areas that can impact water quality of adjacent waterbodies. The design and installation of stormwater systems and facilities at or near the shoreline shall follow the list of criteria below as applicable.

1. The natural dune system and native vegetation shall not be impacted unless an appropriate permit has been issued by DHEC-OCRM and/or the appropriate local government.
2. No beachfront outfalls are allowed unless an appropriate permit has been issued by DHEC-OCRM and/or the appropriate local government.
3. Installation of sediment/erosion control BMPs should take into consideration migration of sediment due to wind.
4. All DHEC-OCRM and local government beachfront setback policies must be followed



Chapter 4 Inspections & Enforcement

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

4.1 Charleston County Stormwater Inspections

The County will inspect applicable construction sites from initial land clearing to final stabilization. The purpose of these inspections will be to check for compliance with and ensure enforcement of the County Stormwater Management Plan (SMP) approved by the Stormwater Division. 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. County inspectors will be checking for adherence to this plan and any necessary changes that may arise after installation. County inspections are not to be construed as a relaxation of the requirements on owners/operators to conduct self-inspections in accordance with any applicable local, state or federal stormwater requirements.

4.1.1 Charleston County Stormwater Management Inspector Duties/Responsibilities

Charleston County's Stormwater Management Inspectors shall inspect and enforce the requirements of the Charleston County Ordinance #1518 (Ordinance) and this Manual. The job duties/responsibilities of a County Stormwater Inspector shall include, but not be limited to, the following:

1. Conduct and document construction site inspections to ensure compliance with the approved County ordinance or stormwater management plan. Frequency of inspections will be determined by the Public Works Director.
2. Ensure that the Ordinance or SMP, the SWPPP, and the approved 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 Operating Permit.
4. Upon owner/operator's request, provide the owner/operator of the project a written report within seven (7) days of request during construction or post-construction site inspection.
5. Initiate enforcement orders to the owner, operator, or person responsible for land disturbing activities when any portion of the work does not follow the approved plans, does not comply with this manual, or work is occurring without appropriate permitting. The enforcement process and types of orders is detailed in Section 4.3.
6. Perform an inspection upon the completion of the stormwater system to determine if the system is constructed in accordance with the approved plans and/or this manual.
7. Take action if the owner/operator fails to follow the approved plans, this manual, and/or a potential hazard exists as a result. The inspector will address the situation and notify any applicable local, state and federal agencies.



8. Maintain accurate and comprehensive project inspection files ensuring relevant information is entered in the files to be maintained in the Public Works Department.

4.1.2 Inspection Process and Procedures

As per the Ordinance, the Public Works Director or an authorized representative/designee (inspector) may enter upon all properties for regular inspections, periodic investigations, enforcement, and to implement the provisions of the Ordinance. Upon refusal by any owner/operator 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. A sample inspection form is in Appendix I.

Upon completion of a site inspection, the County inspector will, 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 approved, construction plans and /or SWPPP 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 County inspector will, 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/Operator Inspection Responsibilities

In accordance with any applicable local, state and federal stormwater requirements owner/operators are responsible for conducting during construction and post-construction site inspections. Records of such inspections shall be kept for a minimum of five (5) years and must be made available to Charleston County upon request or enforcement actions will be initiated.

4.3 Enforcement

If the County determines that a project is not in compliance with the Ordinance or Manual then the Public Works Director may ensure conformity by proceeding with the appropriate enforcement action. The types



of enforcement tools (see Appendix J) available to the County include a Corrective Order, Notice of Violation (NOV), Stop Work Order and Civil/Criminal Penalties. The enforcement mechanism to be utilized will depend on the circumstances as described in the following sections.

4.3.1 Corrective Order

The Public Works Director may issue a Corrective Order for first offenses of non-compliance with the Ordinance, this Manual, or the approved construction plans. The purpose of the Corrective Order is to give notice of the deficiencies, identify expected corrective results, and provide a reasonable timeframe for corrections to the owner, operator, or person responsible for land disturbing activities. Corrective 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 Public Works Director shall issue Corrective Orders within five (5) working days of an inspection. All Corrective Orders, verbal or written, shall be noted in the project file.

A Corrective Order may be issued in such cases, but not be limited to, when there is:

1. Failure to comply with the approved Ordinance to include failure to have properly installed and/or maintained BMP measures
2. Failure to properly maintain permanent stormwater management structures
3. Failure to comply with deficiencies noted on Charleston County Inspection Reports

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

1. Nature of the violation(s).
2. Required corrective actions.
3. The time period for correcting the violation(s).

4.3.2 Notices of Violation (NOV)

If a Corrective Order has been previously issued and there is either subsequent non-compliance issues or failure to complete the items on the Corrective Order within a specified time period, then a Notice of Violation may be issued. In addition, for violations that involve a safety issue or an imminent threat of 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. Erosion protection, sediment controls, or BMPs have not been placed to prevent sediment and/or illicit discharges from leaving the site and/or entering wetlands, critical areas, or other State and Federally regulated areas
2. Failure to have work inspected and approved before restarting construction activities after a stoppage of work
3. Failure to follow the approved construction plans



A Notice of Violation will at a minimum include the following:

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

4.3.3 Stop Work Order

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

1. Construction activities are occurring without County permits and/or an approved stormwater plan
2. Past enforcement actions taken by the County (Corrective Orders, Notice of Violations) to remedy a situation(s) that have not been properly addressed with appropriate and prompt action to the satisfaction of the Public Works Director
3. Non-compliance with the plans have resulted in a health or safety issue
4. Offsite sedimentation or sediment laden discharge
4. Failure to follow the approved construction plans

A Stop Work Order will cease all construction activities until violations are corrected and inspected for compliance. Failure to comply may result in the suspension or revocation of any remaining permits issued for the site and/or civil penalties.

4.3.4 Civil Penalties

Violations may subject the owner/operator to Civil Penalties as outlined in the Ordinance for each violation. Each day a violation continues 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 Ordinance shall be guilty of a misdemeanor and shall be punished within the jurisdictional limits of the magistrate's court. The Public Works Director may issue a uniform summons citation for a violation of this Ordinance. Fines imposed under the Notice of Violation (NOV) are outlined in the Ordinance. Each day a violation continues constitutes a new and separate violation.



DRAFT

**APPENDIX A
APPLICATION FORMS**

CLEARING AND GRUBBING APPLICATION
EROSION PROTECTION & SEDIMENT CONTROL
CERTIFICATION
(supplement to Building Permit)

Staff use:
Zoning Permit: STRM-XX-XX-XXXXX
Plan Review Case: CONS-XX-XX-XXXXX

Application Date _____

Applicant Information

OWNER: _____ **Contact:** _____
ADDRESS: _____
CITY: _____ **STATE:** _____ **ZIP CODE:** _____
PHONE: _____ **CELL PHONE:** _____ **FAX:** _____
EMAIL: _____

Property Information

PARCEL/TMS#: _____
DEVELOPMENT ADDRESS: _____
CITY: _____ **ZIP CODE:** _____
TOTAL ACRES: _____ **DISTURBED ACRES:** _____
DESCRIBE WORK: _____

Owner/Operator must sign the certification below.

I certify under penalty of law that I understand and will comply with the County's Construction Activity Management Requirements for Single Family Residential Structures Disturbing Less Than 1 Acre in the attached document. I will ensure that the control measures are maintained. I further authorize and consent that Charleston County inspectors may enter upon the premises as necessary to ensure compliance with all related requirements of the Ordinance or Manual. I further ensure that I have all rights, easements, or permission to be conducting work on the properties for which I have applied.

NAME (Please Print): _____

SIGNATURE: _____ **DATE:** _____

DATE

Permit # STRM-XX-XX-XXXXX



Linear Application

(Only applicable for linear construction projects (utility, sidewalk, etc.))

- A. Name of Activity: _____
- B. Applicant Name: _____
Address: _____
City: _____, State: _____ Zip: _____
Phone: _____ - _____ - _____ Mobile: _____ - _____ - _____ Fax: _____ - _____ - _____
Email Address (optional): _____
- C. Property Info: Check Box if same as above
Address: _____
City: _____, South Carolina Zip: _____
Tax Map Number(s): _____
- D. Disturbed area to the nearest tenth of an acre: _____
- E. Is this a linear construction project that disturbs less than one acre? YES NO
- F. Are there any wetlands/Waters of the State that will be disturbed? YES NO
- G. Are there any flooding problems on or adjacent to this site? YES NO
- H. Where does this stormwater discharge?

General Narrative: Please give a general site narrative explaining the purposes of the land disturbance, existing and proposed stormwater runoff patterns, offsite stormwater runoff and potential problems with adjacent properties. Also, if applicable, wetland and waterbody disturbance issues must be discussed along with the proof of permit coverage by the US Army Corps of Engineers and SC DHEC, if applicable.

Project Sketch: (Drawn To Scale)

Attach to this application a project sketch that includes **all of the following:** Location of all proposed disturbance; an outline of the limits of the disturbed area; location of existing and proposed stormwater management control outfalls; location of 100-year flood plain; necessary measures for energy dissipation; property lines; location of all sediment and erosion control measures (silt fence, riprap, inlet protection, etc.).

Applicant's Certification:

I hereby certify that all land disturbance, construction, and/or development will be done pursuant to the site plan submitted in accordance with this application, and I am responsible for the land disturbance and related maintenance thereof. I further authorize and consent that Charleston County inspectors may enter upon the premises as necessary to ensure compliance with all related requirements of the Ordinance or Manual.

Applicant's Printed Name

Applicant's Signature

Date

MOBILE HOME APPLICATION

**EROSION PROTECTION & SEDIMENT CONTROL
CERTIFICATION
(supplement to Building Permit)**

Staff use:
Zoning Permit: STRM-XX-XX-XXXXX
Plan Review Case: CONS-XX-XX-XXXXX

Application Date _____

Applicant Information

OWNER: _____ **Contact:** _____
ADDRESS: _____
CITY: _____ **STATE:** _____ **ZIP CODE:** _____
PHONE: _____ **CELL PHONE:** _____ **FAX:** _____
EMAIL: _____

Property Information

PARCEL/TMS#: _____
DEVELOPMENT ADDRESS: _____
CITY: _____ **ZIP CODE:** _____
TOTAL ACRES: _____ **DISTURBED ACRES:** _____
DESCRIBE WORK: _____

Owner/Operator must sign the certification below.

I certify under penalty of law that I understand and will comply with the County's Construction Activity Management Requirements for Single Family Residential Structures Disturbing Less Than 1 Acre in the attached document. I will ensure that the control measures are maintained. I further authorize and consent that Charleston County inspectors may enter upon the premises as necessary to ensure compliance with all related requirements of the Ordinance or Manual. I further ensure that I have all rights, easements, or permission to be conducting work on the properties for which I have applied.

NAME (Please Print): _____

SIGNATURE: _____ **DATE:** _____



**SINGLE FAMILY RESIDENTIAL
&
TOWNHOME APPLICATION**

**EROSION PROTECTION & SEDIMENT CONTROL
CERTIFICATION
(supplement to Building Permit)**

Staff use:
Zoning Permit:
STRM-XX-XX-XXXXX

Plan Review Case:
CONS-XX-XX-XXXXX

Application Date _____

Applicant Information

OWNER: _____ **Contact:** _____
ADDRESS: _____
CITY: _____ **STATE:** _____ **ZIP CODE:** _____
PHONE: _____ **CELL PHONE:** _____ **FAX:** _____
EMAIL: _____

Property Information

PARCEL/TMS#: _____
DEVELOPMENT ADDRESS: _____
CITY: _____ **ZIP CODE:** _____
TOTAL ACRES: _____ **DISTURBED ACRES:** _____
DESCRIBE WORK: _____

Owner/Operator must sign the certification below.

I certify under penalty of law that I understand and will comply with the County's Construction Activity Management Requirements for Single Family Residential Structures Disturbing Less Than 1 Acre in the attached document. I will ensure that the control measures are maintained. I further authorize and consent that Charleston County inspectors may enter upon the premises as necessary to ensure compliance with all related requirements of the Ordinance or Manual. I further ensure that I have all rights, easements, or permission to be conducting work on the properties for which I have applied.

NAME (Please Print): _____

SIGNATURE: _____ **DATE:** _____



NOTICE OF INTENT (NOI)
For Coverage(s) of Primary Permittees
Under South Carolina NPDES General Permit
For Stormwater Discharges From Construction Activities SCR100000
 (Maintain As Part of On-Site SWPPP)

For Official Use Only

File Number: _____
 Permit Number: **SCR10** _____
 Submittal Package Complete: _____

Submission of this Notice of Intent constitutes notice that the Applicant identified in Section II intends to be authorized as a Primary Permittee in the state of South Carolina under NPDES General Permit SCR1000000. Fees required for review and NPDES coverage of each application type are as listed on page 2 of the Instructions.

Date: _____
 Project/Site Name: _____ County: _____
 (Modification or Change of Information Only) Prior Approved NPDES Permit or File Number: _____

Do you want this project to be considered for the Expedited Review Program (ERP)? Yes or No (See instructions)

I. Notice of Intent (NOI) Application Type(s)

- A. **Project (Application/Review) Type(s)** (Select **ALL** that apply):
 New Project (Initial Notification) Ongoing Project: Permitted or Un-Permitted
 Late Notification Low Impact Development (LID) or Project Design Above Regulatory Requirements
 New Owner/Operator or Company Name Change (see instructions, attach Form A (Transfer of Ownership))
 Major Modification: (see instructions, attach Form B (Major Modifications))
 MS4 Project Review
 Ocean and Coastal Resource Management (OCRM) Review
 Change of Information/Other (Specify): _____

B. If Applicable, identify the entity designated as **MS4 Reviewer** and **MS4 Operator** (i.e., Lexington County, City of Greer, etc.): MS4 Reviewer _____ MS4 Operator _____

II. Primary Permittee Information

Change of Information

<input type="checkbox"/> Person or <input type="checkbox"/> Company	If a Company, are you a <input type="checkbox"/> Lending Institution or <input type="checkbox"/> Government Entity? Company EIN (if applicable): EIN: _____
---	--

- A. **Primary Permittee Name:** _____
 Mailing Address: _____ City: _____ State: _____ Zip: _____
 Phone: _____ Fax: _____ Email Address: _____
- B. **Contact /ODSA Name** (if different from above OR if owner is a company): _____
 Mailing Address: _____ City: _____ State: _____ Zip: _____
 Phone: _____ Fax: _____ Email Address: _____
- C. **Property Owner Name** (if different from above): _____
 Mailing Address: _____ City: _____ State: _____ Zip: _____
 Phone: _____ Fax: _____ Email Address: _____

III. Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) Preparer Information Change of Information

- A. **C-SWPPP Preparer Name:** _____
 B. **Registered Professional** Engineer Landscape Architect Tier B Land Surveyor **S. C. Registration #:** _____
 C. **Company/Firm Name:** _____ **S. C. COA # :** _____
 Mailing Address: _____ City: _____ State: _____ Zip: _____
 Phone: _____ Fax: _____ Email Address: _____

IV. Project/Site Information

Change of Information

- A. **Type of Construction Activity(ies)** (Select **ALL** that apply):
 Commercial Industrial Institutional Mass Grading Linear Utility/Infrastructure
 Residential: Single-family Residential: Multi-family Multi-use (Commercial & Residential)
 Site Preparation (No New Impervious Area) Other (Specify) _____
- B. **Site Address/Location** (street address, nearest intersection, etc.) _____
 City/Town (if in limits): _____ Zip Code: _____
 Latitude: ____° ____' ____" N Longitude: - ____° ____' ____" W (Source): GPS Web Site: _____
 Tax Map Number (s) (List all): _____

- C. Is this site located on **Indian Land**? Yes No
- D. **Proposed Start Date:** _____ **Proposed Completion Date:** _____
- E. **Disturbed Area (nearest tenth of an acre):** _____ **Total Area (acres):** _____
- F. **Modification Only:(nearest tenth of an acre):** **Disturbed Area: Current (Approved) Area:** _____
Disturbed Area Change (Increase Only): _____ **Total Disturbed Area (After Change):** _____
- G. Is this project part of a **Larger Common Plan for Development or Sale (LCP)**? Yes No
LCP/ Overall Development Name: _____ Check here if this is the **First Phase.**
Previous State Permit/File Number: _____ **Previous NPDES Coverage Number:** SCR10 _____
- H. Any **Flooding Problems** exist downstream of or adjacent to this site? Yes No (If yes, provide detailed description of flooding problems and applicable floodway/flood zone information in the C-SWPPP).
- I. Active **S.C. DHEC Warning Notice, Notice to Comply or Notice of Violation** for this site or LCP? Yes No
- J. List Relevant **State and Federal Environmental Permits or Approvals** applied for or obtained for this site (e.g., **RCRA, USACOE, Nationwide**, etc.). If None, list None.

K. **Any Waiver(s)/Variances/Exceptions Requested for this Project?** (If yes, identify below and include **Waiver Request and Justifications** in the C-SWPPP for each proposed request).

1. Small Construction Activity Waiver(s) From NPDES permitting (Section 1.4 & Appendix B)? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, Identify requested waiver: <input type="checkbox"/> Rainfall Erosivity Waiver <input type="checkbox"/> TMDL Waiver <input type="checkbox"/> Equivalent Analysis Waiver		
2. Detention Waiver (72-302(B))? <input type="checkbox"/> Yes <input type="checkbox"/> No	3. Other (Specify): _____	

V. Waterbody Information (Attach additional sheet(s) as needed) **Change of Information**

A. **Receiving Waterbody(s) (RWB) Information** (List the nearest and next nearest receiving waterbodies to which the sites stormwater discharges will drain. If stormwater discharges drain to multiple waterbodies, list all such waterbodies).

1. Name of Receiving Waterbodies (RWB)	2. Distance to RWB (feet)	3. Classification of RWB
a. Nearest: _____		
b. Next Nearest: _____		
c. Coastal Zone ONLY: Coastal Receiving Water (CRW): _____		Not Applicable
d. Other Waterbodies: _____		

B. **Waters of the U.S. / State Information** (Attach additional sheet(s) as needed)

Waters of the U.S./ State	1. On the site?	2. Delineated/ Identified?	3. Impacts?	4. 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
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
c. Other Water(s): _____	<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
d. Coastal Zone ONLY: Direct Critical Area	<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

5. If yes for impacts in B.3, describe each impact and activity, and list all permits (e.g., USACOE Nationwide Permit, DHEC General Permit) and certifications that have been applied for or obtained for each impact:

C. **S.C. Navigable Waters (SCNW) Information (Section 2.6.5)** The Department will address any issues related to State Navigable Waters' Program under SC Regulation 19-450 during the review of the C-SWPPP for activities that will **NOT** require a 404 permit or a 401 certification. (Attach additional sheet(s) as needed).

1. Are S. C. Navigable Waters (SCNW) on the site: <input type="checkbox"/> Yes <input type="checkbox"/> No a. If no, do not complete this question. Proceed to Section D (Impaired Waterbodies). b. If yes, provide the name of S.C. Navigable Waters (SCNW) on the site: _____		
2. If yes for C.1, will construction activities cross over or occur in, under, or thru the SCNW? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe SCNW activities (e.g., road crossing, sub-aqueous utility line, temporary or permanent structures, etc.) and proceed to Section C.3: _____		
3. Identify permits providing coverage of SCNW activities proposed for your site. If NONE, list none.		
Permits/Certifications	Permit or Certification No.	Corresponding Covered SCNW Activity(ies)
a. DHEC General/ Other DHEC Permit		
b. USACOE 404 Permit or 401 Certification		
c. SCNW Permit If applied for or issued, identify Date applied for or issued: _____		<input type="checkbox"/> All Activities or <input type="checkbox"/> Some Activities (Describe):
d. If a SCNW Permit has NOT been applied for provide an additional plan sheet that shows plan and profile views (drawn to scale) of the SCNW and associated activities. Include a description of all proposed activities on this plan.		

D. Impaired Waterbodies Information (Attach additional sheet(s) as needed)

1. 303(d) Listed Impaired Waterbodies					
a. Name of Nearest DHEC Water Quality Monitoring Stations (WQMS)(s) that receives stormwater from your construction site and/or thru an MS4 and the Name of the Corresponding Waterbody?		b. Is this WQMS(s) listed on the most current 303(d) List? If No, proceed to Section 2 of this table. If Yes, complete items c thru f.	c. List the pollutant(s) identified as "CAUSES" of the impairment	d. Will any pollutants causing the impairment be present in your site's construction stormwater discharges?	e. If yes for d , list the "USE SUPPORT" impairment(s) affected by the pollutant(s) identified in c.
Nearest DHEC WQMS(s)	Corresponding Waterbody				
		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
f. If yes for d above, will use of the BMPs proposed for your project ensure the site's discharges will NOT contribute to or cause further WQS violations for the impairment(s) listed in c? <input type="checkbox"/> Yes <input type="checkbox"/> No (NOTE: If no for f, this site is NOT eligible for coverage under the CGP). See Instructions.					
2. TMDL Impaired Waterbodies					
a. Name of Nearest DHEC Water Quality Monitoring Stations (WQMS)(s) that receives stormwater from your construction site and/or thru an MS4?		b. Has a TMDL(s) been developed for this WQMS(s)? If No, identify as such below and proceed to Section VI. If Yes, complete items c thru f of this table.	c. If yes for b , what pollutants are listed as "CAUSES" or causing the impairment?	d. If yes for b , has the standard been "ATTAINED" or "Fully Supported" for the impairment(s)?	e. If no for d (Not Attained) , will any pollutants causing the impairment be present in your site's construction stormwater discharges?
		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
f. If yes for e above, are your discharges consistent with the assumptions and requirements of the TMDL(s)? <input type="checkbox"/> Yes <input type="checkbox"/> No (NOTE: If no for f, this site is NOT eligible for coverage under the CGP). See Instructions.					

VI. Signatures and Certifications **DO NOT SIGN IN BLACK INK!** Read the Certifications below (in entirety). Provide date, printed name, and signatures below. If you are a **New Owner/Operator**, as Primary Permittee you must also sign and date the applicable Comprehensive SWPPP Acceptance & Compliance Agreement below.

C-SWPPP PREPARER: "One copy of the C-SWPPP, 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 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." **(This should be the person identified in Section III).**

Printed Name of C-SWPPP Preparer

Signature of C-SWPPP Preparer

S. C. Registration #

PRIMARY PERMITTEE: "I or I (on behalf of my company and its contractors and agents), as the case may be, 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 understand that DHEC enforcement actions may be taken if the terms and conditions of the C-SWPPP are not met and I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

"I or I (on behalf of my company and its contractors and agents), as the case may be, also hereby certify that all land-disturbing 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 and SCR100000. I also certify that a responsible person will be assigned to the project for day-to-day control. I hereby grant authorization to the to S. C. Department of Health and Environmental Control (DHEC) and/or the local implementing agency 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." **(See Section 122.22 of S.C. Reg. 61-9 for signatory authority information.)** Having understood the above information, I am signing this certification as Primary Permittee to the aforementioned NPDES general permit."

Printed Name of Primary Permittee

Title/Position

Signature of Primary Permittee

Date Signed

NPDES CGP FEE SCHEDULE A

(All Counties **EXCEPT** Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper)

The schedule should be attached to DHEC Form 2617. Do not send payment in window envelope. **DO NOT MAIL CASH.** DHEC will notify the Project Owner/ Operator if the submitted check or credit card payment cannot be processed. **The review clock will start when acceptable payment is received.**

1. Identify (✓) the Project Review Type(s) Enter NPDES Coverage Fee of \$125 in the right-hand column if <u>any</u> of the following project/review types apply to this application. Proceed to Item 2.	(✓)	NPDES Coverage Fee
a. Project or LCP (Item IV.G) that will ultimately disturb one (1) acre or more Note: If your project will ultimately disturb less than one (1) acre AND is NOT a part of a Larger Common Plan, coverage under SCR100000 is <u>not</u> required; see http://www.scdhec.gov/administration/library/d-2628.pdf (Notification Form for Sites Disturbing Less Than 1-Acre Not Part of a Larger Common Plan, Non-Coastal County")	<input type="checkbox"/>	\$ _____ .00
b. New Owner/Operator (Transfer of Ownership)/Company Name Change (\$125 NPDES Coverage fee is required by the Department for Transfers of Ownership and Company Name Changes)	<input type="checkbox"/>	
c. Unpermitted Ongoing Project or Late Notification	<input type="checkbox"/>	
d. MS4 Project Review (Item I.A and I.B) (\$125 payable to Department thru MS4 Reviewer)	<input type="checkbox"/>	
e. Other (Specify): _____	<input type="checkbox"/>	

2. Determine the Project Review Fees (Review fees cannot exceed \$2000 for a project)		
PROJECT OR LCP THAT WILL ULTIMATELY DISTURB ONE (1) ACRE OR MORE	(✓)	Review Fees
a. Enter the disturbed area (Item IV.E) for this project. Proceed to Items 2.b and 2.c.	_____ (Nearest tenth of an acre)	
b. Will this project or LCP (Item IV.G) ultimately disturb more than 1.0 acres	<input type="checkbox"/> Yes <input type="checkbox"/> No	
c. Is this project exempt from S. C. Reg. 72-300 et seq.?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1. If this project will not ultimately disturb more than 1.0 acre, and is not part of an LCP, your project is automatically covered under this permit and the NPDES coverage fee and review fee are not required. See the BOW-SPWS for "Less Than 1-Acre of Land Disturbance – Non-Coastal Counties". 2. If this project will ultimately disturb more than 1.0 acre, proceed to Item 2.d.		
d. Enter the project review fees (based on \$100/disturbed area) in the right-hand column. (Multiply the disturbed area (Item 2.a) by \$100/disturbed area). If the disturbed area for this project (Item 2.a.) totals 20.0 acres or more, enter \$2000 in the right-hand column. Review fees cannot exceed \$2000 for a project.		\$ _____ .00

3. Total Required Fees Add the values in the right-hand columns of Items 1 and 2.d. Proceed to Item 4. (The Department will not review this project until all required fees are received).	\$ _____ .000
---	---------------

4. Identify the Method of Payment:

Payment by Check:

Attach a **signed and dated check payable to S.C. DHEC** to the **front** of this Fee Schedule.

Please note that all checks must be **less than 30 days old** and must be for the **entire required fees.**

Payment by Credit Card: (Check here if you wish to pay via credit card using the on-line payment system).

The Department will contact you to provide instructions and the invoice number necessary for online payment.

Please provide an e-mail address where the invoice number may be sent: _____

For official use only: Invoice Number _____

NPDES CGP FEE SCHEDULE B

(ONLY for Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper Counties)

Submit payment for NPDES Coverage fees only to DHEC.

The schedule should be attached to DHEC Form 2617. Do not send payment in window envelope. **DO NOT MAIL CASH.** DHEC will notify the Project Owner/ Operator if the check or credit card payment cannot be processed. **The review clock will start when acceptable payment is received and after the project is deemed consistent with the S.C. Coastal Zone Management Plan.**

1. Identify (✓) the Project/Review Types		NPDES Coverage Fee(s)
(NOTE: You may ONLY select Item 1.a OR 1.b BELOW). Enter NPDES coverage fee of \$125 in the right-hand column if any of the following project/review types apply to this application. Proceed to Item 2.	(✓)	
a. Project or LCP that is located within ½ mile of CRW (Item V.A) that will ultimately disturb more than 0.5 acres (if select a, do not select b)	<input type="checkbox"/>	\$ _____ .00
b. Project or LCP that is NOT located within ½ mile of CRW (Item V.A) that will ultimately disturb one (1) acre or more (if select b, do not select a)	<input type="checkbox"/>	
c. New Owner/Operator (Transfer of Ownership)/Company Name Change <small>(\$125 NPDES Coverage fee is required by the Department for Transfers of Ownership and Company Name Changes)</small>	<input type="checkbox"/>	
d. Unpermitted Ongoing Project or Late Notification	<input type="checkbox"/>	
e. MS4 Project Review (Item I.A and I.B)	<input type="checkbox"/>	
f. Other (Specify): _____	<input type="checkbox"/>	

2. Determine the Project Review Fees (Review fees cannot exceed \$2000 for a project).
NOTE: COMPLETE ITEM 2.a BELOW. COMPLETE EITHER SECTION 3 OR SECTION 4. DO NOT COMPLETE BOTH SECTIONS.

a. Enter the disturbed area (Item IV.E) for this project. **Proceed to Item 3 OR Item 4.** _____ (nearest tenth of an acre)

3. PROJECT OR LCP LOCATED WITHIN ½ MILE OF A CRW (ITEM V.A)		Review Fees
a. Will this project or LCP (Item IV.G) ultimately disturb more than 0.5 acres?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
b. Is this project exempt from S. C. Reg. 72-300 et seq.?	<input type="checkbox"/> Yes <input type="checkbox"/> No	

1. If this project will NOT ultimately disturb more than 0.5 acres and is not part of an LCP, your project is automatically covered under this permit and the NPDES coverage fee and review fee are not required. See section 1.3.1.B. See the BOW-SPWS for "Less Than 1-Acre of Land Disturbance - Coastal Counties".

2. If this project or LCP will ultimately disturb more than 0.5 acres, **proceed to Item 3.c.**

c. Enter the project review fees (based on \$100/ disturbed acre) in the right-hand column. (Multiply the disturbed area (Item 2.a.) by \$100/disturbed area). If the disturbed area for this project (Item 2.a.) totals 20.0 acres or more, enter \$2000 in the right-hand column. **Review fees cannot exceed \$2000 for a project. Proceed to item 3.d**

\$ _____ .00

d. **Total Required Fees (Coastal Project located WITHIN ½ mile of a CRW (Item V.A))**
 Add the values in the right-hand columns of Items 1 and 3.c. (The Department will not review this project until all required fees are received). **Proceed to Item 5.**

\$ _____ .00

4. PROJECT OR LCP NOT LOCATED WITHIN ½ MILE OF A CRW (ITEM V.A)		Review Fees
a. Will this project or LCP (Item IV.G) ultimately disturb one (1) acre or more?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
b. Is this project exempt from S. C. Reg. 72-300 et seq.?	<input type="checkbox"/> Yes <input type="checkbox"/> No	

1. If this project will NOT ultimately disturb one (1) acre or more, and is not part of an LCP, coverage under SCR100000 is NOT required; see the BOW-SPWS for "Less Than 1-Acre of Land Disturbance - Coastal Counties".

2. If this project or LCP will ultimately disturb one (1) acre or more, **proceed to Item 4.c.**

c. Enter the project review fees (based on \$100/ disturbed acre) in the right-hand column. (Multiply the disturbed area (Item 2.a.) by \$100/disturbed area). If the disturbed area for this project (Item 2.a.) totals 20.0 acres or more, enter \$2000 in the right-hand column. **Review fees cannot exceed \$2000 for a project. Proceed to item 4.d.**

\$ _____ .00

d. **Total Required Fees (Coastal Project NOT located WITHIN ½ mile of a CRW (Item V.A))**
 Add the values in the right-hand columns of Items 1 and 4.c. (The Department will not review this project until all required fees are received). **Proceed to Item 5.**

\$ _____ .00

5. Identify the Method of Payment: **Payment by Check:** (Attach a signed and dated check payable to S.C. DHEC to the front of this fee schedule. All checks must be less than 30 days old and must be for the entire amount of required fees). **Payment by Credit Card:** (Check here if you wish to pay via credit card using the on-line payment system). The Department will contact you via e-mail to provide instructions and the invoice number necessary for online payment. **Please provide an e-mail address where the invoice number may be sent:**

For official use only: Invoice Number _____

Instructions for Completing the Notice or Intent (NOI)

If you are uncertain whether you need to obtain coverage under the NPDES General Permit for Stormwater Discharges from Construction Activities, SCR100000 (CGP), if you cannot access the websites listed on the NOI and instructions, or if you have any other questions, contact the Stormwater Permitting Section (SWP) at (803) 898-4300 or Coastal Stormwater Permitting Section (CSWP) at (843) 953-0200. Projects located in the S.C. Coastal Zone (SCCZ – Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper counties) are reviewed by CSWP. Please see the Bureau of Water, Stormwater Permitting website (BOW-SPWS): <http://www.scdhec.gov/environment/water/swater/> for guidance and additional information regarding the CGP.

Who Must File a NOI:

- If S.C. Department of Transportation (SCDOT) is the Primary Permittee (Owner/ Operator), this NOI form (Form 2617) should not be used.
- The Owner/ Operator of a single project or larger common plan for development or sale (LCP—see item IV.G of instructions) that will ultimately disturb 1 acre or more (all counties).
- In the SCCZ, the Owner/Operator of a single project or LCP that is located within ½ mile of a coastal receiving water (CRW) (See item V.A of the instructions) and will ultimately disturb more than 0.5 acres.
- See the BOW-SPWS for “Less Than 1-Acre of Land Disturbance - Non-Coastal Counties” and “Less Than 1-Acre of Land Disturbance - Coastal Counties”.

Where to File:

See the BOW-SPWS for a current list of the areas that are reviewed by Municipal Separate Storm Sewer System (MS4) operators and entities that have delegated review authority. For projects in these areas, the initial submittal should be made to the MS4 operator; if initial submittal is made to DHEC for projects in these areas, the review process may be delayed. Please contact the appropriate entity for additional information and requirements; for example, the MS4 operator may require that a different application form be submitted. If a project crosses jurisdictional boundaries (e.g., sewer line in Greenville County and the city of Mauldin), then submittals to all appropriate MS4 operators, delegated entities, and DHEC must be coordinated.

Projects Located in the SCCZ	All Other Areas
S.C. DHEC—Bureau of Water Coastal Stormwater Permitting Section 1362 McMillan Ave., Suite 400 Charleston, S.C. 29405	S.C. DHEC—Bureau of Water Stormwater Permitting Section 2600 Bull Street Columbia, SC 29201-1708

Submittal Package for SWP and CSWP:

- When DHEC performs a full technical review, you must include the original, signed NOI form, appropriate fee schedule (A or B) with required fees, one (1) copy of the Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP), and one (1) copy of all other supporting documentation with the initial submittal. For projects in the **non coastal counties** disturbing **greater than or equal to 1 acre and less than or equal to 2 acres**, one (1) copy of the C-SWPPP and one (1) copy of supporting documentation can be submitted with the initial submittal. In the **SCCZ**, applications for Coastal Zone Consistency certification are to be filed with requests for NPDES construction coverage and will then be routed internally to the Office of Ocean and Coastal Resource Management (OCRM) for review. OCRM submittal requirements can be located at: <http://www.scdhec.gov/environment/ocrm/czc.htm>
- When a regulated MS4 or entity implementing Regulation 72-300 performs the technical review, you must include a copy of the MS4 approved NOI form or MS4 approved application, the \$125 NPDES fee, and one (1) copy of the MS4 approval. In the **SCCZ**, applications for Coastal Zone Consistency certification are to be filed with requests for NPDES construction coverage and will then be routed internally to OCRM for review.
- For projects ultimately disturbing more than 1 acres, the checklist must be completed and attached when DHEC reviews your C-SWPPP. In the **SCCZ**, for projects ultimately disturbing more than 0.5 acres and located within ½ mile of a CRW, the checklist must be completed and attached. See BOW-SPWS for the most current version of the checklist. If this project will **NOT** ultimately disturb more than 0.5 acres (Coastal Counties) or more than 1.0 acre (Non-Coastal Counties) AND is not part of an LCP, **your project is automatically covered under this permit and the NPDES coverage fee and review fee are not required.** See the BOW-SPWS for “Less Than 1-Acre of Land Disturbance - Coastal Counties AND “Less Than 1-Acre of Land Disturbance – Non-Coastal Counties.
- For Modification projects where DHEC performs a technical review, see Section I of the instructions and Form B. Complete the applicable sections of the NOI Form. Complete the Form B Checklist. Submit an original, signed NOI form, appropriate fee schedule (C) with required fees, one (1) copy of SWPPP revisions, and one (1) copy of all other supporting documentation, including necessary engineering calculations. **No review clock is required for Modification reviews.**

Authorization to discharge is granted based on the timeframes specified in the table below. For project sites located in the SCCZ, the timeframes provided below do not commence until a Coastal Zone Consistency determination has been issued for the site.

Review Type	Allotted Review Time Frame
Regulated MS4 or entity implementing Regulation 72-300	7 business days of DHEC receipt of a complete NOI and fee payment.
DHEC (when construction site is subject to State C-SWPPP reviews)	20 business days of DHEC receipt of a complete NOI and fee payment.

S. C. Coastal Zone (SCCZ) Requirements:

For projects that are located within ½ mile of a CRW and involve greater than 0.5 acres of land disturbance, a registered engineer, landscape architect, or Tier B surveyor must prepare, amend when necessary, certify, and stamp the C-SWPPP as required and allowed by the qualified individual's respective act and regulations. Regulation 72-307(C)(5)(g) establishes additional requirements for projects located in the **SCCZ**. The additional water quality measures are outlined in Chapter III, Section XIII of the South Carolina Coastal Zone Management Program, as refined available at <http://www.scdhec.gov/environment/ocrm/czmp.htm>

Fee Schedules:

Make sure to answer all applicable questions on the appropriate Fee Schedule. **Complete Fee Schedule A for Non-Coastal projects; Schedule B for Coastal projects. Attach Form A, as required, for Transfer of Ownership. Attach Form B for major modifications to a prior approved project with Fee Schedule C if DHEC reviews your modification.**

Office Mechanics and Filing:

The original NOI form for projects located outside of MS4 areas and supporting documentation will be kept in the Central Office files (hard copy or digitized copy) in accordance with the Retention Schedule.

Date: Enter today's date.

Project/Site Name: The Project/ Site Name should be a unique or distinguishing name (e.g., not Proposed Subdivision).

NOTE: DHEC must be notified in writing if the Project/ Site Name changes.

County: If the project is in multiple counties, list the county in which the majority of the site is located. **If part of the project is in the SCCZ, then list the coastal county in which the majority of the site is located and submit the project to CSWP;** see the "Where to File" section. List the other counties in which the site is located in the C-SWPPP.

Prior Approved NPDES Permit Number (Major Modification or Change of Information Only): Provide the NPDES permit number (SCR number) or File Number previously assigned to the project or LCP.

Expedited Review Program (ERP): For additional information about ERP, see the ERP website <http://www.scdhec.gov/environment/water/swater/expeditedReview.htm>. DHEC will notify the Project Owner/ Operator if the project is selected for review in the ERP. There are additional required fees for participation in this program; these ERP fees should not be submitted until DHEC has notified the Project Owner/ Operator that the project was selected for participation in the ERP. **In the SCCZ, please note that projects impacting Geographic Areas of Particular Concern (GAPCs) and/or wetlands may not eligible for participation. Consult OCRM staff.**

I. **Notice of Intent (NOI) Application Type(s)** (See Section 2.4 of CGP for submission deadlines and notification requirements)

A. **Project (Application) Type** - Select **ALL** applicable application types that best describe your project or application. Section 2 of the Construction General Permit (CGP) may be reviewed for further information on each type of application listed in this section. As an example, if your project is one that is a new startup, then "New Project" should be selected. If your project is a new startup that will be located in Beaufort County, that will also be expedited, then "New Project", "OCRM Project Review", and "Expedited Review Program" should each be selected to describe your application. **To determine if the project design is considered to be above regulatory requirements or Low Impact Development, see the "Expedited Review Standard Operating Procedures" document.** If **none** of the application types listed in this section apply or clearly define the intent of your project, select "Other" and provide specific details that clearly describe the intent of your NOI application.

NOTE: DHEC must be notified in writing within fourteen (14) business days of a new Owner (person, lending institution, government institution, etc.) taking title to or ownership of a prior approved ongoing NPDES construction project/site. A new Property Owner must complete all applicable sections of Form A (Transfer of Ownership) and submit this form to the Department or respective MS4 with the NOI application. Written notification is also required when the Owner or Developer's company name changes for a prior approved construction permit.

NOTE: Major Modifications allowed by the Department are listed in Section 3.1.7 of the CGP. If your project is a major modification, complete Form B, Fee Schedule C, and applicable sections of the NOI per directions identified on Form B. Please note that Section V (Waterbody Information) of the prior approved NOI must be reviewed for changes prior to submitting any modification request to the Department. If changes have occurred, identify as Change of Information on the NOI form and provide the revised information in this section. Attach a detailed Narrative and revised C-SWPPP documents to the major modification request.

A. **MS4 Reviewer and MS4 Operator** - If this project is located inside a Municipal Separate Storm Sewer System (MS4) and must be reviewed and approved by a MS4 entity prior to submission to DHEC, then select "MS4 Project Review" as application type in Item A and provide the names of the entities that will perform the review and the MS4 Operator. Urbanized area boundary maps are available at <http://cfpub.epa.gov/npdes/stormwater/urbanmapresult.cfm?state=SC>. See the following website for information about MS4s: <http://www.scdhec.gov/environment/water/swnsms4.htm>. Note: Some MS4s have increased their review jurisdiction boundaries beyond the original urbanized area map. Please confirm with the appropriate MS4 regarding review jurisdiction.

II. **Primary Permittee Information**

Identify whether the Primary Permittee is a person or a company. If a company, identify if it is a lending institution or government entity. Provide the Employer Identification Number (EIN) as established by the U.S. Internal Revenue Service for the company. **The EIN is commonly referred to as the taxpayer ID. If the company does not have an EIN (e.g., single member LLC, sole proprietorship). DO NOT list a Social Security number**

- A. **Primary Permittee Name** - Provide the complete, legal name of the person or entity (company) that will be the Primary Permittee (Owner/Operator, O/O) for the project. If a person, provide the Title or Position. If a company, provide the complete, legal name of the company. **Do not list the D/B/A (Doing Business As) name.** **NOTE: If S.C. Department of Transportation (SCDOT) is the O/O, this NOI form (Form 2617) should NOT be used.** Provide the complete mailing address of the person/company identified in II.A as the Primary Permittee.
- B. **Contact/ODSA Name** – Complete if different from II. A or O/O is a company. Provide the complete legal name of the person identified as the Contact or Operator of Daily Site Activities (ODSA) for the project. This can be someone other than the person that has signatory authority for the company. Often the Contact person is also referred to as the ODSA. Provide the complete mailing address for the person, other than the permittee, the Department may contact. This address can be different from the mailing address entered for the O/O.
- C. **Property Owner Name** – If different from II.A or B, list the complete, legal name of the current Property Owner(s) of the site. Enter the complete mailing address for the Property Owner. **NPDES coverage will be issued to the Primary Permittee identified in Section II.A, not the Property Owner, unless same entity.** If there are multiple Property Owners, attach additional sheets with all information requested in Section II.C.

III. **Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) Preparer Information**

- A. **C-SWPPP Preparer Name** – Provide the name of the C-SWPPP Preparer for this project.
- B. **Registered Professional** – Identify whether the C-SWPPP Preparer is a Registered South Carolina Professional Engineer, Tier B Surveyor, or Landscape Architect. For projects disturbing more than 2 acres, the C-SWPPP preparer must be one of the listed professionals or federal government employee as described in Title 40, Chapter 22, and as required and allowed by the qualified individual's respective act and regulations. **In the SCCZ, projects that are located within ½ mile of a CRW and that involve greater than 0.5 acres of land disturbance, the C-SWPPP preparer must be one of the listed professionals or federal government employee as described in Title 40, Chapter 22, and as required and allowed by the qualified individual's respective act and regulations.**
- C. **Company/Firm Name** - Provide the complete, legal name of the company and S.C. Certificate of Authorization (S.C. COA number). Enter the complete mailing address. DHEC may contact the C-SWPPP Preparer via email. See the following websites for information about COA requirements for Landscape Architecture firms <http://www.dnr.sc.gov/land/LandscArch/LALicense.html> and Engineering and Surveying firms <http://www.lir.state.sc.us/POL/Engineers/>. Enter N/A for S.C. COA if the firm is not required to have a COA.

IV. **Project/Site Information**

- A. **Type of Construction Activity (ies)** - Select **ALL** activity types that best describe the development proposed for the site. "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 selected. If none describe the development, then select "Other" and list the activity.
- B. **Site Address/Location** - List the site address. If the site address is unknown, list the road name(s) on which the site is located, the nearest intersection, or other detailed description of the site location. List a city/town only if the site is within the city/ town limits. List zip code (if known). Provide the latitude/longitude and tax map numbers. See the following website for assistance in obtaining latitude/ longitude coordinates: http://www.epa.gov/tri/report/siting_tool/index.htm. Latitude (from 32° to 35°) and longitude (-78° to -83°) should be for the center of the site. Minutes (') and seconds (") should be from 0 to 59. Identify the lat/long data source.
- C. **Indian Lands** – Identify if this site is located on Indian lands.
- D. **Proposed Start Date/Completion Date** – Provide proposed project start and completion dates.
- E. **Disturbed Area/Total Area** - Enter the disturbed area for the project and the total area for the site. The disturbed areas must 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. **NOTE: Provide written notification if the actual disturbed area exceeds the disturbed area on the approved NOI.**
- F. **Modification Only: Change to Disturbed Area** – If your modification to a prior approved project will increase or decrease the disturbed area, complete this section and see Section I of the Instructions. Enter the current approved disturbed area and proposed increase (+) or decrease (-) to the disturbed area. If no change, enter 0.0. Enter the new total disturbed area (after change). Round each entry to the nearest tenth of an acre.
- G. **Larger Common Plan for Development or Sale (LCP)** - The plan in LCP is "broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating construction activities may occur on a specific plot." [63 Federal Register No. 128, July 6, Page 6 1998, p. 36491] For example, if master calculations have been prepared and/ or submitted for an entire site, then all phases and parcels at that site would be considered part of an LCP. If the site is part of a subdivision, industrial park, commercial park, etc., then it is considered to be part of an LCP. List a unique, distinguishing LCP/ Overall Development name. This name should not reference a specific phase. This LCP/ Overall Development name should also be listed on all NOIs for future projects that are part of this LCP, including subsequent phases. Check the box if this is the first phase of the LCP. List the previous state permit/ file number and previous NPDES coverage number if applicable. **(DO NOT enter SCR100000).** **If not known, contact the Department for assistance.**

- H. **Flooding Problems** – Identify whether flooding problems exist on the site, or downstream or adjacent to the site. If yes, provide detailed explanation of the extent and impact in your C-SWPPP. **NOTE:** All C-SWPPP applications must include a Floodway Map/FEMA Flood Insurance Map (See Checklist) with an outline of the project boundary on the map. **NOTE:** The Department does not regulate the placement of fill in floodplains. Contact local city or county official.
- I. **Active S. C. DHEC Warning Notice/Notice to Comply/Notice of Violation** – Select yes if DHEC has issued a Warning Notice, Notice to Comply, or Notice of Violation for the site or any site within the LCP. Provide additional information about the Notice (e.g., Order number) and a copy of correspondence with DHEC regarding the Notice in your C-SWPPP.
- J. **State and Federal Environmental Permits or Approvals** – List relevant state and federal permits applied for. See §122.21(f) of S.C. Regulation 61-9 <http://www.scdhec.gov/environment/water/regs/r61-9.pdf> for a list of permits, approvals, and programs that should be considered. If inaccurate, NPDES coverage may be invalid.
- K. **Waiver(s)** - Identify any waivers requested for your project or construction site. Provide details and required justifications in the C-SWPPP.

V. Waterbody Information

A. Receiving Waterbody(s) (RWB) Information

1. The **Nearest** receiving waterbody (RWB) is the nearest Waters of the State (WoS). See definition in §122.2 of S.C. Regulation 61-9 - <http://www.scdhec.gov/environment/water/regs/r61-9.pdf> to which the site's stormwater discharges will drain. The nearest RWB must be listed in reference to a named waterbody, if the RWB is unnamed. For example, if the site's stormwater discharges drain to a stream on the site, then the nearest RWB would be the stream. If the stream is not named, then determine the nearest named waterbody (e.g., Grove Creek) into which the stream will flow and list the nearest RWB as a tributary to the named waterbody (e.g., Tributary to Grove Creek). Then, the **Next Nearest** named RWB would be Grove Creek. If the site's stormwater discharges drain to multiple waterbodies, then list all such waterbodies; attach additional sheets, if necessary.
2. Provide the **distance**, in feet to each receiving waterbody.
3. Provide the **classification** for each named waterbody. See S.C. Regulation 61-69 (<http://www.scdhec.gov/environment/water/regs/r61-69.pdf>) for a list of classifications of waterbodies within S.C. If the nearest RWB is unnamed, then search the document for the nearest named RWB. If the nearest, named RWB is not listed, then continue searching the document for the next, named waterbody, proceeding downstream from the site. For example, a site in Anderson County drains to a tributary of Hornbuckle Creek, then to Hornbuckle Creek, then to Middle Branch, and then to Brushy Creek/ Big Brushy Creek. First, search the document for Hornbuckle Creek, then Middle Branch, then Brushy Creek. Because there are 3 listings for Brushy Creek, the next, named waterbody (Saluda River) must be determined. Note that the county for this record for Brushy Creek is listed as Pickens because the headwaters of Brushy Creek are in Pickens County. The classification of the tributary to Hornbuckle Creek is "FW—Freshwaters".
4. **SCCZ Only:** Provide the **Coastal Receiving Water (CRW)** to which the site's stormwater discharges will drain. This distance is used to determine permitting requirements. Coastal Receiving Water is defined as a receiving water body as defined in the [Policies and Procedures of the South Carolina Coastal Zone Management Program, updated July 1995](#). This includes all regularly tidally influenced salt and fresh water marsh areas, all lakes or ponds which are used primarily for public recreation or a public drinking water supply, and other water bodies within the coastal zone, excluding wetlands, swamps, ditches and stormwater management ponds which are not contiguous via an outfall or similar structure with a tidal water body.
5. Provide the distance, in feet to the CRW. **Classification of RWB is not applicable for CRW.**

B. Waters of the U. S. /State Information (See Section 2.6.2 thru 2.6.6 of the CGP)

1. Complete the "On the Site?" column for items a-d. 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. Jurisdictional wetlands are under ACOE jurisdiction.
2. **Delineation** means identification by U.S. Army Corps of Engineers (USACOE) or wetlands consultant. Also, see the checklist for information about delineation requirements. 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. **For Direct Critical Area in the SCCZ, delineation means identification by OCRM or wetlands consultant. OCRM staff may require identification of Direct Critical Area by OCRM staff as part of its Coastal Zone Consistency review.**
3. **Impacts** - If construction activities will occur in and/ or will impact WoS, then select yes for "Impacts?"
4. **Amount of Impacts** - 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 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 C-SWPPP. See Sections 2.6**
6. **If yes for impacts in B.3, describe each impact and activity, and list all permits** (e.g., U.S. Army Corps of Engineers (USACOE) Nationwide Permit, DHEC General Permit) and certifications that have been applied for or obtained for each impact. 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. Include all plats referenced in the permits or correspondence.

C. S. C. Navigable Waters (SCNW) Information

1. **Are SCNW on the site?** See <http://www.scdhec.gov/environment/water/navwater.htm> for the definition of SCNW and other information related to SCNW. Or, contact S.C. DHEC Water Quality Certification, Standards & Wetlands Programs Section at (803) 898-4300 for assistance determining the navigability of the waters on your site or with questions related to SCNW. **If yes to C.1**, list the **name of the SCNW**. If the SCNW is not named, then provide a description that references the nearest, named waterbody (e.g., tributary to Grove Creek). **If no to C.1**, do not complete questions C.2 thru C.3 of this section.
2. If yes to C.1 and construction activities proposed by your project will cross over or occur in, under, or thru the SCNW, describe SCNW activities (e.g., road crossing, sub-aqueous utility line, temporary or permanent structures, etc.). This includes temporary and permanent crossings with roads, utility lines, etc.
3. Identify permits providing SCNW Activity(ies) coverages for your site.
 - a. Identify proposed activities covered under a DHEC General Permit or other DHEC permit. Identify permit number(s) and corresponding activities covered under each. See the following website for a list of DHEC General Permits for activities in some SCNW: <http://www.scdhec.gov/environment/water/docs/gp/gp.xls>. See the "Notes" column to determine what types of activities are covered under each permit.
 - b. Identify **USACOE 404 Permit or 401 Certification** issued for the site. Identify permit number(s) or certification(s) and corresponding activities covered under each.
 - c. If applicable, identify the date the **SCNW permit** was applied for. Identify whether the permit applied for will cover ALL activities listed in C.2 of some activities listed in C.2. List covered activities.
 - d. If a **SCNW permit** has NOT already been applied for or issued for all of the activities in SCNW for this site, then those activities and conditions can be addressed during the review of the C-SWPPP, and a separate State Navigable Waters permit is not required. **Provide an additional plan sheet with plan and profile views (drawn to scale) of SCNW and associated activities; include activities description on the plan sheet.**

D. Impaired Waterbodies Information (Section 3.2.12)

NOTE: The TMDL, 303(d), and Non-Point Source water quality tool is a mapping system showing detailed information on WQMS locations, water quality status, and much more. The tool is available at the following website along with instructions for using the tool: <http://www.scdhec.gov/environment/water/tmdl/>.

In the SCCZ, list the nearest upstream and downstream DHEC WQMS(s) and corresponding waterbody(ies). Additionally, shellfish stations only monitor for Fecal coliform bacteria. Include both the nearest shellfish monitoring station(s) and full WQMS(s) on the NOI for both upstream and downstream locations when shellfish monitoring stations are present. If a shellfish monitoring site is not present then you only need to list the full WQMS(s). When a shellfish monitoring station is present, everything but Fecal coliform bacteria needs to be assessed at the full WQMS(s). Shellfish monitoring stations begin with numbers and full WQMS(s) begin with letters.

1. 303(d) Listed Impaired Waterbodies

- a. List the **nearest SCDHEC Water Quality Monitoring Station(s)** to which the site's construction stormwater discharges will drain and its **corresponding waterbody**. See the following website for the most current 303(d) List for Impaired Waters and related information: <http://www.scdhec.gov/environment/water/tmdl/>. **NOTE: DHEC has determined that construction SW discharges are expected to contain pollutants causing the following impairments: TURBIDITY, BIO (Macroinvertebrate), TP (Total Phosphorus), TN (Total Nitrogen), Chlorophyll-a, and FC (Fecal coliform) in Shellfish Harvesting Waters in the SCCZ.** Carefully evaluate whether the site's construction 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.
- b. Identify whether this **WQMS is listed on the most current 303(d) List**. The 303(d) list is available in Microsoft Excel and Adobe Reader formats. WQMS locations are available for each watershed at the website provided in 1.a as well using the **TMDL, 303(d), and Non-Point Source water quality tool**. To search the 303(d) list to determine whether a WQMS is listed, select "Edit" from the top toolbar of your web browser. 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" and proceed to item V.D.2 (TMDL Impaired Waterbodies). If any of the WQMS(s) are found, then select "Yes" and proceed to item c.**
- c. **If yes for b**, list the impairment(s) or pollutants identified as cause(s) of the impairment (see last column labeled "CAUSE") for the WQMS(s) and proceed to item d.
- d. Identify whether the site's stormwater discharges contain any pollutants causing the impairment(s). **If no for d, proceed to item V.D.2 (TMDL Impaired Waterbodies).** **If yes to d and the receiving water is listed on the most current 303(d) List of Impaired Waters** for a sediment or a sediment-related parameter, BIO (macroinvertebrate), turbidity, Total Phosphorous, Total Nitrogen, Chlorophyll-a, or Fecal coliform in Shellfish Harvesting Waters in the SCCZ. You must carefully evaluate all selected BMPs and their performance to ensure that the construction site's Stormwater discharges will not contribute to or cause a violation of water quality standards. **If yes for d and the disturbed area is less than 25 acres**, include an evaluation of the Best Management Practices (BMPs) proposed for the site as described in Section 3.2.12.B(l) of the CGP in the C-SWPPP. **If yes for d and the disturbed area is greater than or equal to 25 acres**, then provide a written qualitative and quantitative assessment of the BMPs proposed in the C-SWPPP for the site as

described in section 3.2.12.B(II) of the CGP. For more information on this subject, please see the DHEC publication entitled "Antidegradation for Activities Contributing to NonPoint Source Pollution to Impaired Waters." This publication can be downloaded at the following DHEC WEB site www.scdhec.gov/eqc/water/pubs/antidegnps.pdf.

- e. **If yes to d, list the "USE" support impairment (AL, FISH, REC, SHELLFISH) affected by the pollutant or impairment listed in item c.**
- f. **If yes for d, will use of the BMPs proposed for your project ensure the stormwater discharges leaving the site will NOT contribute to or cause further water quality standard violations for the impairment(s) listed in c? NOTE: If your answer to item f is NO, this site is NOT eligible for coverage under the CGP. You may contact the Department to determine if an individual permit application is necessary or you may revise your project to include appropriate Best Management Practices, controls, and procedures to bring your discharge into compliance**

2. TMDL Impaired Waterbodies

- a. List the **nearest SCDHEC water quality monitoring station(s)** to which the site's construction stormwater discharges will drain. List WQMS identified in part V.D.1.a of this table.
- b. Identify whether a TMDL is listed for this WQMS. NOTE: See the following website for a list of all WQMS with Approved S.C. Total Maximum Daily Loads (TMDLs): <http://www.scdhec.gov/environment/water/tmdl/>. Select "Approved SC TMDLS", then select "[Sites Covered Under an Approved TMDL and Corresponding WQ Attainment Status](#)". Select "Edit" from the top toolbar. Then, select "Find". Enter the WQMS exactly as listed and hit enter.
If a WQMS is NOT found, then select "No," Stop and proceed to Section VI. If a WQMS is found, then select "Yes" and proceed to item c.
- c. **If yes for b, identify and list the impairment(s) or pollutants listed as CAUSE(S) of the impairment (see 7th column labeled "CAUSE") and proceed to item d. If the WQMS(s) is impaired for more than one parameter, then the WQMS will be listed multiple times on successive rows.**
- d. **If yes for b, identify whether the standard has been ATTAINED for the impairment(s). NOTE: 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 no for d (the standard has NOT been attained (NOT SUPPORTED) for all impairments for all WQMS(s)), proceed to item e. If yes for d (the standard has been attained for all impairments for all WQMS(s)), proceed to Section VI.**
- e. Identify whether the site's stormwater discharges contain any pollutants causing the impairment(s). **If no for e, proceed to Section VI. If yes for e, proceed to f.**
- f. If yes for e, **are your discharges consistent with the assumptions and requirements of the TMDL(s)? NOTE: If your answer to item f is NO, this site is NOT eligible for coverage under the CGP. You may contact the Department to confirm that adherence to a C-SWPPP that meets the requirements of the CGP will be consistent with the TMDL. Where a TMDL has not specified a WLA applicable to construction stormwater discharges, but has not specifically excluded these discharges, adherence to a C-SWPPP that meets the requirements of the CGP will generally be assumed to be consistent with the approved TMDL. If the TMDL specifically precludes such discharges, the site is not eligible for coverage under the CGP.**

VI. Signatures and Certifications **DO NOT SIGN IN BLACK INK!** The NOI must have original signatures unless the application being submitted to DHEC is one approved by an MS4.

C-SWPPP Preparer - The same registered professional must sign and seal the NOI form, C-SWPPP, calculations, and supporting documentation.

Primary Permittee - If the Primary Permittee or Project Owner/ Operator is a company, print the name of the person who is signing the NOI for the Owner/ Operator. A person with signatory authority for the Owner/ Operator must sign the application. The C-SWPPP Preparer cannot sign the application for the Owner/ Operator. The C-SWPPP, all reports, including monthly reports, and any information requested by DHEC must be prepared under the direction or supervision of a person with signatory authority for the Owner/ Operator or a duly authorized representative.

See below for a summary and §122.22 of S.C. Reg. 61-9 (Appendix C of the CGP) for complete information about signatory authority requirements.

- 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.



DRAFT

**APPENDIX B
REVIEW CHECKLIST**



Charleston County Checklist for Design of New and Redevelopment Project

This checklist will be used by Charleston County Plan Reviewers or others employed by the Director, in reviewing proposed construction activities. This checklist shows the components that must be provided by the applicant per the project types.

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

Application Types: ALL

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

II. TECHNICAL REPORT/ENGINEERING CALCULATIONS

1. REPORT COMPOSITION:

Application Types: II and III

- Table of Contents included.
- Report should be put together in a manner that facilitates review.
- Report prepared by licensed professional.
- Two copies to be submitted.

2. MAP(S):

Application Types: ALL

- 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.
- Soil types.
- 100-year FEMA floodplain contours.
- Wetlands.
- Simple sketches will suffice for SFR, Utility, and Type I applications.

3. PROJECT NARRATIVE:

Application Types: ALL

- 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 (Types II and III) projects.
- Simple narratives will suffice for SFR, Utility, and Type I applications.



4. HYDROLOGIC ANALYSIS:

Application Types: II and III

- 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 two (2), ten (10), twenty-five (25), fifty (50), and one hundred (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 corresponds to the delineation. Hydrograph calculations should be provided as needed.
- Analysis performed using SCS methodology (Rational method not acceptable for Types II and III applications) or other if acceptable to Public Works.
- Use rainfall data from Chapter 3.

5. DETENTION ANALYSIS/DESIGN:

Application Types: II and III

Analysis

- Pond routing using a volume based hydrograph for the two (2), ten (10), twenty-five (25), fifty (50), and one hundred (100) 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), ten (10), twenty-five (25), fifty (50), and one hundred (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.

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 1/4 inch).
- Maximum WSE for the design storm event below the embankment with one (1) foot of freeboard.
- The volume within any structure used for water quantity control shall be drained from the structure within seventy-two (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:

Application Types: II and III

- 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:

Application Types: II and III

- Permanent water quality addressed (all projects or larger common plans that disturb five [5] or more acres)
- Wet ponds designed to catch the first one half (1/2) inch of runoff from the entire area draining to the pond and release it over at least a 24-hour period.
- Dry ponds designed to catch the first one (1) inch of runoff from the entire area draining to the pond and release it over at least a 24-hour period.
- For areas not draining to a pond, show how permanent water quality requirements were addressed.
- Waters of the U.S./State not 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).

Note: Other non-traditional stormwater controls such as Bioretention areas, constructed wetlands, etc., may be used.

Note: 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 (e.g., bacteria, hydrocarbons, etc.).

8. INLET PROTECTION:

Application Types: II and III

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

9. DISCHARGE POINTS:

Application Types: II and III

- The post-development discharge rates should be less than pre-development discharges for each discharge point for the two (2), ten (10), and twenty-five (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.
- Provided a twenty (20) foot minimum buffer between the property line and the end of all pipes or energy dissipation measures are installed, where applicable.
- Outlets do not discharge on fill slopes.
- Discharge pipes greater than twenty-four (24) inch 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:

Application Types: II and III

- 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).

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 ten (10) foot buffer is recommended for construction and maintenance.

11. UTILITY/LINEAR LINES:

Application Types: II, III, and Utility

- 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:

Application Types: II and III

- 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 eighty (80) percent for suspended solids or 0.5 ML/L peak settleable solids concentration, which ever is less. The efficiency shall be calculated for disturbed conditions for the ten (10) year twenty-four (24) hour design event.
- Sediment basins provide storage for the ten (10) year, twenty-four (24) hour storm event for disturbed conditions if ten (10) acres or more drain to a common point (stream, lake, property line, etc.).
- Sediment traps only used for drainage areas of less than five (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.
- Clear cutting (including tree stump removal) is limited to ten (10) acres.
- 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 ten (10) year, twenty-four (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: Application Types: ALL

- Delineation of all Waters of the State (WoS) located on the site, including wetlands, shown and labeled on plans.
- 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 fifty (50) foot undisturbed buffer cannot be maintained between the disturbed area and the WoS.
- Minimum ten (10) foot 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 NOI.

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, County permit coverage cannot be granted until all applicable state and federal permits have been obtained.

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

14. SPECIAL PROTECTION AREAS: Application Types: II and III

- 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 2006 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 2006 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: Application Types: II and III

- 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:



- 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 Public Works Director 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:

Application Types: ALL

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

17. DETENTION WAIVER:

Application Types: II and III

- If the 2- and 10-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

Application Types: II and III

- One (1) complete sets of plans and one (1) complete set of engineering calculations. One (1) complete set should come to Public Works Director.
- One (1) additional set of plans and calculations. Ask for one additional set (two [2] for municipalities) once review is complete.

1. GENERAL ITEMS:

- Prefer 24" x 36" sheets.
- Engineer stamp and signature on every sheet.
- Engineering firm's Certificate of Authorization seal on grading plan.
- Correct scale and north arrow.
- Existing and proposed contours are to be tied to a known datum, no **assumed** elevations (one (1) foot 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

- Prefer 24" x 36" sheets.
- Provide drainage area map for existing and proposed conditions, outlining delineated sub-basins, sub-basin characteristics (watershed identifier, curve number, area length, slope), and the areas draining to all BMPs on site. Off-site drainage areas should be included.
- Labeling should be consistent with the technical report.

Conveyance Profiles

- Indicate high and low points for the site.
- Catch basin locations should be outside intersection curve radii, uphill of intersection.
- Easements for storm drainage.
- Twenty (20) foot wide maintenance shelf around entire pond for Charleston County maintenance.
- Access road to pond, dedicated with pond.
- Discharge pipes greater than twenty-four (24) inch require headwall with wing walls.
- 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.
- Fifteen (15) inch minimum pipe size (no decreases in pipe size in the downstream direction).
- 0.1% minimum pipe slope.
- 20% maximum pipe slope.
- Minimum fall across boxes of 0.1-feet.
- Crown elevation of inlet pipes equal or greater than crown elevation of outlet pipe.
- Pre-cast storm drainage structures with knock out panels can be no greater than six (6) feet in depth. Pre-cast pipe openings preferred. Knockout panel box not used in depths which exceed six (6) feet deep. Deeper boxes shall be hand-built or use approved pre-cast. Steps required for boxes greater than four (4) feet deep. Minimum inside box measurements are 3'x3'.
- 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



- Curb (rolled, barrier, expulsion).
- Typical road cross section(s).
- 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 Charleston County requirements.



APPENDIX C

OPERATING PERMITS AND CERTIFICATION



CHARLESTON COUNTY GOVERNMENT, SOUTH CAROLINA

**Department of Public Works
Stormwater Division**

COVENANTS FOR PERMANENT MAINTENANCE OF STORMWATER FACILITIES

THIS MAINTENANCE COVENANT AND ACCESS EASEMENT ("Covenant Agreement") is made this ____ day of _____, 20____, between _____ ("Property Owner") and the COUNTY OF CHARLESTON, a public body corporate and politic and political subdivision of the State of South Carolina (the "County").

RECITALS

WHEREAS, Property Owner is the owner of certain real property located in the County of Charleston, Charleston County, South Carolina, legally described on Exhibit A attached hereto and commonly known as _____ (the "Property").

WHEREAS, the County has approved the Construction Activity Application submitted by the Property Owner for development, re-development, or other construction activities. This Covenant Agreement applies to all Best Management Practices (BMPs) used by the Property Owner for the control of stormwater, including but not limited to detention and retention ponds. This Covenant Agreement applies to all BMPs as described in the approved construction plans and any other BMPs that may hereafter be constructed on the Property.

WHEREAS, to protect subsequent owners of the Property and owners of neighboring property, the County is requiring that Property Owner enter into this Covenant Agreement as a condition to the County's approval of the Construction Activity Application and approval of the final plat for the Property.

WHEREAS, this Covenant Agreement is intended to protect the value and desirability of the real property described above, and shall inure to the benefit of all citizens of the County of Charleston and their successors and assigns.

COVENANT AGREEMENT

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the County and Property Owner agree as follows:

- A. The above stated recitals are incorporated herein by reference as if fully restated verbatim.
- B. **Definitions.**
The following words and terms when used in this Article shall have the meaning respectively ascribed to them in this Section.



“Best Management Practices (BMPs)” are any structural or non-structural measure including, but not limited to stormwater detention and retention ponds or facility used for the control of stormwater runoff, be it for quantity or quality control. BMPs also include schedules of activities, prohibitions of practices, maintenance procedures, treatment requirements, operating procedures, and other management practices to control site runoff, spillage or leaks, sludge or waste disposal, drainage from raw material storage, or measures that otherwise prevent or reduce the pollutant loading of receiving waters.

“Forebay” is a settling basin, engineered structure, or plunge pool constructed at the incoming discharge points of a stormwater BMP which helps to isolate the sediment deposition in an accessible area.

C. Covenant to Maintain and Repair.

Property Owner shall at all times maintain the BMPs in good working order, condition, and repair, clear of all debris, and in compliance with all applicable federal, state and local laws, rules, regulations, and guidelines (including those adopted from time to time by the County, including but not limited to, the County’s Stormwater Design Standards Manual), and in accordance with the Property Owner Responsibilities set forth in this Covenant Agreement.

D. Property Owner Responsibilities.

- 1) **Regular Inspections:** Inspections shall be performed at least twice a year or more regularly as listed below. In the event of a sale or a transfer of property, the original set of inspection records or a copy of the original inspection records shall be provided to the new property owner. BMP Inspection reports (“BMP Reports”) shall be generated and kept on file for five (5) years. BMP Reports shall be made available to the County of Charleston within seven (7) business days upon written request. If such reports are generated by a third party, the reports shall remain the owner’s (or owners’) responsibility to maintain.
- 2) **Routine Maintenance:** Maintenance activities needed on a routine basis are listed below. All activities listed below shall be performed at the frequency specified below or more frequently as needed.
 - a) **Vegetation Management:** If applicable, grass shall be mowed every two (2) weeks or more frequently as needed during the growing season, February through November.
 - b) **Inlet and Outlet Structures:** Any blockage of inlet and outlet structures shall be removed immediately. Inlet and outlet protection shall be repaired or replaced as needed.
 - c) **Debris and Litter:** Trash and other debris that collects in stormwater detention and retention ponds shall be removed immediately. Trash and other debris that collects in other BMPs shall be removed as recommended by the manufacturer or at a frequency such that the function of the BMP is not adversely affected.
- 3) **Sediment Removal:** BMPs will trap sediments and other material over time and shall be maintained in accordance with the submitted and County-approved post-construction maintenance plan. Removal of the sediment shall occur no less frequently than once per year for manufactured BMPs, or once every five years for stormwater detention and retention ponds, or as specified by the BMP manufacturer, whichever is more frequent. If a Forebay exists, any trash or other debris shall be completely removed as discovered through routine maintenance activities or inspections.



may be foreclosed in accordance with the law, as amended from time to time. If the Property is owned by more than one person (i.e., multiple lot owners), each such owner shall be jointly and severally liable for payment of the amounts provided for under the requirements contained in this Covenant Agreement.

H. Indemnification.

Property Owner agrees to indemnify, defend, and hold harmless the County, its employees, independent contractors and designees harmless from and against any liability, losses, costs, expenses (including reasonable attorneys' fees), claims or suits arising from Property Owner's failure to perform its obligations under this Covenant Agreement or any exercise of the County, its employees, independent contractors or designees of their rights under this Covenant Agreement.

I. Access Easement.

Property Owner hereby grants the County, its employees, independent contractors and designees a nonexclusive easement for ingress and egress over, across and under the Property for the purposes described in this Covenant Agreement and from time to time at the County's sole discretion to inspect, sample, and monitor components of the BMPs and discharges there from.

PROPERTY OWNER, FOR ITSELF AND ITS SUCCESSORS AND ASSIGNS (INCLUDING ALL OWNERS OF LOTS IN THE PROPERTY), AGREES THAT THE COUNTY, ITS EMPLOYEES, INDEPENDENT CONTRACTORS AND/OR DESIGNEES SHALL NOT HAVE ANY OBLIGATION TO EXERCISE THEIR RIGHTS UNDER THIS COVENANT AGREEMENT OR TO PERFORM ANY MAINTENANCE OR REPAIR OF THE BMPS, AND THAT THE COUNTY, ITS EMPLOYEES, INDEPENDENT CONTRACTORS AND/OR DESIGNEES SHALL NOT HAVE ANY LIABILITY TO PROPERTY OWNER OR ANY OF PROPERTY OWNER'S SUCCESSORS OR ASSIGNS (INCLUDING OWNERS OF LOTS IN THE PROPERTY) IN CONNECTION WITH THE EXERCISE OR NONEXERCISE OF SUCH RIGHTS, THE MAINTENANCE OR REPAIR OF THE BMPS, OR THE FAILURE TO PERFORM THE SAME.

J. This Covenant Agreement Runs with the Land.

The parties' rights and obligations contained herein shall run with the land and inure to the benefit of, and shall be binding upon, the County and Property Owner and their respective successors and assigns including, without limitation, subsequent owners of the Property and any homeowner's association owning common areas on the Property.

K. Assignment.

The obligations of the Property Owner (and subsequent owners of the Property) under this Covenant Agreement shall not be assigned except (a) in connection with the sale of the property owned by such person (in which case the transferee shall assume such obligations), or (b) with the prior written consent of the County.

L. Authority.

By executing this Covenant Agreement, the Property Owner represents and warrants to the County that he or she has the full power and authority to do so and that the Property Owner has full right and authority to enter into this Covenant Agreement and perform its obligations under this Covenant Agreement.



M. Entire Covenant Agreement.

This Covenant Agreement constitutes the entire Covenant Agreement between the parties, and supersedes all prior discussion, negotiations, and all agreements whatsoever whether oral or written.

N. Governing Laws.

The laws of South Carolina shall govern this Covenant Agreement. Any and all litigation arising under or as a result of said Covenant Agreement shall be litigated in the Circuit Court in the Ninth Judicial Circuit of Charleston County, South Carolina.

O. Severance.

Should any part of this Covenant Agreement be determined by a court of competent jurisdiction to be invalid, illegal, or against public policy, said offending section shall be void and of no effect and shall not render any other section herein, nor this Covenant Agreement as a whole, invalid. Any terms which, by their nature should survive the suspension, termination or expiration hereof shall be deemed to so survive.



PROPERTY AND BMP DESCRIPTIONS

PARCEL/TMS#: _____

NAME & TYPE OF BMP(S):

LOCATION OF BMP(S):

PROPERTY DEED RECORDED DATE:

TITLE OF SITE PLAN:

(Shall exactly match the title given on application for a land disturbance permit)

PROJECT ENGINEERING FIRM:

PROJECT CONSTRUCTION FIRM:

NUMBER & DATE OF LAND DISTURBANCE PERMIT:

STORMWATER DIVISION APPROVAL OF MAINTENANCE CONVENANTS

Plan Review Engineer or Public Service Department Designee

Date



PROPERTY OWNERS

NAME : _____

ADDRESS: _____

COUNTY: _____ STATE: _____ ZIP CODE: _____

PHONE: _____ FAX: _____

E-MAIL: _____

NAME : _____

ADDRESS: _____

COUNTY: _____ STATE: _____ ZIP CODE: _____

PHONE: _____ FAX: _____

E-MAIL: _____

NAME : _____

ADDRESS: _____

COUNTY: _____ STATE: _____ ZIP CODE: _____

PHONE: _____ FAX: _____

E-MAIL: _____



IN WITNESS WHEREOF, the Property Owner and the County have executed this Covenant Agreement on the date first written above.

PROPERTY OWNER: _____

BY: _____ ITS: _____

Witness: _____ Printed Name _____

Witness: _____ Printed Name _____

STATE OF SOUTH CAROLINA) ss
County of Charleston)

This instrument was acknowledged before me on _____, by
_____ as _____.

Notary Public for South Carolina
My Commission Expires _____

THE COUNTY OF CHARLESTON, SOUTH CAROLINA

BY: _____ ITS: _____

Witness: _____ Printed Name _____

Witness: _____ Printed Name _____

STATE OF SOUTH CAROLINA) ss
County of Charleston)

This instrument was acknowledged before me on _____, by
_____ as _____ of the County of
Charleston.

Notary Public for South Carolina
My Commission Expires _____



FORM A
PRIMARY PERMITTEE TRANSFER OF OWNERSHIP
(New Owner/Operator Notifications)
Under South Carolina
NPDES Construction Stormwater General Permit SCR10000

Section 2.4.3 of the Construction General Permit (CGP) requires that New Owner/Operators of prior approved Ongoing Projects notify the Department in writing within fourteen (14) calendar days of the change in ownership. Lending or other institutions taking operational control of a prior approved construction site (due to foreclosure, bankruptcy, abandonment, etc.) must also contact the Department within fourteen (14) business days of taking title to the property. Transfer of Ownership Notifications and information defining the stabilization and construction activity status of the site must also be provided as defined in Section 2.4.3 of the Construction General Permit (CGP).

A new NOI must be submitted and NPDES coverage granted by the Department prior to any new Owner/Operator performing any construction activities at the site. Transferred sites must also be properly stabilized prior to issuance of new coverage. Sites that are properly stabilized are not required to submit a new NOI immediately and may submit this form as initial notification to the Department. New Owner/Operators must agree to comply or not comply with an existing Comprehensive SWPPP and must initial the appropriate SWPPP Acceptance and Compliance Statement in Section E. *If your site is properly stabilized, and you are simply making a notification, a pdf of this form may be submitted electronically to the Department, or, the original signed document may be mailed as defined in the instructions to this form. To apply for new coverage under this permit, attach a completed copy of this form to the new C-SWPPP and NOI.* **NPDES coverage fee of \$125 is required when the NOI application is submitted for NPDES coverage. No fee is required for Transfer of Ownership Notifications.**

Date: _____ County: _____

A. NOTIFICATION ONLY NPDES COVERAGE

1. Project/Site Name (As Approved by the Department): _____
2. NPDES Coverage No. or State Permit (File Tracking) No: _____
3. Larger Common Plan (LCP) Name: (If Applicable, As Approved by the Department): _____
4. If Applicable: MS4 Reviewer: _____ MS4 Operator: _____

B. Current Primary Permittee (Owner/Operator) Information

1. Current Primary Permittee (Owner/Operator) Name: _____
 Company Name (As Applicable): _____ EIN: ____ - _____
 Mailing Address: _____ Email Address: _____
2. Property Owner Name: _____
 Company Name (As Applicable): _____ EIN: ____ - _____
 Mailing Address: _____ Email Address: _____

C. New Primary Permittee (Owner/Operator) Information

<input type="checkbox"/> Person <input type="checkbox"/> Company	If a Company, are you a <input type="checkbox"/> Lending Institution or <input type="checkbox"/> Government Entity? Company EIN (If applicable): EIN: ____ - _____
--	---

1. **Primary Permittee Name:** _____
 Mailing Address: _____ City: _____ State: _____ Zip: _____
 Phone: _____ Fax: _____ Email Address: _____
2. **Contact /ODSA Name (If different from above OR if owner is a company):** _____
 Mailing Address: _____ City: _____ State: _____ Zip: _____
 Phone: _____ Fax: _____ Email Address: _____

D. Transfer of Ownership Information

1. Title Date or Effective Date of Transfer of Ownership to New Owner: _____
2. **Lending/ Government Institution/Other Entity Only (Select the appropriate option of intent below):**
 Purchasing this project/site WITH THE INTENT FOR RESALE ONLY (without operational control of site development)
 Purchasing this project/site WITH THE INTENT OF CONTINUING CONSTRUCTION ACTIVITIES (for site development)
 (Provide a summary of planned proceedings below. Attach additional sheets if necessary).

3. Any Active Warning or Compliance Notice issued by the Department for the current approved project or site? Yes No
If yes, Date Issued: _____
4. Select As applicable: Entire Permit or Site being transferred to the New Owner/Operator, or
 A Portion of the Entire Permit or Site being transferred to the New Owner/Operator?
5. Complete both tables A and B below for each site or portion of the site being transferred.

Table A: Site Transfer Information & Status (Attach additional sheets as necessary)

a. Site Name(s) or Portion of Site Being Transferred Name	b. Total Number of Acres Being Transferred (Nearest tenth of an acre)	c. Current Total Number of Disturbed Acres (Nearest tenth of an acre)	d. Identify if Site(s) or Lot(s) are Currently Abandoned or Subject to Pending Foreclosure or Bankruptcy Proceedings?
			<input type="checkbox"/> Abandoned <input type="checkbox"/> Foreclosure <input type="checkbox"/> Bankruptcy <input type="checkbox"/> N/A
	Total: _____	Total: _____	<input type="checkbox"/> Abandoned <input type="checkbox"/> Foreclosure <input type="checkbox"/> Bankruptcy <input type="checkbox"/> N/A

Table B: Project/Site Stabilization & Construction Activity Status

If the site under the control of the new Owner is inactive and all areas disturbed have not *reached stabilization*, the new Owner must obtain permit coverage and provide stabilization as defined in this permit.

a. Site Name(s) or Portion of Site Being Transferred Name	b. Is your Site(s) Currently: Active or Inactive or Under Delayed Recommencement of Construction Activities?	c. If Inactive or Under Delayed Recommencement of Construction Activities	
		Is the Transferred Site or Transferred Portion Currently Stabilized? (If No, provide stabilization completion date below)	Identify Proposed Date for Recommencement of Construction Activities?
	<input type="checkbox"/> Active <input type="checkbox"/> Inactive <input type="checkbox"/> Under Delayed Recommencement	<input type="checkbox"/> Yes <input type="checkbox"/> No If No, date for completion: _____	
	<input type="checkbox"/> Active <input type="checkbox"/> Inactive <input type="checkbox"/> Under Delayed Recommencement	<input type="checkbox"/> Yes <input type="checkbox"/> No If No, date for completion: _____	

E. Signatures & Certifications (Read the Certification statements below (in entirety). Initial the applicable C-SWPPP Compliance Statement below. Sign and date the certification agreement. Initial the applicable C-SWPPP Compliance Certification Statement. **DO NOT SIGN IN BLACK INK!**

Current Owner/Operator Certification

If the signature of the current Owner/Operator cannot be obtained, please check this box: Provide explanation in the project Narrative.

"As the Current Owner/Operator for this project, I hereby certify that the site or portion of the site described above is covered under the Construction General Permit which has now transferred ownership/responsibility as indicated above. The new owner or operator, has been made aware of the importance of site stabilization in an effort to control pollutant runoff and/or sedimentation. I hereby relinquish the responsibility and ownership of the NPDES Permit or portion of the NPDES permit listed in Section A. I realize that sediment and erosion control compliance responsibilities for the site or portions of the site listed in Section D now belong solely to the new Owner/Operator

Signature of Current Owner/Operator or Duly Authorized Representative

Date Signed

New Owner/Operator Certifications/Compliance Statement

"As the New Owner/ Operator for this project, I certify that I or, I on behalf of my company and its contractors and agents, as the case may be, am responsible (per this transfer of ownership) for all of the land-disturbing activities, stormwater discharges, and related maintenance thereof for this construction project or construction site.

(Initial the applicable C-SWPPP Compliance statement below)

_____"I agree to comply with the existing Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) and will follow (construct in accordance to) the previous approved C-SWPPP, including Grading & Drainage Provisions and Best Management Practices (BMPs) as identified in the previous NPDES approval."

OR

_____"I will provide a new Notice of Intent (NOI) and new Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) and will follow (construct in accordance to) the new approved C-SWPPP, including Grading & Drainage Provisions, and Best Management Practices (BMPs) as identified in the new C-SWPPP approved by the Department."

"As the New Owner, I also hereby certify that I or I (on behalf of my company and its contractors and agents), as the case may be, am responsible for installing and maintaining the appropriate sediment and erosion control measures to provide continued stabilization for the project or site identified in Section A. I understand that stabilization measures shall be implemented 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) calendar days after work has ceased, except where stabilization by the 14th day is precluded by snow cover or frozen ground. Where construction activity on a portion of the Site is temporarily ceased, and earth-disturbing activities will be resumed within 14 calendar days, temporary stabilization measures do not have to be initiated on that portion of the Site. I further certify that I also understand that SCDHEC is authorized to inspect the transferred site pursuant to regulations and standards identified in the NPDES General Permit for Stormwater Discharges from Construction Activities (CGP). " Having understood the above information, I am signing this agreement as the New Owner of the aforementioned property covered under the NPDES general permit."

Signature of New Owner/Operator or Duly Authorized Representative

Date Signed

Instructions for Completing the Transfer of Ownership form

If you are uncertain whether you need to obtain coverage under the NPDES General Permit for Stormwater Discharges From Construction Activities SCR100000 (CGP), if you cannot access the websites listed in these instructions, or if you have any other questions, contact the Bureau of Water Stormwater Permitting Section (BOW) at (803) 898-4300. Please see the Bureau of Water, Stormwater Permitting website (<http://www.scdhec.gov/stormwater>) for guidance and additional information.

This Transfer of Ownership form must be completed by a new Property Owner taking title to or ownership of a previously approved NPDES construction site as the new Primary Permittee. This form must be submitted to the Department or respective Municipal Separate Storm Sewer System (MS4) as notification of changes in ownership. **If your project is located within a Municipal Separate Storm Sewer System (MS4), you must contact the applicable MS4 to determine their requirements and fees for ownership transfers. NO FEE IS REQUIRED FOR SUBMITTING A TRANSFER OF OWNERSHIP NOTIFICATION TO THE DEPARTMENT. A \$125 NPDES COVERAGE FEE IS REQUIRED WHEN THE NOI IS SUBMITTED FOR NPDES COVERAGE OF A NEW OWNER/OPERATOR AS THE PRIMARY PERMITTEE.**

When Do I Need to Complete This Form?

The CGP requires that the Department receive notification within fourteen (14) calendar days of a new Owner taking title to the property or within 14 business days of a Lending or other type institution taking over operational control of a construction site due to abandonment, foreclosure proceedings, or permittee filing for bankruptcy. **If your project or site is being transferred to a new Owner/Operator as the Primary Permittee, you must complete this form and/or the Notice of Intent as defined in Section 2 of the CGP** to make such notifications. This Transfer of Ownership form also identifies the current construction activity status for the property or site being transferred (i.e., active, inactive, under delayed recommencement of construction activity, temporarily stabilized, permanently stabilized, etc.).

What Are the New Owners Responsibilities?

All new Property Owners and lending and other types of institutions taking ownership of a prior approved NPDES construction site become responsible for stormwater discharges from the property. New Owners must ensure that if construction activities have temporarily or permanently ceased, *all disturbed areas are properly stabilized as soon as practicable and within fourteen (14) calendar days of taking title to a property.* New Owners of sites not properly stabilized may be issued a compliance agreement.

Some institutions, such as lending institutions, taking over a construction site, may do so with only the intent for property resale, therefore may not intend to obtain NPDES coverage as a Primary Permittee with the intent to complete construction activities at a site. In such cases, commencement or recommencement of construction activities may be delayed for longer unplanned periods of time. Institutions taking ownership of such sites must ensure that they are properly stabilized to minimize the potential for erosion. **Each new Owner and subsequent owner must provide notification to the Department or respective MS4 within fourteen (14) calendar days of taking ownership. Each new Owner completing this form becomes responsible for stabilization of the site and stormwater discharges from the site until NPDES coverage is granted to a subsequent Owner/Operator as Primary Permittee for the site.**

Prior to initiating construction activity at the site as the new Owner/Operator, a new Notice of Intent (NOI) and a SWPPP Compliance Agreement or, if applicable, a new or modified SWPPP must be submitted to and approved by the Department. ***The NOI must be submitted at a later date if the site is properly stabilized. If your site is INACTIVE & NOT stabilized or properly stabilized, a complete NOI and this form must be submitted to the Department as defined in the CGP.***

Completing the Form

Complete the entire form. Abbreviate if necessary to stay within the space allowed for each item. Submit a completed form to the applicable SCDHEC office at

<u>Coastal Counties</u>	<u>Non-Coastal Counties</u>
<u>Coastal Stormwater Section</u> 1362 McMillan Avenue Suite 400 Charleston, SC 29405	<u>Stormwater Permitting Section,</u> 2600 Bull Street, Columbia, SC 29201-1708

or the appropriate MS4 or local entity responsible for plan reviews. Provide the date and county and identify if this form is submitted as a Notification ONLY or for new NPDES coverage. If submitted as notification, complete the entire form. Complete sections B, D, and E if submitted with a NOI for NPDES coverage.

Section A –Project/Site Information

Provide the name of the approved project or site, as approved by the Department on the previous approved NOI. Provide the NPDES or State Permit (File Tracking) number. If part of a Larger Common Plan (LCP), identify the LCP name. If this project is in a MS4 area, identify the entity designated as the MS4 Reviewer and Operator (i.e., Lexington County, City of Greer, etc.).

Section B – Current Primary Permittee (Owner/Operator) Information

List the complete legal name of the current Owner/Operator and Property Owner, as applicable. If a company, provide the company name and requested information. Provide complete mail and e-mail information.

Section C – New Primary Permittee (Owner/Operator) Information

List the complete legal name of the new Owner/Operator.

If a person, provide the name. If a company, identify if you are a Lending Institution or Government Entity.

Provide the company name and the Employer Identification Number (EIN) as established by the U.S. Internal Revenue Service. Provide the complete mailing address, telephone number, fax and e-mail address. Provide the Contact (ODSA) information.

Section D – Transfer of Ownership Information

Complete this entire section. Complete all tables and information requested to identify the stabilization status and plans for continued construction activities for the site or portions(s) of the site being transferred. Attach additional sheets as necessary.

Section E – Signatures & Certifications

Read the certification statements (in entirety). Provide your signature and the date and initial the applicable Compliance Statement. **DO NOT SIGN IN BLACK INK.**

If the signature of the current Owner/Operator cannot be obtained, please check the box provided in this section.



APPENDIX D

TABLES OF BMP SUGGESTED 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		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 Storm Water 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 (Acres)	Soils
Wet Storm Water Pond	LOW	LOW	X	X	10 MIN 25 PREFERRED	HSG A SOILS MAY REQUIRE POND LINER
Wet Extended Pond with Aquatic Bench	LOW	LOW	X	X	10 MIN 25 PREFERRED	HSG B SOILS MAY REQUIRE INFILTRATION TESTING
Micropool Extended Pond	MODERATE	LOW	X	X	10 MIN	
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 REQUIRE PRETREATMENT
Sand Filtration Facilities	HIGH	HIGH			5 MAX 2 PREFERRED	
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)		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 Stormwater Pond	X	X	X	HIGH	MODERATE	MODERATE	MODERATE
Wet Extended Pond with Aquatic Bench	X	X	X	HIGH	HIGH	MODERATE	MODERATE
Micropool Extended Pond	X	X	X	HIGH	MODERATE	MODERATE	NO DATA
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

BMP	Monitoring	Pollutant Removal Efficiency %					Other
		TSS	TP	TN	Nitrate Nitrogen		
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 Filter	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 Channel	Yes	30	10	0	0	Bacteria Neg	
Vegetated Drainage Channel	Yes	65	25	15	Neg	Hydrocarbons 65 Metals 20-50 Bacteria Neg	
Vegetated Filter Strip	Yes	70	10	30	0	Metals 40-50	

Should be used as a general guide to expected effectiveness and not for design purposes.



APPENDIX E

SWPPP TEMPLATE AND CHECKLIST



STORMWATER POLLUTION PREVENTION PLAN SWPPP

The stormwater pollution prevention plan (SWPPP) must be kept on site when work being conducted. If there is no one on site, the location of the SWPPP must be made available.

For projects that disturb more than 1 acre the preparer of the SWPPP must be a registered professional engineer, registered landscape architect or a Tier B land surveyor. More information concerning the requirements of the SWPPP can be found in the **NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities (CGP)**. This can be found on the SCDHEC website at: <http://www.scdhec.gov/eqc/water/html/erfmain.html>. Information on preparing a SWPPP can be found on the Environmental Protection Agency's website at: <http://cfpub.epa.gov/npdes/stormwater/swppp.cfm>.

Listed below are the contents of a SWPPP. This is **not** intended to be a comprehensive list. A more inclusive listing of the requirements can be found in the CGP.

SWPPP Components:

1. Copy of the NOI, NPDES Coverage letter, copy of the NPDES Construction General Permit copy of the approved plans and specifications.
2. Identify all potential sources of pollution which may be expected to affect the quality of stormwater discharges.
3. Indicate which areas on site that operators and operators with "day-to-day" control are responsible for.
4. Operators with "day-to-day" control of activities must ensure compliance with the portion of the site they have control over. They must ensure implementation of BMPs and other controls required by the SWPPP. Make sure their activities do not render another party's pollution control ineffective.
5. Copies of all contractor certifications must be kept with the SWPPP.
6. Site Activity Description
 - a. Function of project
 - b. Sequence of major activities
 - c. Estimate of total disturbed area
 - d. Location map
 - e. Direction of stormwater flow
 - f. Slope after major grading
 - g. BMP locations (structural and non structural)
 - h. Locations of off-site materials
 - i. Equipment storage areas
 - j. Location of Waters of the State
 - k. Discharges to local surface waters
7. Controls to Reduce Pollutants



- a. Description of pollution control measures used to control pollutants in stormwater discharges
 - b. Description of all interim and permanent stabilization practices
 - c. Ensure preservation of existing vegetation where feasible
 - d. Discharges to impaired waters including TMDLs. Ensure selected BMPs will not impact or contribute to water quality impairments.
8. Records that must be kept with the SWPPP
- a. Dates of major grading
 - b. Dates of temporary or permanent stopping of work
 - c. Dates of stabilization methods
9. Description of structural practices
10. Description of post construction BMPs that will be installed during construction.

INSPECTIONS

Inspections are required to be conducted either once every 7 days or once every 14 days and within 24 hours of a 0.5 in rain event. Copies of inspection reports along with records of any subsequent maintenance required after an inspection must be kept with the SWPPP.

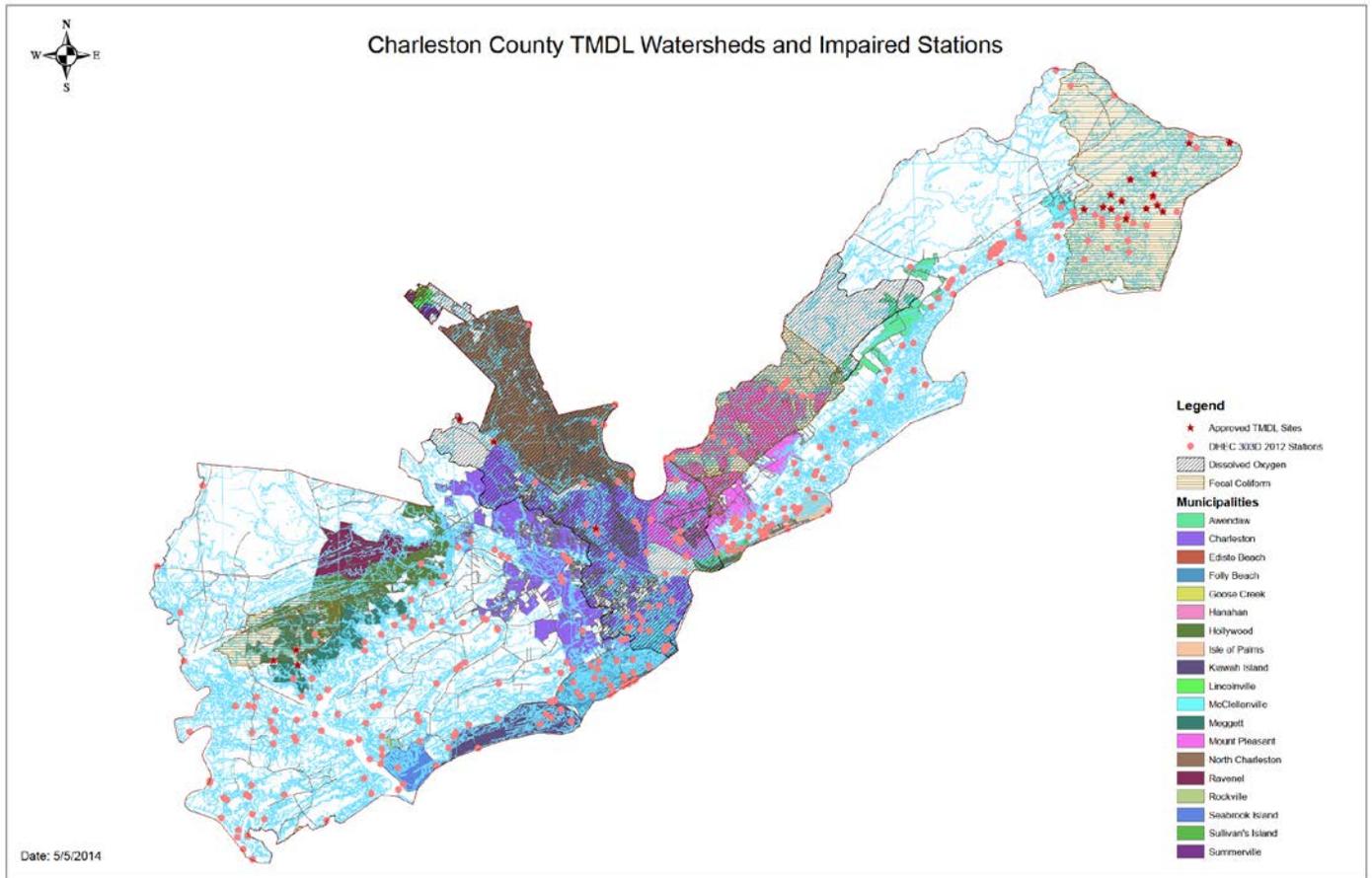
For projects larger than 1 acre inspections must be conducted by the SWPPP preparer, someone under the direct supervision of the SWPPP preparer or by a certified sediment and erosion control inspector.

Monthly reports which include the inspection reports must be mailed directly to SCDHEC and the local MS4.



DRAFT

**APPENDIX F
TMDL AND IMPAIRED WATERS MAP**



Note: This map is current as of May 2014 and subject to change when any new TMDLs or impairments are issued by SCDHEC. For current map, please refer to SCDHEC.



APPENDIX G
CALCULATIONS



- a. Calculate the estimated load for the pollutant(s) of concern. The IDEAL model may be used for all water quality calculations. Contact the Public Works Director for more information on this model. Another, less preferred option is the Schueler 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,
One-half (½) inch for wet ponds, some wetlands,
One (1) inch for all other BMPs,
- P_j** = Fraction of rainfall events over the time interval that produce runoff
P_j = One (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 1.1),
- 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 eighty-five (85) % of the average annual rainfall amount in Charleston County occurs from storm events with a total depth equal to or greater than 1-inch. The one (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 functions, such as in SEDPRO and SEDCAD for eroded particles or common buildup and wash off equations may be used.

- b. Select appropriate BMPs from Tables 3.7 and the BMP Uses tables in Appendix F. The use of an engineered device will 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.
- 4. If the BMP is to capture runoff from one (1) or more acres, design a forebay or vault. Guidance on this aspect can be found in SCDHEC (2005) and ARC (2001).
- 5. Calculate the water quality volume using the following equation.

$$WQV = \frac{Q * DA}{12}$$

Equation 3

Where:

WQV = water quality volume (acre-feet)

Q = runoff depth inches (one-half inch for permanent pool (“wet”) structures, one (1) inch for dry structures)

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 Public Works Director (e.g. credits).

- 6. Compute the inflow hydrograph for the structure for one (1) inch or one-half (1/2) inch, twenty-four (24) hour storm event, as necessary, for the proposed condition. Note – this is the one inch **runoff** event.
- 7. 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).
- 8. Perform routing calculations for the one (1) inch or one-half (1/2) inch, twenty-four (24) hour storm event through the BMP. These may be done by hand, or may be done by using a storage routing computer model.
- 9. Determine if the entire volume from the one (1) inch or one-half (1/2) inch, twenty-four (24) hour storm event was released before the twenty-four (24) hour point. If it does, the outlet is too large. Resize outlet structure.
- 10. Repeat steps 4-8 until entire volume is not released prior to twenty-four (24) hours. This procedure is commonly accomplished using a low-flow orifice.



APPENDIX H

MTD DESIGN STORM SUMMARY



Stormwater Manufactured Treatment Devices (MTDs) – General Information

Stormwater Manufactured Treatment Devices (MTDs) are water quality structures designed to filter out sediment and other pollutants prior to runoff being discharged off-site or to receiving water bodies, and may be incorporated into a series of water quality best management practices. MTD pollutant removal efficiencies are variable and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity and other factors. MTDs are designed to filter and trap trash, sediment, totals suspended solids (TSS), oil and grease, metals, hydrocarbons and other pollutants. MTDs combine settling, filtration, and various biological processes into one controlled system. MTDs are not designed, or are intended to store a volume of water for water quality treatment. When the storage of a water quantity volume is required, additional or separate BMPs must be implemented.

MTD pollutant removal efficiencies are variable and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity and other factors. MTDs are classified in to three Types:

- MTD Type 1 - Separation Devices (Standard Stormwater MTD). Contains a sump for sediment deposition with a series of chambers, baffles or weirs to trap trash, oil, grease and other contaminants.
- MTD Type 2 - Filtration Devices (Impaired Water Bodies, TMDL Requirements). Contains a sedimentation chamber and a filtering chamber. MTD Type 2 contains filter materials or vegetation to remove specific pollutants such as nitrogen, phosphorus, copper, lead, zinc, and bacteria.
- MTD Type 3 - Catch Basin Inserts (Limited Right-of-Way). May contain filter media including polypropylene, porous polymers, treated cellulose, and activated carbon designed to absorb specific pollutants such as oil, grease, hydrocarbons and heavy metals. MTD Type 3 must provide overflow features that do not reduce the original hydraulic capacity of the catch basin.

MTDs are designed to treat, at a minimum, the peak flow rate of the stormwater runoff for the water quality design event (WQE) from the entire drainage area to the MTD. Offsite flows may be directed to and treated by the MTD, or they may bypass the MTD. If offsite flows are directed to the MTD, then the MTD water quality design and overall design must account for these flows.

Use MTDs designed to treat the entire WQE with no by pass for a minimum **80%** Total Suspended Solids (TSS) removal efficiency (ASTM D-3977-97 SSC). The WQE flow rate is a separate flow rate from the Level of Service (LOS) flow rate. In addition to meeting the required treatment efficiency for the WQE, the MTD must be capable of passing the specified LOS flow rate (i.e. 10-year storm event) without causing adverse hydraulic impact to upstream portions of the drainage system and without causing any re-suspension or scour of previously trapped pollutants, or the MTD may be required to be placed off-line. Ensure site constraints (available right of way and available depth) allow the installation of a single MTD for design peak water quality flow rates up to 8 cfs. Additional MTDs may be required for water quality event flow rates greater than 8 cfs.

Ensure tail water conditions are accounted for in the MTD design.

When applicable, use MTDs designed to meet any other additional watershed, TMDL, or site-specific water quality requirements. MTDs may include a high flow bypass mechanism for rainfall events larger than the water quality event to prevent scouring and re-suspension of previously trapped pollutants. MTDs



not providing a high flow bypass mechanism must provide specific lab or field testing results verifying no re-suspension or scour of previously trapped pollutants during the level of service design event for the MTD.

Use MTD Type 1 sized using area scaling with a maximum Hydraulic Loading Rate of **25 gpm/sf (0.0557 cfs/sf)**, and an optimal target Hydraulic Loading Rate of **20 gpm/sf (0.0446 cfs/sf)**. MTDs designed with higher Hydraulic Loading Rates must provide specific lab or field testing results verifying the required removal efficiency for the water quality event at the Hydraulic Loading Rate.

Stormwater MTDs Single Event Design Storm Determination

In order to establish a standardized procedure for the MTD design to meet the 80% TSS removal efficiency criteria, the appropriate water quality event (WQE) design storm must be determined. It is recommended that MTDs be designed to treat, at a minimum, the peak flow rate of the stormwater runoff from the **1.8-inch, 1-year, 24-hour storm event**, from the entire drainage area to the BMP. This is defined as the water quality event (WQE) and the determination of this design storm event is presented in this report.

The single event design storm of six MTDs was determined using IDEAL (Integrated Design, Evaluation and Assessment of Loadings), a water quality software program. The following MTDs were selected, and their total suspended solids (TSS) removal efficiencies, as shown in Table 1, were based on a literature review of manufacturer publications and testing results. Some of these efficiencies were derived from a study conducted in Beaufort, SC. See <http://pubs.usgs.gov/sir/2008/5150> for more information.

Table 1: Literature Review TSS Removal Efficiencies of Engineered Devices

Engineered Device	TSS Removal Efficiency
Crystal Stream Technologies	55%
Vortechs	80%
CDS	78%
Stormceptor	66%
VortCentury	76%
Bay Saver	49%

The MTDs were modeled in IDEAL as a user-defined BMP. The particle size distribution of the contributing soils and the ability of the MTD to trap the different particle classes significantly affect the TSS trapping efficiency. The user-defined BMP in IDEAL calculates the TSS trapping efficiency through the input of the trapping efficiency of the different particle sizes. Figure 1 is a screenshot of the input form of the user-defined BMP. The user can also input the trapping efficiencies of nutrients and bacteria, but since the focus of this study was on TSS, no other inputs were included.



Figure 1: User-Defined BMP Inputs

Trapping Efficiency			
Please enter trapping efficiency percent			
Clay (%)	0	Particulate Nitrogen (%)	0
Silt (%)	48	Dissolved Nitrogen (%)	0
Sand (%)	98	Particulate Phosphorus (%)	0
Small Aggregates (%)	96	Dissolved Phosphorus (%)	0
Large Aggregates (%)	99	Bacteria (%)	0

In order to model the MTDs listed in Table 1, the trapping efficiencies of the particles classes for each MTD were determined from Figure 2. The graph was developed based on a review of New Jersey Corporation for Advanced Technology (NJCATS) and EPA Environmental Technology Verification (ETV) Program testing protocol results for MTDs. This review included test results from many different MTDs and was not created exclusively for the analysis of the six MTDs listed above. NJCATS has developed a process for verification and certification of manufactured stormwater device technologies to evaluate vendor specific performance claims.

The ETV Program also develops test protocols and verifies the performance of innovative technologies. The testing protocol results were typically given in TSS trapping efficiencies, but in some cases, the particle distribution could be determined from the study. Since the exact size of the various particles classes such as clay, silt, small aggregates, sand, and large aggregates were not given in all of the ETV documents, some approximation (ranges) were used to break down TSS into discrete components in order to correlate the TSS trapping efficiency with the individual particle size trapping efficiencies. All of the MTDs included in these studies used an auto sampler to sample inflow and outflow rather than grab samples. Grab samples taken from the entire water flow column have the ability to result in a better representation of the actual eroded particle distribution. Auto samplers typically have the sample inlet located at the bottom of the water column and therefore are not always proficient at collecting suspended particles less than 75 microns (i.e., silt) and are only somewhat proficient at collecting particles between 75 and 125 microns.

Because clay is an extremely small particle (<5 microns) that does not settle easily when suspended in water, MTDs are not capable of capturing these eroded particles. MTDs will, however, capture nearly all of the large particles that are contained in the inflow, and a very high percentage (>90%) of the small aggregates and sand particles. Therefore, it was assumed that the variation in trapping efficiency between MTDs would be based on their ability to capture silt. Using the principles of Stokes' Law and the results of the NJCATS and ETV tests that provided enough information to break down TSS into discrete particle size ranges, the graph in Figure 2 was developed to accurately predict the trapping efficiencies of the individual particle sizes by MTDs, given only the MTD overall TSS trapping efficiency.



In Figure 2, there are various curves (20% - 80%) corresponding to the TSS trapping efficiency of the MTDs. The x-axis represents five particle sizes (Clay, silt, Small Aggregates, Sand, and Large Aggregates) and the y-axis represents trapping efficiency (%) of those particle classes. To use the graph, first determine the TSS trapping efficiency for the MTD and then find the curve corresponding to the published value. Next find the five points along that curve corresponding to the five particles classes on the x-axis. At each point, read the trapping efficiency value off the y-axis. Some interpolation may be necessary.



Figure 2: TSS Graph for Trapping Efficiency for Particle Classes

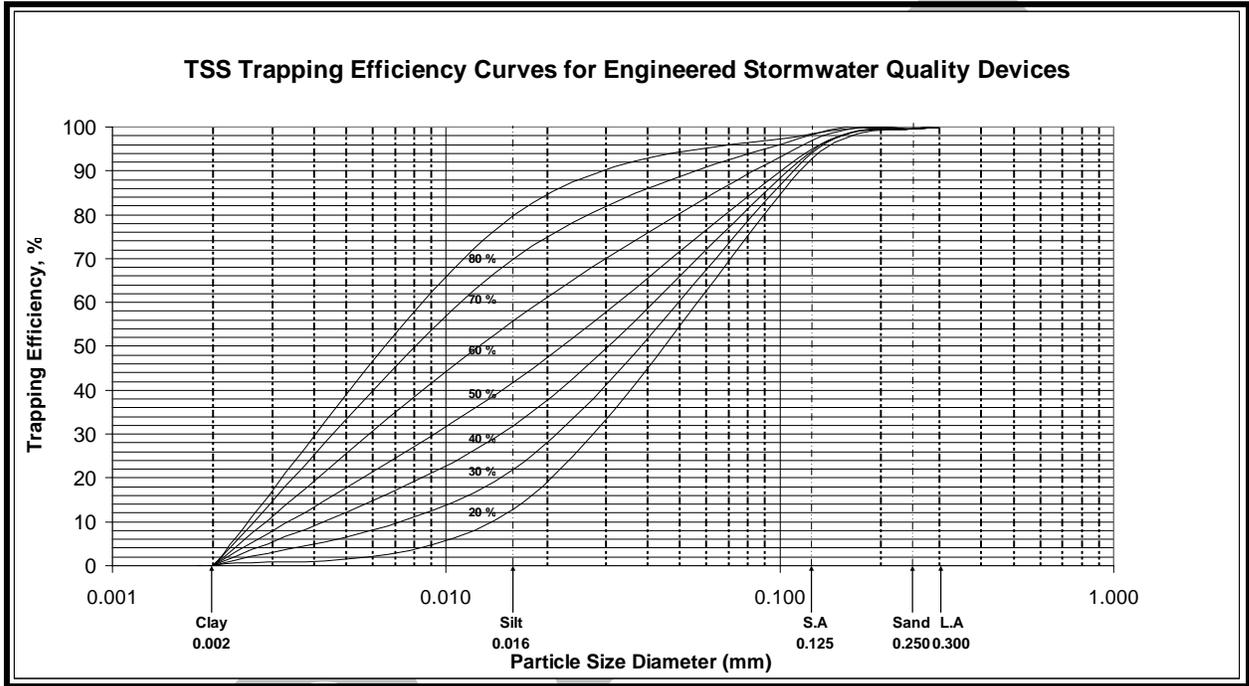


Table 2 shows the breakdown of the particle size trapping efficiencies used as the inputs for the six MTDs.

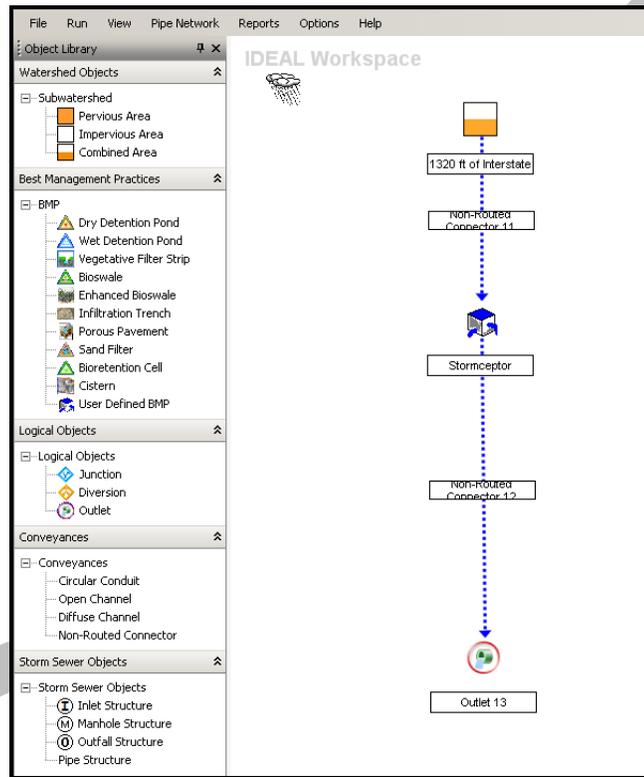
Table 2: Particle Size Trapping Efficiencies of MTDs

Engineered Device	Clay	Silt	Sand	Small Aggregates	Large Aggregates
Crystal Stream	0%	48%	98%	96%	99%
Vortechs	1%	80%	99%	98%	100%
CDS	1%	80%	98%	98%	99%
Stormceptor	0%	64%	98%	97%	99%
VortCentury	1%	78%	98%	98%	99%
Bay Saver	0%	42%	98%	94%	99%

The next input into IDEAL was the subwatershed attributes contributing the runoff that is routed through the MTD. The subwatershed was modeled with characteristics of the Upstate of South Carolina, such as Cecil soils. The total size of the subwatershed varied, but all were modeled as being 95% impervious. The watershed sizes were based on typical SCDOT roadway widths and various roadway lengths ranging from 500 feet to 1 mile. Figure 3 shows the subwatershed draining to a user-defined BMP (MTD) in IDEAL.



Figure 3: IDEAL Screenshot of Subwatershed Draining to a MTD



The models were first run with Greenville’s annual probability distribution of storms. The TSS trapping efficiency of the MTD during the annual simulation was calculated and recorded. A single, 1-year, 24-hour, type II storm, was then found that matched the TSS trapping efficiency attained from the annual probability distribution of storms. Effectively, this determined the single design storm event that represents the expected performance of the MTD on an annual basis. Some of the results are shown in Table 3.

Table 3: Single, 1-year, 24-hour, Type II Design Storms

Engineered Device	Contributing Area (acres); 95% Impervious			
	0.29 ac	0.77 ac	1.53 ac	3.06 ac
Crystal Stream	1.75 inch	1.77 inch	1.76 inch	1.74 inch
Vortechs	1.75 inch	1.76 inch	1.76 inch	1.75 inch
CDS	1.75 inch	1.77 inch	1.76 inch	1.75 inch
Stormceptor	1.75 inch	1.77 inch	1.76 inch	1.75 inch
VortCentury	1.75 inch	1.77 inch	1.76 inch	1.75 inch
Bay Saver	1.75 inch	1.77 inch	1.76 inch	1.75 inch

The annual probability distribution of storms in IDEAL is selected when the user wants to consider annual loadings. Statistical average values for runoff, sediment, and nutrient loadings are calculated based on a site-specific joint probability distribution of precipitation, season, and antecedent moisture condition. This conditional probability distribution is a part of the database in the model and is calculated from (a) rainfall records for the site of interest and includes values for 12 possible rainfall ranges, (b) the probability the given precipitation value will occur in either the growing or dormant seasons (2 possibilities), and (c) the probability that the given precipitation event will occur in either dry, average, or wet antecedent moisture conditions (3 possibilities). IDEAL runs all 72 (12 x 2 x 3) conditions and calculates runoff, loadings, and effectiveness of practices for each. By combining the results for each of the 72 combinations and their



respective probabilities, sediment yield and nutrient yields are calculated at the exit of each subwatershed and at the exit of all BMPs.

The MTD manufacturers must be able to provide data and testing results that show their product can treat the peak flows associated with that single design storm event at the efficiency they claim.

The results indicate that the design storm varies slightly with the size of the contributing drainage area; therefore the design storm is rounded up to 1.8 inches. Although this conclusion was drawn for the Upstate of South Carolina, a 1.8 inch, 1-year, 24-hour storm would be a conservative design storm for the coastal areas where the eroded sediment particle distributions are generally larger in size and therefore have faster settling velocities.

It is recommended that stormwater manufactured treatment devices be designed to treat at a minimum the peak flow rate of the stormwater runoff from the **1.8-inch, 1-year, 24-hour storm event**, from the entire drainage area to the BMP. This is defined as the water quality event. This water quality event is distributed into the rainfall intensities in Table 4. The MTDs must also be designed to carry the peak flow rates for the level of service event of the stormwater drainage system discharging to the MTD, or this flow must be bypassed around the MTD.

Table 4: Water Quality Event (WQE) Design Intensities

Frequency	a	b	c	i ¹ (t _c = 5 min) (in/hr)	i ¹ (t _c = 10 min) (in/hr)	i ¹ (t _c = 15 min) (in/hr)	i ¹ (t _c = 30 min) (in/hr)
Water Quality Event	135.65	40.2	1.0863	2.16	1.93	1.74	1.34

¹ Where:

$$i = \frac{a}{(b + t_c)^c}$$

i = rainfall intensity (inches per hour)
Tc = time of concentration (minutes)
a, b, c = water quality event coefficients



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APPENDIX I
INSPECTION CHECKLIST



Stormwater Inspection Report

Charleston County

4045 Bridge View Drive North Charleston, SC

Phone: 843.202.7639 Fax: 843.202.7601

Inspection Number: _____

Inspection Date: _____

Inspector: _____

Job Address: _____

Parcel Number _____

Inspectors Comments

Weather Conditions

No Deficiencies Found

Site work appears to be in compliance with the Charleston County Stormwater Manual. Please continue to maintain BMPs and routine self-inspections to prevent future issues.

No Construction Started

Construction associated with the Charleston County Stormwater Permit does not appear to be started. Please notify the stormwater division when construction begins.

Silt fence not being maintained - No Erosion

The silt fences on site are not being maintained and/or are not installed properly. No sediment is escaping project bounds at this time, but any future erosion due to lack of maintenance could result in enforcement action.



Stormwater Inspection Report

Charleston County

4045 Bridge View Drive North Charleston, SC

Phone: 843.202.7639 Fax: 843.202.7601

Inspection Number: _____

Inspection Date: _____

Inspector: _____

Job Address: _____

Parcel Number _____

Silt fence not being maintained- Erosion

The silt fences on site are not being maintained and/ or are not installed correctly. Sediment is escaping project bounds. Repair silt fences immediately and remove any escaped sediment. Failure to correct erosion problems may result in enforcement actions.

BMPs not being maintained

Temporary BMPs are not being maintained and are not functioning as designed.

Additional BMPs needed

BMPs need to be added in order to control the sediment on site and/or treat the runoff leaving the site.

Sediment tracking offsite

Sediment is leaving the site due to vehicle tracking. Clean roadways and right of ways of any tracked sediment and install protective measures to prevent future tracking.

Inactive areas not stabilized

Inactive areas and stockpiles are required to be seeded or otherwise stabilized to prevent erosion if left inactive for longer than 14 days.



Stormwater Inspection Report

Charleston County

4045 Bridge View Drive North Charleston, SC

Phone: 843.202.7639 Fax: 843.202.7601

Inspection Number: _____

Inspection Date: _____

Inspector: _____

Job Address: _____

Parcel Number _____

Pollutant Impacts

Pollutants other than sediment are leaving the site, impacting water bodies or runoff, or are otherwise having a negative environmental impact.

Other Stormwater Deficiencies

Concrete washing

Concrete washing is not being conducted in a protected and consolidated area according to the permit requirements. Remove any residual concrete waste and ensure that all future concrete washing is done in a manner to prevent surface runoff.

General Comment



Stormwater Inspection Report

Charleston County

4045 Bridge View Drive North Charleston, SC

Phone: 843.202.7639 Fax: 843.202.7601

Inspection Number: _____

Inspection Date: _____

Inspector: _____

Job Address: _____

Parcel Number _____

Off-site impacts

Activities related to the permitted site work are impacting other properties and is not in compliance with the Charleston County Stormwater Permit.

Wetland/Protected area impacts

Designated wetland and special protection areas are not allowed to be disturbed without permits from the proper regulating agency. Immediately stop work that is impacting those areas and return any disturbed areas to their original condition.

Permit, Plans, and Inspection Logs

Necessary permits, site plans, and/or contractor inspection logs are not being maintained onsite in accordance with the Charleston County Stormwater Manual.

Construction Plans

Site work is not being conducted in accordance with the approved plans/permit. Contact a Charleston County Stormwater Engineer to submit intended changes for approval.

Inspection Needed – Critical Installation Point

An inspection of the installation of a critical stormwater system (i.e. Manufactured Treatment Devices, underground storage) is required by Charleston County Stormwater prior to covering the system or rendering it otherwise inaccessible. Contact a Stormwater inspector to arrange an inspection date.



Stormwater Inspection Report

Charleston County

4045 Bridge View Drive North Charleston, SC

Phone: 843.202.7639 Fax: 843.202.7601

Inspection Number: _____

Inspection Date: _____

Inspector: _____

Job Address: _____

Parcel Number _____

Re-Inspection Required

A re-inspection of the site will be conducted on or about the date below to ensure that deficiencies have been addressed by the owner/operator. Failure to address the deficiencies within the specified time will result in enforcement action from Charleston County in accordance with Chapter 4 of the Stormwater Manual.



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**APPENDIX J
ENFORCEMENT FORMS**

James R. Neal
Director



843.202.7600
Fax 843.202.7601
jneal@charlestoncounty.org
Lonnie Hamilton, III
Public Services Building
4045 Bridge View Drive, Suite A301
North Charleston, SC 29405-7464

Public Works Department
Stormwater Division

CORRECTIVE ORDER

Date:

Name
Address
City, State Zip code

Project: _____
Permit No. _____

This correction order serves as a warning concerning activities on your above mentioned site.

This warning is based on the results of a Charleston County 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 Charleston County Stormwater 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 843-202-7600.

Signed by: _____

Printed Name: _____

James R. Neal
Director



843.202.7600
Fax 843.202.7601
jneal@charlestoncounty.org
Lonnie Hamilton, III
Public Services Building
4045 Bridge View Drive, Suite A301
North Charleston, SC 29405-7464

Public Works Department
Stormwater Division

NOTICE OF VIOLATION

Date:

Name
Address
City, State Zip code

Project: _____
Permit No. _____

You are hereby served notice that you are in violation of Charleston County's Stormwater Management, Sediment and Erosion Control Ordinance at the above mentioned site.

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

These deficiencies noted on the inspection report must be corrected within **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 questions concerning this violation you can contact our office at 843-202-7600.

Signed by: _____

Printed Name: _____



James R. Neal
Director

843.202.7600
Fax 843.202.7601
jneal@charlestoncounty.org
Lonnie Hamilton, III
Public Services Building
4045 Bridge View Drive, Suite A301
North Charleston, SC 29405-7464

Public Works Department
Stormwater Division

NOTICE OF VIOLATION-STOP WORK ORDER

Date:

Name
Address
City, State Zip code

Project: _____
Permit No. _____

You are hereby served notice that you are in violation of Charleston County's Stormwater Management, Sediment and Erosion Control Ordinance at the above mentioned 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 Charleston County follow up inspection completed on _____. A copy of our inspection report is enclosed with this violation.

Your site must be inspected by a Charleston County Stormwater Management Inspector prior to resuming any construction activity. Any activity other than work leading to compliance with this Stop Work Order will 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 843-202-7600.

Signed by: _____

Printed Name: _____



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APPENDIX K
AS-BUILT CHECKLIST



CHARLESTON COUNTY AS-BUILT CHECKLIST

Stormwater Record Drawings

As part of the project closeout process, a full size hard copy and one electronic PDF format copy of the record drawings, properly identified, executed, and certified shall be delivered to the Stormwater Division. Additionally, the record drawings for stormwater facilities shall contain the following information:

Piped Drainage Systems

- a. Enter actual values beside planned values on the approved construction plans.
- b. Show elevations to the nearest 0.01'. Actual elevations within 0.10' of the planned values are sufficient except where higher accuracy is needed to indicate positive flow.
- c. Diameter, material and class of all pipes.
- d. Type of joint of all pipes (O-Ring, T&G, etc.).
- e. Invert of pipe at outfall and all structures.
- f. Slope and lengths of all pipe.
- g. Structure type and elevations (top of grate, throat elevation, etc.)
- h. Location of all pipe and structures in relation to drainage easements on plan view.
- i. Centerline roadway elevations at all low points and other stormwater crossings.
- j. Length, depth, and width of all outfall protection as specified.

Open Channel Drainage Systems

- a. Enter actual values beside planned values on the approved construction plans.
- b. Show elevations to the nearest 0.1' except where higher accuracy is needed to indicate positive flow.
- c. Actual elevations within 0.1' of the planned values are sufficient except where higher accuracy is needed to indicate positive flow.
- d. Slope of all open channels.
- e. For swales 1' or less in depth, show actual side slopes and spot invert elevations at a frequency of at least every 100'.



- f. For swales or ditches greater than 1' in depth, show top of bank and toe of slope designations and elevations at a frequency of at least than every 100'.
- g. For ditches 3' or greater in depth, generate actual 1' contours.
- h. Location of ditch or swale in relation to drainage easements on plan view.
- i. Length, depth, and width of all outfall protection or other erosion control as specified.

Stormwater Management Pond or Basin

- a. Enter actual values beside planned values on the approved construction plans.
- b. Show elevations to the nearest 0.01'. Actual elevations within 0.10' of the planned values are sufficient except where higher accuracy is needed to indicate positive flow.
- c. Sufficient elevations along top of dam/pond to verify design elevation.
- d. Sufficient elevations along toe of slope and bottom of pond to verify design elevation.
- e. Generate actual 1' contours and provide a stage-volume table to confirm design volume.
- f. Verify pond slopes and vegetative cover.
- g. Location, elevations, slopes, and dimensions of all orifices, weirs, spillways, trash racks or any other aspects of outfall control.
- h. Location, dimensions, and elevations of emergency spillway.
- i. Outfall protection location and dimensions.
- j. Water elevation in pond at time of survey, if applicable.
- k. Provide location, dimensions, make or brand, model, serial number and maintenance manual for any engineered water quality treatment devices.

Certifications Statement

The record drawing must include the following statement:

"I hereby sign and affix my seal to certify confirm to the best of my knowledge that this record drawing accurately represents existing field conditions and that the comprehensive stormwater management system as constructed is in substantial conformance with the standards, dimensions and specifications of the approved construction plans."

SC Registered Professional Engineer/Landscape Architect/

Signature must match the approved Stormwater Application



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APPENDIX L
GRASSING SPECIFICATIONS



Charleston County Stabilization Specifications

INTRODUCTION

This seeding specification was developed in an effort to improve the success of grassing/stabilization efforts throughout Charleston County. It includes appropriate seed mixes and application rates for different areas of the County for different seasons. Following the recommendations of this specification should reduce the number of times a site has to be reseeded and the time it takes to achieve stabilization. This specification also includes information on proper fertilizer, growth stimulant, and soil amendment use to achieve site stabilization throughout the County.

1. DELIVERY, STORAGE, AND HANDLING

1.1

Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable.

1.2

Deliver lime, fertilizer and biological growth stimulants in sealed factory labeled waterproof bags showing weight, chemical analysis, and name of manufacturer. Damaged bags are not acceptable. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures, and construction operations.

1.3 Deliver sod on pallets.

2. SEED SPECIFICATIONS

Use seed that conforms to all state laws and all requirements and regulations of the South Carolina Department of Agriculture (SCDA). Seeds containing species designated by the State Crop Pest Commission as a plant pest (i.e., noxious weeds) are not permitted. Use seed that is individually packaged or bagged and tagged. Each tag must clearly state:

- Net weight
- Botanical name
- Common name
- Variety
- Grower name
- Grower lot number
- Percent purity
- Percent germination
- Percent other crop seed
- Percent inert matter
- Percent weed seed (if weed seed is present, provide a list of species by botanical name)



- Origin

When mixtures of different types of seed are called for in the seeding schedule, pre-blended mixtures that are individually packaged or bagged and tagged with the tag specifying the botanical and common name of each species contained in the blend, and the percentages of each species may be used.

When purchasing seed, it's important to note the expiration date to avoid buying more than can be used before seed expiration.

2.1 SEED SCHEDULE

Seed selection should be determined by the planting dates. The charts in Appendix A show when it is acceptable to plant different seed types. Find the appropriate table based on the seeding location (see section 2.2). The first column indicates how many seed types must be picked from that category. If the box is blank, all seed types in that section must be used. The selected seeds must be combined to create the appropriate seeding mixture.

2.2 SEED MIXES

2.2.1 Urban Canal and Ditch Slopes and Shelves

The urban canal and ditch slopes and shelves seed mix should be used in urban locations where homes or commercial businesses are adjacent to the ditch/canal.

2.2.2 Rural Canal and Ditch Slopes and Shelves

The rural seed mix should be used for rural ditches and canals that are adjacent to wooded areas and/or other unmaintained vegetated areas. This mixture should not be used in areas adjacent to maintained lawns and/or gardens.

2.2.3 Road Medians and Shoulders

The road medians and shoulders seed mix should be used for all County road medians and shoulders.

2.2.4 Road Slopes

The road slope seed mix should be used for steep slopes along roads or ditches or in areas where erosion is more prominent.

2.2.5 Beaches

The Beach seed mix should be used near beaches in natural areas with sandy soil, such as bordering sand dunes. It would not be appropriate to use this mix in a residential or commercial area unless a more "natural" type of vegetation is desired.

3. STABILIZATION PRODUCTS



3.1 LIME

3.1.1 Agricultural Granular Lime

Use solid agricultural granular lime for all permanent cover applications that is agricultural grade, standard ground limestone. Ensure that each bag has a tag or label, or in the case of bulk sales, a delivery slip showing brand or trade name, calcium carbonate equivalent, percent by weight passing prescribed U. S. Standard Sieves, and other pertinent information to identify lime as being agricultural grade, standard ground limestone.

Applying Granular Lime

Thoroughly mix agricultural granular lime with the soil to a depth of approximately two (2) inches. Mixing is not required when spreading lime with hydraulic methods. Adequately scarify all slopes subject to slides and inaccessible to power equipment. Lime may be applied by approved mechanical spreaders or by hydraulic methods as a mixture of lime and seed. Granular lime should be applied at a rate of approximately 2000 pounds per acre.

3.1.2 Fast Acting Lime

Use fast acting liquid forms and/or dry forms of lime for all temporary cover by seeding and permanent cover applications that meet all of the requirements of agricultural grade granular lime specified herein, except percent by weight passing U.S. Standard Sieves.

Applying Fast Acting Lime

Fast acting liquid and dry lime provides an immediate pH adjustment. Use fast acting liquid or fast acting dry forms of lime for all temporary cover by seeding and permanent cover by seeding applications. Apply fast acting liquid lime at a rate of 5 gallons per acre or per the manufacturer’s recommendations. Apply fast acting dry lime at a rate of 100 pounds per acre or per the manufacturer’s recommendations.

3.2 FERTILIZER, SOIL AMENDMENTS AND BIOLOGICAL GROWTH STIMULANTS

3.2.1 Granular Fertilizer

Use granular fertilizer for all permanent cover applications to ensure adequate stabilization. The proper fertilizer mixture is dependent on the soil conditions and it is recommended that a soil analysis be performed if soil conditions are uncertain in the area of fertilizer application. In general, because of the high natural levels of phosphorus in the Charleston County area, a fertilizer low in phosphorus is recommended. In a mixed fertilizer such as 18-3-12, the first number represents the percent of nitrogen required, the second number represents the percent of phosphorus, and the third number represents the percent of water soluble potassium in the fertilizer. **Use fertilizer that incorporates a minimum of 50% water insoluble (slow release) nitrogen.** Animal by-product or municipal waste fertilizers are not acceptable under this Specification.

Unless a soil analysis is performed to determine otherwise, a good rule of thumb granular fertilizer to apply in Charleston County is 18-3-12. The 18-3-12 fertilizer contains the appropriate amount of slow release



nitrogen and has a lower level of phosphorus appropriate to the area due to the high levels of natural phosphorus content in the soils. Other potential granular fertilizer blends appropriate for use in Charleston County, due to the high level of natural phosphorus in the soils, are 15-0-15 or 25-0-12. In no case should a 20-20-20 fertilizer be used on County stabilization projects due to the potential burning of the seedbed.

Applying Granular Fertilizer

Adequately scarify all slopes subject to slides and inaccessible to power equipment. Fertilizer may be applied by approved mechanical spreaders or by hydraulic methods as a mixture of fertilizer and seed. When fertilizer is applied with combination seed and fertilizer drills, no further incorporation is necessary. Apply the fertilizer and seed together when hydraulic methods of seeding are used.

3.2.2 Compost Soil Amendment

For seedbeds that have little or no topsoil, furnish, place, and mix certified weed free compost to a minimum depth of 3 inches into the seedbed in order to ensure a good stand of grass. Provide compost when seedbeds are excessively nutrient deficient to the extent of requiring costly fertilizer additions and or have excessively low pH values (lower than 5.0) to the extent of requiring costly lime additions.

3.2.3 Biological Growth Stimulants

It is often beneficial in ensuring adequate stabilization that a biological growth stimulant be used in addition to the application of granular fertilizers. When using biological growth stimulants, it is important to follow the manufacturer’s recommendations to avoid damage or burning of the seedbed. Use approved hydraulic methods to apply biological growth stimulants. **Liquid fertilizer is not a biological growth stimulant and can cause burning of the seedbed if applied as such.**

Where necessary, reapply biological growth stimulants in accordance with the manufacturer’s instructions. Reapplication is not required unless biological growth stimulant treated soils are disturbed or turbidity or water quality shows the need for an additional application.

Use biological growth stimulants that provide an immediate seedbed adjustment to help stimulate seed germination, improve the availability of nutrients to the grass, increase the number and depth of root development, and generate robust plant growth which is more tolerant of changes in environmental conditions.

Use biological growth stimulants that:

- Contain plant growth hormones (i.e. auxins) which act as a stimulant to improve vegetative growth and can reduce damage from disease and insect infestation.
- Contain humic acid and/or other components that increases biological activity in the soil to improve stress tolerance/drought resistance, reduces sodium uptake in sandy soils, provides more phosphorus availability, and increases cation exchange capacity resulting in earlier germination and better root establishment.



Animal by-products or municipal waste products are not acceptable biological growth stimulants under this specification. Liquid fertilizers are not acceptable as biological growth stimulants under this specification.

3.2 EROSION PREVENTION/STABILIZATION PRACTICES

3.2.1 Mulch

Mulch is recommended for all permanent cover and temporary cover applications except for shoulder work and resurfacing projects that have a disturbed width less than six (6) feet and where seeding is compacted using a culti-packer or light roller. Compaction is not necessary if seeds are planted by mechanical seed drills that perform a compaction procedure. Only use mulch that is certified weed free. Mulch is used for temporary cover by mulch applications. Wood chip mulch is not acceptable for seeding applications. Apply mulch according to Table 1.



TABLE 1: MULCH APPLICATIONS

<u>Mulch Type</u>	<u>Applicable Road or Shoulder Slopes (H:V)¹</u>	<u>Minimum Application Rate (lbs/acre -dry)²</u>
Straw or Hay with Tackifier	≤ 4:1	2,000
HECP Type 1	≤ 4:1	2,000
HECP Type 2	4:1 < S ≤ 3:1	2,500
HECP Type 3	3:1 < S ≤ 2:1	3,000
HECP Type 4	2:1 < S ≤ 1:1	3,500
	> 1:1	4,000 (temp cover only) ³
Compost Mulch	≤ 2:1	200 CY/acre

- 1** The maximum allowable continuous slope length for all mulch is 50 feet. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet.
- 2** Strictly comply with the manufacturer’s mixing recommendations for the actual slope steepness and the actual continuous slope length of the application.
- 3** HECP Type 4 may be used for permanent cover applications on slopes 1:1 or greater at a minimum rate of 4,500 pounds per acre.

3.2.2 Straw or Hay Mulch with Tackifier

Use straw or hay mulch material that consists of certified weed free straw or hay. Use straw that consists of stalks of wheat, rye, barley, oats, or other approved straw. Use hay that consists of Timothy, Peavine, Alfalfa, Coastal Bermuda, or other grasses from approved sources. Use materials that are reasonably dry and reasonably free from mature seed-bearing stalks, roots, or bulblets of Johnson grass, Nutgrass, Sandburg, Wild Garlic, Wild Onion, Wild Mustard, Crotonaria, Pigweed, Witchweed, and Cocklebur. Comply with all state and federal domestic plant quarantine regulations. Straw mulch is not to be used in urban areas or in areas adjacent to sidewalks, guardrails, curbs, curb and gutters, or concrete medians. Do not use straw or hay mulch with tackifiers for temporary cover by mulch applications on slopes steeper than 4H:1V. Anchor straw mulch material using one of the following tacking agents:

3.2.3.1 Organic or Chemical Tackifier

These tackifiers consist of guar gum, plantago, polysaccharides, polymer synthetic resin, polypectate, liquid latex, or other material that will give adhesive properties when sprayed on straw mulches. Applications should be heavier at edges, in valleys, and at crests of banks and other areas where the straw mulch may be moved by wind or water. All other areas must have a uniform application of the tackifier. Apply tackifiers at the manufacturer’s recommended rate.

3.2.3.2 Hydraulic Straw Tackifiers

Apply hydraulic erosion control products at the manufacturer’s recommended rate for straw binding.



3.2.3 Compost Mulch

Compost is the product resulting from the controlled biological decomposition of organic material occurring under aerobic conditions that has been sanitized through the generation of heat and stabilized to the point that it is appropriate for its particular application. Ensure compost possesses no objectionable odors or substances toxic to plants and does not resemble the raw material from which it was derived. Provide compost only from a compost producer that participates in the United States Composting Council's (USCC) Seal of Testing Assurance (STA) program.

Compost mulch may include, but is not limited to, the following:

- Leaf and yard trimmings
- Food scraps
- Treated biosolids
- Manure
- Agricultural residuals
- Forest residuals
- Tree wood
- Bark
- Paper

Ensure compost does not contain any visible refuse, other physical contaminants, or any substance considered harmful to plant growth. Do not use materials that have been treated with chemical preservatives as a compost mulch. Do not use mixed municipal solid waste compost.

3.2.4 Temporary Erosion Control Blankets (ECBs) and Turf Reinforcement Matting (TRM)

Temporary Erosion Control Blankets (ECBs) and/or Turf Reinforcement Matting should be considered in areas where there are steep slopes or there is a significant erosion problem. It is very important to refer to the manufacturer's specifications when installing ECBs or TRM for descriptions, materials and installation requirements. In addition, it is recommended that the County Engineer be involved when ECBs or TRM is to be installed to aid in the selection process as well as the performance evaluation. Utilize Table 2 to determine appropriate applications of ECBs and TRM.



TABLE 2: ECB and TRM APPLICATIONS

<u>ECB/TRM Type¹</u>	<u>Road or Shoulder Slope (H:V)²</u>	<u>Minimum Slope Height (ft)</u>
Temporary ECB or Type 1 TRM	≤ 2:1	5
Type 2 TRM	≤ 1.5:1	5
Type 3 TRM	≤ 1:1	5

1 Strictly comply with the manufacturer’s specifications.

2 The maximum allowable continuous slope length for ECBs and TRM is 50 feet. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet.

CONSTRUCTION REQUIREMENTS

4.1 Seeding Dates and Rates of Application

Perform seeding work during the periods and at the rates specified in the seeding tables of this Specification (Appendix A). Do not use temporary cover by seeding, permanent cover, and permanent grassing for projects when:

- The ground is frozen and/or when the 10-day forecasted low temperature remains below 35 degrees Fahrenheit;
- The ground is excessively wet; or
- The ground is excessively dry (periods of drought) unless watering is specified.

During periods of adverse conditions, use temporary stabilization by mulch.

4.2 Seedbed Preparation

- Ensure that the areas to be seeded are uniform and conform to the finished grade of the stabilization project area.
- Perform minor shaping and evening of uneven and rough areas outside of graded area in order to provide for more effective erosion control and for ease of subsequent mowing operations.
- Loosen the seedbed (including cut slopes) to a minimum depth of three (3) inches before compost, agricultural lime, fertilizer, mulch, or seed is applied.
- An acceptable method of preparing the seedbed on slopes is vertically tracking the seedbed up and down the slope with proper equipment.
- Remove stones larger than two and one-half (2½) inches in any dimension, large dirt clods, roots, or other debris brought to the surface.
- Use compost for shoulders and slopes if good seedbed material is not located on site.

4.4 Temporary Cover

Perform temporary cover by mulch or temporary cover by seeding within seven (7) days when a site will not be worked for 21 days up to a maximum of 60 days. If the site will not be worked for a period longer



than 60 days, then temporary cover by seeding is required. Do not use temporary cover by seeding when the ground is frozen and/or when the 10-day forecasted low temperature remains below 35 degrees Fahrenheit. Scarify all temporary cover areas before fill is placed on top of the temporary cover area.

4.4.1 Temporary Cover by Mulch

Temporary cover by mulch may be used on isolated problem areas or where it is not feasible or practicable to bring an area to final slope and grade. Finish the surface so that permanent cover can be performed without subsequent disturbance by additional grading.

4.4.2 Temporary Cover by Seeding

Following the preparation of the seedbed according to this Specification, sow seed prior to a rainfall event that compacts the seedbed. Using the seed specified in the seeding tables in Appendix A, the Contractor will determine all rates of application necessary to produce the required results and follow the application procedures as specified herein. Uniformly sow seed at the rate specified by the use of approved mechanical seed drills, rotary hand seeders, hydraulic equipment, or any other type of equipment that produces a uniform seed application.

After sowing temporary seed, apply an appropriate mulch as listed in this Specification prior to a rainfall event that compacts the seedbed. On small areas inaccessible to machinery, the seed may be covered by hand rakes or other methods satisfactory to the County Engineer. Add fertilizer and lime as necessary to enhance growth.

Temporary cover by seeding may be used in isolated problem areas or where it is not feasible or practicable to bring an area to final slope and grade. Finish the surface so that permanent cover can be performed without subsequent disturbance by additional grading.

4.4.3 Acceptance of Temporary Cover

Before acceptance of temporary cover, the Contractor will be required to produce temporary cover sufficient to control erosion for a given area and length of time before the next phase of construction or the establishment of permanent cover is to commence. The Contractor will be required to produce a satisfactory stand of temporary cover meeting the requirements of this Specification regardless of the time of the year the work is performed.

4.5 Permanent Cover/Grassing

Perform permanent cover with seeding within 21 days of when the site was last worked. Following the application of fertilizer and preparation of seedbed according to this Specification, perform permanent cover within 5 working days and/or prior to a rainfall event that compacts the prepared seedbed. Using the seed specified in the seeding tables in Appendix A, create a seeding plan and determine all rates of application necessary to produce the required stand of grass and follow the application procedures as specified herein. Uniformly sow seed at the rate specified by the use of approved mechanical seed drills, rotary hand seeders, hydraulic equipment, or any other type of equipment that produces a uniform seed application.



After sowing permanent seed, apply an appropriate mulch as listed in this Specification within 5 working days and/or prior to a rainfall event that compacts the prepared seedbed. On small areas inaccessible to machinery, the seed may be covered by hand rakes or other methods satisfactory to the County Engineer. Add fertilizer and lime as necessary.

Select nutrients based on experience and past success. If granular fertilizer and lime are used, sow seed within 24 hours following the application and preparation of the seedbed.

Permanent grassing for small projects (less than 1 acre) does not require the application of mulch when the width of the seeding application is less than six (6) feet and seeding is compacted using a culti-packer or light roller. Compaction is not necessary if seeds are planted by mechanical seed drills that perform a compaction procedure. Track slopes inaccessible to compaction equipment prior to seeding. Stabilize slopes that cannot be tracked with the appropriate mulch.

4.5.2 Acceptance of Permanent Cover and Permanent Grassing for Small Projects

Before acceptance of permanent cover or permanent grassing, a uniform perennial vegetative cover with a density of 70% of each square yard of the seeded area is required by the Contractor. A well developed root system must be established to sufficiently survive dry periods and winter weather and be capable of reestablishment in the spring.

4.6 Protection of Structures

Cover any parts of bridges, culverts, guardrails, signs, sidewalks, curb and gutters, catch basins, pipe ends, and other structures as necessary to prevent discoloration before spraying organic or chemical tackifiers.

4.7 Selective Watering for Vegetation

Selective watering for vegetation consists of selectively applying water to seeded areas that are slow to develop or deficient in adequate density. Use Selective Watering to enhance germination and enhance root growth in poor growth areas.

When directed by the County Engineer use the following guidelines in areas where germination has not occurred within 21 days after seeding:

- Keep the soil moist but not excessively wet until the seed germinates.
- Water a minimum of three (3) days a week for two (2) weeks preferably watering two (2) or three (3) times a day in small quantities.
- Use fine spray and low pressure to avoid soil wash and to prevent uncovering buried seeds.
- When applicable, water during early morning hours or early evening hours.
- Do not water when rain is forecast for the area.

Use the following guidelines in areas where adequate density is a problem after emergence:

- Apply one (1) inch of water per irrigation event. (Note: 1-acre-inch = 27,154 gallons. This is the volume of water necessary to cover one (1) acre one (1) inch deep.)
- During summer, water two (2) to three (3) days per week.



- During winter, water once every ten (10) to fourteen (14) days.
- If rainfall occurs, suspend watering according to rainfall amount.

Closely monitor the deficient areas to ensure germination and density of cover. Further analysis of the soil, application of soil amendments, or re-seeding may be necessary if the problem area persists.

4.8 Inspection and Maintenance

Perform all maintenance necessary to keep permanent cover, permanent grassing for small projects, temporary cover by seeding, and temporary cover by mulch areas in a satisfactory condition until the work is finally accepted. This includes mowing, repairing areas of erosion and washes, and applying additional seed, fertilizer, and mulch to areas where a satisfactory stand of grass has not been achieved. Water seeded areas as directed by the County Engineer. The Contractor is not responsible for permanent cover, permanent grassing for small projects, temporary cover by seeding, and temporary cover by mulch areas damaged by insects, animals, or extreme rainfall events. An extreme rainfall event is defined as being a 25-year storm event or greater based on the inches of rain received per time interval (30-min, 1-hr, 3-hr, 6-hr, 24-hr etc.) for the particular location as determined from the current NOAA precipitation tables.

3 SODDING

Sod shall be placed between March 1st and December 1st.

Sod shall be placed within 48 hours of cutting.

Sod shall be moist when laid and placed on moist ground. Sod shall be carefully placed by hand, beginning at the toe of slopes and working upwards. The length of strips shall be at right angles to the flow of surface water. All joints shall be tightly butted and end joints shall be staggered at least 12 inches. Sod shall be immediately pressed firmly into the ground by tamping or rolling. Fill all joints between strips with fine screened soil. Sod on slopes shall be pegged with sod pegs to prevent movement. The sod shall be watered, mowed, weeded, repaired, or otherwise maintained by Contractor, to insure the establishment of a uniform healthy stand of grass until acceptance.



APPENDIX M

**LINEAR APPLICATIONS STANDARDS AND PROCEDURES
MANUAL**



Preface

Charleston County has developed standard operating procedures and design criteria to ensure that County linear construction and maintenance projects meet the stormwater management and sediment/erosion control requirements adopted by the County. This manual is to be utilized by the Charleston County Stormwater Division as well as road/linear project designers, contractors, inspectors and maintenance personnel. The County has adopted the parameters in this manual for what alterations/improvements to roads and other linear projects will be required in regards to stormwater management best management practices (BMPs) in order to meet County, State and Federal standards.

This Manual is for stormwater management purposes only, and the requirements herein are specific to The Charleston County Stormwater Management Program and do not preclude either the Planning and Building Services Departments from performing their permit, plan review, inspection or other related duties and collecting applicable fees.

Every effort has been made throughout this Manual to cover the common conditions and information needed by those involved in linear construction activities. However, these design standards and the County Ordinances should be reviewed carefully to ensure that all requirements are being met. Projects may also be impacted by applicable state and federal requirements.

The selection and design process must be conducted to meet all the constraints and design considerations for a particular project. It is up to the developer's/designer's judgment to decide which design is the most appropriate for their particular site. Hydrologic functions such as infiltration, frequency and volume of discharges, and groundwater recharge become essential considerations when identifying and selecting BMPs. The following table provides a summary of potential site constraints for various BMPs.



Site Constraints of Best Management Practices (BMPs)

	Bio-retention	Vegetated Filter Strip	Enhanced Bioswale	Infiltration Trench
Space Required	Surface area range: 3% to 8% depending on the amount of impervious area	Minimum length of 15 to 20 ft. Minimum width of 4 ft.	Bottom width: 2 ft minimum, 6 ft maximum	Minimum width: 3 to 6 ft Minimum length: 2 to 190 ft
Slopes	4:1 Preferred, 2:1 Maximum	2% - 10%	Swale side slopes: 2:1 or flatter Longitudinal slope: 1.0% minimum; 5% maximum based on permissible velocities	Maximum slope of 5%
Water Table	Minimum vertical distance of 12", recommended 36" between bottom of BRA and seasonally high water table.	2ft clearance above water table recommended	2ft clearance above water table recommended	6 inches of clearance above water table required
Max. Depth	2 to 4 ft depth depending on soil type	Not applicable	Not applicable	8 ft. depending on soil type and water table
Maintenance	Low requirement	Lower requirement, routine landscape maintenance	Low requirement, routine landscape maintenance	Moderate to high

Road Categorization

Charleston County currently has six (6) classifications of roads: Private, County Non-Standard, Secondary Rural, Primary Rural, Secondary County, and Primary County. The purpose of this section is to outline the permitting requirements for improvement of County Non-Standard, Secondary Rural and Primary Rural roads. Each classification has requirements which limit development and improvement possibilities. The minimum requirements for these classifications are:

1. County Non-Standard - Maximum of ten (10) lots. Travel way minimum width determined on a per road basis.
2. Secondary Rural - Maximum of ten (10) lots. Travel way minimum width of eighteen (18) feet.
3. Primary Rural - No lot maximum. Travel way minimum width of twenty (20) feet.

The minimum right-of-way width for a roadway to be accepted into the County maintenance system is fifty (50) feet unless otherwise approved by the Public Works Director. The following criteria can be used for road categories other than those specified but must be approved by the Public Works Director.



Table 1: Charleston County Road Maintenance Categorization

Road Classification	Recommended Lots		Length		Right of Way		Existing Material		Category
	≤10	>10	≤500'	>500'	<50'	≥50'	Earth	Rock	
Non-Standard County Roads	X		X		X		X		2
	X			X	X		X		1 and (3, 4, or 5)
Secondary Rural Roads	X		X			X	X		2
	X			X		X	X		1 and (3, 4, or 5)
Primary Rural Roads	X		X			X	X	X	2
		X		X		X	X	X	1 and (3, 4, or 5)

Categories for Maintenance Plan

1. Install impervious pavement and maintain roadside ditch/swale with grass filter strip (if possible)
2. Install porous pavement or maintain roadside ditch with grass filter strip (if possible)
3. Install bioretention cell(s)
4. Install bioswale(s) or infiltration trench(es)
5. Install and maintain Manufactured Treatment Devices (MTD)

Porous Pavement

Description

Porous pavement is a permeable pavement surface with a stone reservoir underneath. The reservoir temporarily stores surface runoff before infiltrating it into the subsoil. Runoff is thereby infiltrated directly into the soil and receives some water quality treatment. Since the reservoir area underneath porous pavement stores and infiltrates surface runoff, using porous pavement can reduce the amount of land needed for traditional stormwater management measures. Porous pavement increases groundwater recharge, reduces pollutants in stormwater runoff, and helps alleviate flooding.

Design parameters that determine the applicability of porous pavement include the load-bearing and infiltration capacities of the subgrade soil, the infiltration capacity of the porous asphalt, and the storage capacity of the stone base/subbase. Additional subbase may be required to compensate for the lower structural support capacity of clay and sand soils. Alternate designs may be acceptable if approved by Public Works Director.

Subgrade Preparation

The main consideration in using porous pavement should be the subgrade soil properties as per AASHTO soil classifications. Native subgrade refers to materials beyond the limit of the excavation. The existing native subgrade material under all bed areas shall not be compacted or subject to excessive construction equipment traffic prior to geotextile and stone bed placement. Where erosion of the native material subgrade has caused accumulation of fine materials and/or surface ponding, this material shall be removed



with light equipment and the underlying soils scarified to a minimum depth of six (6) inches with appropriate light equipment.

Bring subgrade to the line, grade, and elevations indicated. Fill and lightly regrade any areas damaged by erosion, ponding, or traffic compaction before the placing of the stone subbase. Subbase refers to materials below pavement surface and above native subgrade. All bed bottoms should be as level as feasible to promote uniform infiltration. For pavement subbases constructed on grade, soil or fabric barriers should be constructed along equal elevation for every six (6) to twelve (12) inches of grade change to act as internal check dams. This will prevent erosion within the subbase on slope.

The density of subbase courses shall be determined by AASHTO T 191 (Sand-Cone Method), AASHTO T 204 (Drive Cylinder Method), or AASHTO T 238 (Nuclear Methods), or other approved methods at the discretion of the supervising engineer or Public Works Director.

Porous Media Bed Installation

Upon completion of subgrade work, the Engineer or designee (a qualified/certified inspector) shall be notified and should perform an inspection before proceeding with the porous media bed installation. Sideslope geotextile and porous media bed aggregate shall be placed immediately after approval of subgrade preparation. Any accumulation of debris or sediment which has taken place after approval of subgrade shall be removed prior to installation of geotextile.

Place sideslope geotextile in accordance with manufacturer's standards and recommendations. Adjacent strips of geotextile shall overlap a minimum of sixteen (16) inches. Secure geotextile at least four feet outside of the bed excavation and take any steps necessary to prevent any runoff or sediment from entering the storage bed.

Install filter course aggregate to grades indicated on the design drawings. Choker should be placed evenly over surface of filter course bed, sufficient to allow placement of pavement, and notify the Engineer for approval. Choker base course thickness shall be sufficient to allow for even placement of the porous asphalt but no less than two (2) inches in depth.

The infiltration rate of the compacted subbase shall be determined by ASTM D3385 or approved alternate at the discretion of the supervising engineer or Public Works Director.

Following placement of the subbase aggregate, the sideslope geotextile shall be folded back along all bed edges to protect from sediment washout along bed edges. At least a four (4) foot edge strip shall be used to protect beds from adjacent bare soil. This edge strip shall remain in place until all bare soils contiguous to beds are stabilized and vegetated. In addition, take any other necessary steps to prevent sediment from washing into beds during site development. When the site is fully stabilized, temporary sediment control devices shall be removed.

Porous Asphalt Pavement Installation

Contact surfaces such as curbing, gutters, and manholes shall be painted with a thin, uniform coat of Type RS-1 emulsified asphalt immediately before the asphalt mixture is placed against them.



The temperature of the asphalt mixture, at the time of discharge from the haul vehicle and at the paver, shall be between 275° and 325° Fahrenheit, within 10° F of the compaction temperature for the approved mix design. The porous asphalt shall be placed within a single application at a minimum two (2) inches thick or in two lifts. If more than one lift is used, measures must be taken to ensure that the porous asphalt layers join completely. Time between layer placements must be kept minimal and the first layer clear from dust and moisture. Traffic should be kept at a minimum on the first layer. Protect all exposed surfaces that are not to be treated from damage during all phases of the pavement operation.

The asphalt mixture shall be spread and finished with the appropriate equipment. The mixture shall be struck off in a uniform layer to the full width required and of such depth that each course, when compacted, has the required thickness and conforms to the grade and elevation specified. Pavers shall be used to distribute the mixture over the entire width or over such partial width as practical. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture shall be spread and raked by hand tools.

No material shall be produced so late in the day as to prohibit the completion of spreading and compaction of the mixture during daylight hours, unless night paving has been approved for the project. No traffic will be permitted on material placed until the material has been thoroughly compacted and has been permitted to cool to below 100° F. The use of water to cool the pavement is not permitted. The Engineer reserves the right to require that all work adjacent to the pavement, such as guardrail, cleanup and turf establishment, is completed prior to placing the wearing course when this work could cause damage to the pavement. On projects where traffic is to be maintained, the Contractor shall schedule daily pavement operations so that at the end of each working day all travel lanes of the roadway on which work is being performed are paved to the same limits. Suitable aprons to transition approaches, where required, shall be placed at side road intersections and driveways as directed by the Engineer.

Maintenance

The overall maintenance goal for porous pavement is to prevent clogging of the void spaces within the surface material. Fine particles that can clog the pores are deposited on the surface from vehicles, the atmosphere, and runoff from adjacent land surfaces. Occasional sweeping or vacuuming of debris will be required to ensure the surface does not clog. The surface of porous pavements must not be sealed or repaved with non-porous materials if it is to continue to function.



Vegetated Filter Strip

Design Criteria

A vegetated filter strip is an area of grasses or other generally low growing, dense vegetation designed to remove sediment and other pollutants from stormwater runoff flowing through it. Pollutants suspended in the runoff or attached to suspended soil particles are removed by filtration and sedimentation. A vegetated filter strip is intended to remove pollutants from runoff flowing through it as sheet flow. Filter strips can be effective in reducing sediments and associated pollutants such as hydrocarbons, metals and nutrients though sedimentation and filtration. Soluble pollutants may also be removed through uptake vegetation. While vegetated filter strips address water quality, they do not address water quantity.

Vegetated filter strips are designed to be a post-construction best management practice (BMP). Post-construction design is required for all vegetated filter strip installations.

Periodic maintenance is primarily focused on ensuring healthy plant growth and removal of debris and litter. Keeping the grasses at an acceptable level will minimize the growth of successional vegetation. It is important to avoid the use of herbicides and fertilizers on grassed portions of the filter strip. These applications can directly contribute pollutants.

A design standard has been created for Charleston County which specifies the slope percentage and recommended minimum width of the filter strip based on road width. These criteria are based on a sandy loam soil using a mixed type grass with regular maintenance. Vegetated filter strips must be installed above the flow line of the ditch to ensure the trapping of sediment and pollutants. A stone trench or other flow separating device should be utilized in order to reduce the velocity of water before entering the vegetated filter strip. These standards are meant for a general guideline and may not apply in situations that do not fall under these criteria. Table 2 shows the vegetated filter strip standards approved by Charleston County. Figure 1 provides a detail drawing as guidance for the design of vegetated filter strips.

Table 2: Vegetated Filter Strip for 80% Annual TSS Trapping

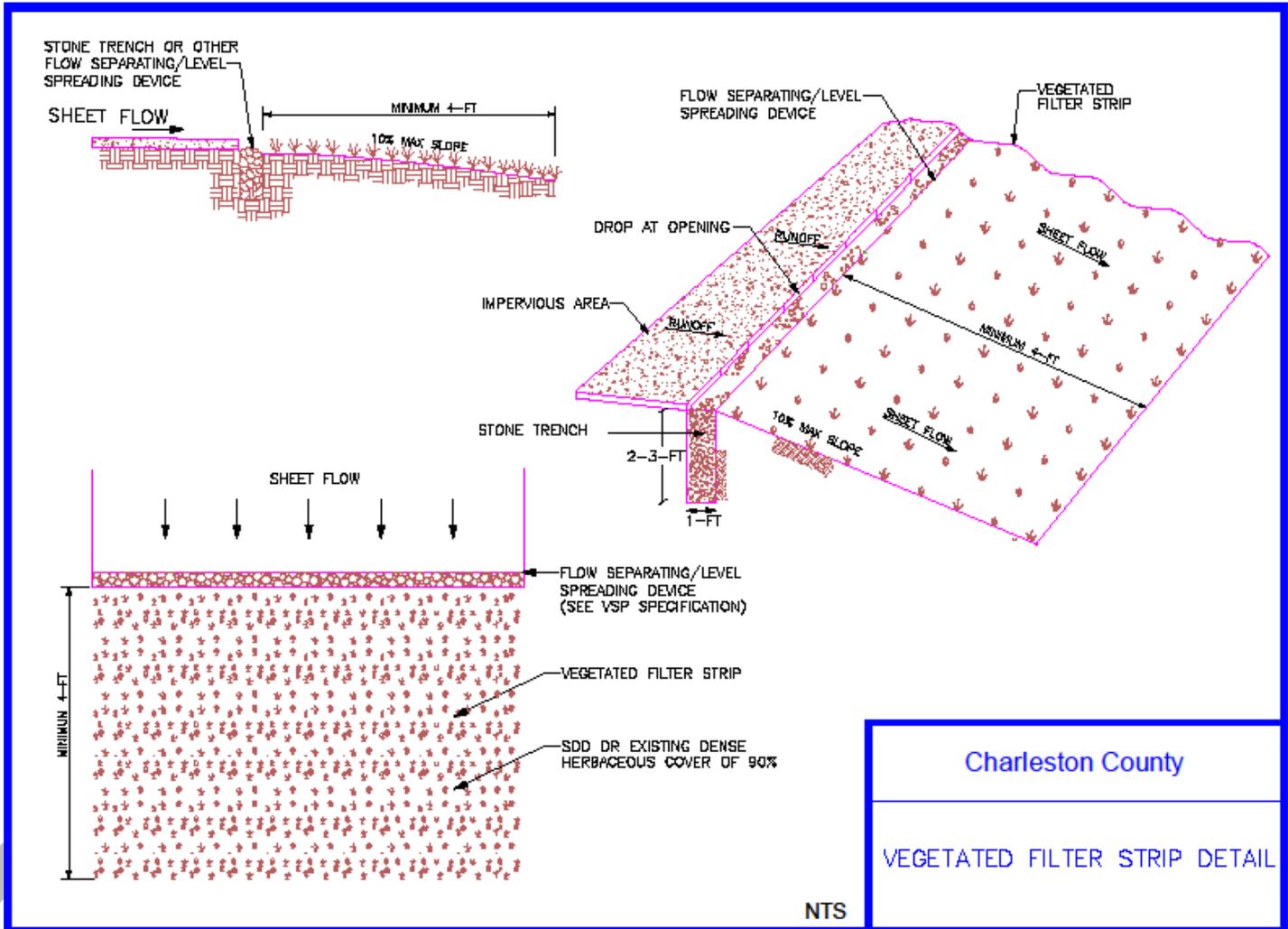
Width of Road (ft)	Slope of VFS	Minimum Width of VFS (ft)
up to 24	2-10%	4

Site Constraints

The presence of a shallow water table may hinder the infiltration function of the strip. The lowest elevation of the filter strip should be a minimum of six (6) inches above the local seasonally high water table. If site restrictions do not allow for the installation of a vegetated filter strip meeting the specified sizing criteria other BMP solutions will need to be considered.



Figure 1: Vegetated Filter Strip





Infiltration Trenches

Description

Infiltration trenches are excavations filled with stone to create an underground reservoir to manage stormwater runoff. The stormwater runoff volume enters the infiltration trench, is temporarily stored, and gradually exfiltrates through the bottom and sides of the trench into the subsoil. Infiltration Trenches fully de-water within a 24- to 72-hour period depending on trench dimensions, soil type, and underdrain system.

Use Infiltration Trenches to capture sheet flow from a drainage area or function as an off-line device. Due to the relatively narrow shape, Infiltration trenches can be adapted to many different types of sites and can be utilized in retrofit situations. Because infiltration trenches are sensitive to fine sediments, do not install them on sites where the contributing area is not completely stabilized or is periodically being disturbed.

Infiltration trenches are limited to areas with highly porous soils where the water table is located well below the trench bottom. Infiltration trenches:

1. Are only for applicable soils, or soils that have a minimum infiltration rate of 0.3 inches per hour as determined from site specific soil boring samples. Suggested classifications may include hydrological group A, gravels, or sandy soils in accordance with AASHTO or USCS soil classifications.
2. Are located to avoid ground water contamination.
3. Are not intended to trap sediment during construction activities.
4. Have a sediment forebay or other pre-treatment measure to prevent clogging in the gravel.
5. Have an overflow system to provide non-erosive flow velocity along the length and at the outfall.
6. Are applicable for impervious areas where there are low levels of fine particulates in the runoff and the site is completely stabilized and the potential for possible sediment loads are very low.

Pretreatment Criteria

Infiltration trenches must have pretreatment measures in place to ensure the long term longevity of the designed infiltration rate. One of the following techniques must be installed to pretreat 100 percent of the inflow:

1. Grass Channel
2. Grass Filter Strip. A minimum twenty (20) feet and only if sheet flow is established and maintained.
3. Forebay. Should accommodate a minimum fifteen (15) percent of the design storm volume; if the infiltration rate for the underlying soils is greater than two (2) inches per hour, the



forebay volume should be increased to a minimum of fifty (50) percent of the design storm volume.

4. Gravel Diaphragm. Minimum one (1) foot deep and two (2) feet wide and only if sheet flow is established and maintained.
5. Filter System.
6. Proprietary Structure. Must demonstrate capability of reducing sediment and hydrocarbons.

Pretreatment structures at the edge of pavement must have a two (2) to four (4) inch drop from the edge of pavement to the top of the grass or stone in the pretreatment structure to prevent accumulation of debris and subsequent clogging at the point where runoff is designed to enter the pretreatment structure.

Design Requirements

To achieve 80% removal efficiency of the average annual post-development total suspended solids (TSS), infiltration trenches are designed to have a water quality volume equal to:

1. One (1) inch of runoff from impervious areas located on the project site, or
2. 1.5 inches of runoff from built-upon portions of the project if located within 1,000 feet of shellfish beds.

Table 3 outlines the accepted design criteria which were derived using models for the most common underlying soil textures in Charleston County. Certain factors were used to determine the extents of these models and any variation from these assumed factors will need to be designed for accordingly. The assumed factors were as follows:

- 300 feet of road length was used to model for design. The length of trench must be scaled up by the same factor as road length for longer road sections.
- Rock fill must be at least 35% porous. If 35% porosity cannot be achieved, trench length must be increased to match the design pore volume.
- Infiltration trenches may include an underdrain or outlet structure.

Figure 2 provides a detail drawing as guidance for the design of infiltration trenches.



Figure 2: Infiltration Trench

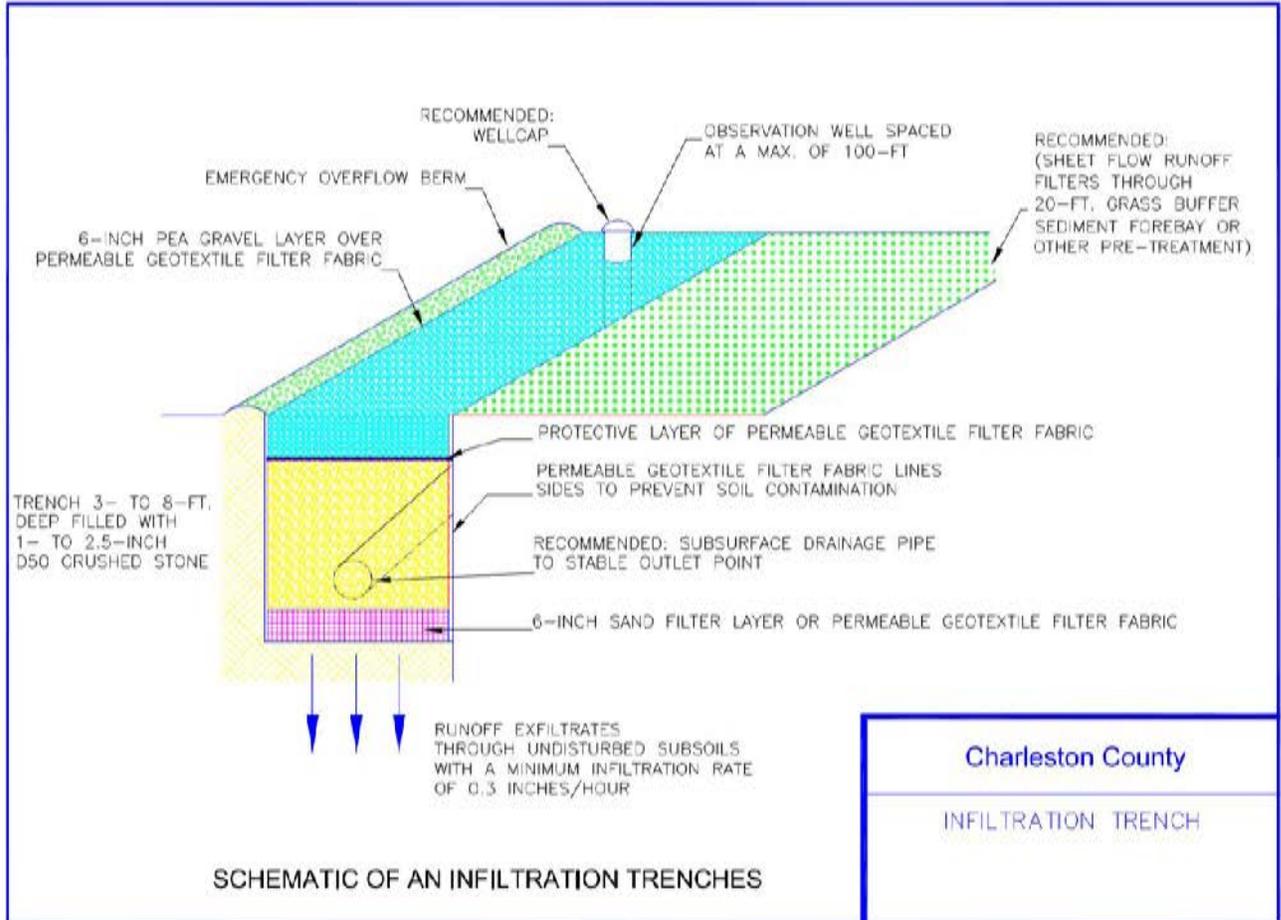




Table 3: Infiltration Design Criteria

Underlying Soil Texture: Clay			
Road Width (ft)	Depth of Trench (ft)	Width of Trench (ft)	Minimum Length of Trench per 300' road (ft)
10	2	3-4	80
		4-6	60
		6+	45
	3	3-4	55
		4-6	45
		6+	30
	4	3-4	45
		4-6	35
		6+	25
12	2	3-4	95
		4-6	75
		6+	50
	3	3-4	65
		4-6	50
		6+	35
	4	3-4	50
		4-6	40
		6+	30
18	2	3-4	145
		4-6	110
		6+	75
	3	3-4	100
		4-6	75
		6+	50
	4	3-4	75
		4-6	60
		6+	40
24	2	3-4	190
		4-6	145
		6+	100
	3	3-4	130
		4-6	100
		6+	70
	4	3-4	100
		4-6	80
		6+	55

Underlying Soil Texture: Sandy Loam				
Road Width (ft)	Depth of Trench (ft)	Width of Trench (ft)	Minimum Length of Trench per 300' road (ft)	
10	2	3-4	35	
		4-6	30	
		6+	20	
		3	3-4	25
			4-6	20
			6+	15
	4	3-4	20	
		4-6	15	
		6+	15	
	12	2	3-4	40
			4-6	35
			6+	25
3		3-4	30	
		4-6	25	
		6+	20	
4		3-4	25	
		4-6	20	
		6+	15	
18		2	3-4	60
			4-6	50
			6+	35
	3	3-4	45	
		4-6	35	
		6+	25	
	4	3-4	35	
		4-6	30	
		6+	20	
	24	2	3-4	80
			4-6	65
			6+	45
3		3-4	60	
		4-6	45	
		6+	35	
4		3-4	50	
		4-6	40	
		6+	25	

Underlying Soil Texture: Sandy Clay Loam			
Road Width (ft)	Depth of Trench (ft)	Width of Trench (ft)	Minimum Length of Trench per 300' road (ft)
10	2	3	60
		4	45
		6	30
	3	3	45
		4	35
		6	25
	4	3	35
		4	25
		6	20
12	2	3	70
		4	55
		6	40
	3	3	50
		4	40
		6	30
	4	3	40
		4	30
		6	20
18	2	3	110
		4	80
		6	60
	3	3	75
		4	60
		6	40
	4	3	60
		4	45
		6	30



Materials

Stone Fill

The stone fill media consists of a No. 5 clean crushed stone with six (6) inches of No. 6 clean crushed stone located on top separated by a Class 2 Type C permeable nonwoven geotextile filter fabric.

Permeable Nonwoven Geotextile Fabric

Place a permeable nonwoven geotextile filter fabric between the pea gravel and stone fill and the stone fill and adjacent soil. The filter fabric prevents sediment from passing into the stone media and is easily separated from the nonwoven geotextile fabric that protects the sides of the excavated trench.

Sand Filter

Place a six (6) inch sand filter or Class 2 Type C permeable nonwoven filter fabric on the bottom of the trench.

Observation Well

Install observation wells spaced a maximum of 100 feet in every infiltration trench. The well is made of four (4) to six (6) inch PVC pipe. Extend the observation well to the bottom of the trench. The observation well shows the rate of de-watering after a storm event and predicts when maintenance is required for the infiltration trench. Install the observation well along the centerline of the trench, flush with the ground elevation of the trench. Cap the top of the well to discourage vandalism and tampering.

Table 4: Infiltration Trench Material Specifications

Material	Specification
No. 57 Aggregate	Use course aggregate No. 57 consisting of crushed slag or gravel
1.0- to 2.5-inch D ₅₀ Crushed Stone	Coarse Aggregate Size No.: 2, 24 or 3
Pea Gravel	ASTM D 448; Stone Size No. 6 or 1/8" to 3/8"
Sand Filter Material	AASHTO Std. M-43, Size No. 9 or No. 10) (SCDOT FA-10 Size No. 8)
Pipe Underdrains	Use perforated pipe underdrains with a minimum diameter of 4 inches
Observation Well and Outlet Pipe	Use non-perforated pipe underdrains with a minimum diameter of 4 inches
Class 2 Type C Permeable Non-Woven Geotextile Fabric	Use Class 2 Type C non-woven geotextile fabric

Construction Requirements

Ensure stormwater runoff from areas draining to infiltration trenches passes through stabilized vegetated filter at least twenty (20) feet in length, a sediment Forebay, or other pre-treatment measure before discharging to the infiltration trench. Do not install infiltration trenches in fill material because piping along the fill and natural ground interface may cause slope failure.

Site Preparation

Ensure a vertical distance of six (6) inches between the infiltration trench bottom and the elevation of the seasonally high water table, whether perched or regional. The water table is determined by direct piezometer measurements and on-site soil borings.



Locate infiltration trenches greater than three (3) feet deep a minimum of ten (10) feet from basement walls. Locate infiltration trenches a minimum of 150 feet from any public or private water supply well. Construct infiltration trenches with a maximum width of twenty-five (25) feet.



Installation

Perform the following for all infiltration trench installations:

1. Construct an excavated trench with a minimum depth of three (3) feet and a maximum depth of eight (8) feet. The maximum slope bottom of the infiltration practice is five (5) percent.
2. Do not install infiltration trenches in fill material as piping along the fill/natural ground interface may cause slope failure.
3. Do not install an infiltration trench on or atop a slope whose natural angle of incline exceeds 20 percent.
4. Line the excavated trench with a permeable nonwoven geotextile filter fabric.
5. Place a six (6) inch sand filter on the bottom of the trench and place a permeable geotextile filter fabric over the sand filter.
6. Install observation wells spaced a maximum of 100 feet apart. Extend the well to the bottom of the trench.
7. Install the observation well along the centerline of the trench, and flush with the ground elevation of the trench. Cap the top of the well to discourage vandalism and tampering.
8. Place the crushed stone fill media to a depth of six (6) inches below the top ground surface and place a permeable geotextile filter fabric over the crushed stone. Install this permeable filter fabric so it is easily separated from the geotextile filter fabric that protects the sides of the excavated trench.
9. Place six (6) inches of No. 6 clean crushed stone on top of the No. 5 clean crushed stone.

4.0.6 Inspection and Maintenance

Regular inspection and maintenance is critical to the effective operation of infiltration trenches. Typical maintenance responsibilities include:

1. Keeping a record of the average de-watering time of the infiltration trench to determine if maintenance is required.
2. Replacing the top six (6) inch layer of pea gravel and the permeable nonwoven geotextile filter fabric separating the pea gravel from the stone media when they become full of sediment.
3. Clearing debris and trash from all inlet and outlet structures monthly.
4. Checking the observation wells after three (3) consecutive days of dry weather after a rainfall event. If complete de-watering is not observed within this period, there may be clogging within the trench and proper maintenance is required.



5. Removing trees, shrubs, or invasive vegetation semi-annually.
6. If complete failure is observed, performing total rehabilitation of the trench by excavating the trench walls to expose clean soil, and replacing the gravel, geotextile filter fabric, and topsoil.

Table 5: Infiltration Trench Maintenance Requirements

Required Maintenance	Frequency
Ensure that the contributing area is stabilized with no active erosion.	Monthly
Mow grass filter strips and remove grass clippings.	Monthly
Check observation wells after 72 hours of rainfall. Ensure Wells are empty after this time period. If wells have standing water, the underdrain system or outlet may be clogged.	Semi-annual (every 6 months)
Remove invasive vegetation.	Semi-annual (every 6 months)
Inspect pretreatment structures for deposited sediment.	Semi-annual (every 6 months)
Replace pea gravel, topsoil and top surface geotextile filter fabric.	When clogging or surface standing water is observed
Perform total rehabilitation of infiltration trench.	Upon observed failure

Bioretention Areas

Description

Bioretention areas are stormwater basins intended to provide water quality management by filtering stormwater runoff before release into a stormwater conveyance system or stabilized outfall. Use individual bioretention areas for drainage areas up to two (2) acres in size.

Stormwater runoff enters bioretention areas and is temporarily stored in a shallow pond on top of a filter media layer. The ponded water then slowly filters down through the filter media and is absorbed by the plantings. As the excess water filters through the system, it is stored and/or collected. An optional underdrain system that eventually discharges to a designed storm conveyance system may be installed.



Design Requirements

General Design Criteria

To achieve 80% removal efficiency of the average annual post-development TSS, bioretention areas are designed to have a water quality volume equal to:

- One (1) inch of runoff from impervious areas located on the Project site, or
- 1.5 inches of runoff from built-upon portions of the Project if located within 1,000 feet of shellfish beds.

Design bioretention areas to treat the water quality volume of runoff from the entire drainage basin. Bioretention areas work best when constructed off-line, capturing only the water quality volume. Divert excess runoff away from the bioretention area or collect it with an overflow catch basin.

Design bioretention areas to fit around natural topography and complement the surrounding landscape. Bioretention areas can be of any reasonable shape and can be fit around sensitive areas, natural vegetation, roads, driveways, and parking lots.

Typical bioretention areas have a minimum width of ten (10) feet and a minimum flow length of 40 feet to establish a strong healthy stand of vegetation.

Where nitrogen or phosphorus is a concern, create a 90 degree elbow in the underdrain system from the bottom of the Bioretention area to create an Internal Water Storage Zone to encourage the denitrification process.

A summary of the design characteristics for bioretention areas is shown in Table 6.



Table 6: Design Characteristics for Bioretention Areas

Drainage Area	0.5 to 2 acres
Surface Area	Varies, but typically 3% to 8% of the contributing watershed depending on the amount of impervious area
Surface Side Slope	4:1 preferred, 2:1 maximum
Infiltration Rate	Between 1 and 6 inches per hour for filter media
Water Depth	Range from 6 to 12 inches with a 9-inch standard above the filter media
Water Table	Vertical distance of 3 feet between bottom of Bioretention area and seasonally high groundwater table (typically 4 to 6 feet below ground surface of the Bioretention)
Places to Avoid	Areas that regularly flood (at least once a year), areas adjacent to building foundations, and locations with continuous flow
Mulches	A minimum of 2 inches is required while 3 to 4 inches is preferable. Mulch should be hardwood, not pine bark nuggets (float). Double-shredded hardwood works well. Pine straw may be used in some areas.
Underdrain Stone	Aggregate No. 57 or No. 5 stone is preferred. Separate the gravel from the filter media with a permeable geotextile

Source: Urban Waterways / Urban Storm Water Structural Best Management Practices (BMPs), North Carolina Extension Service, June, 1999

The components of a well-designed bioretention area include a pre-treatment area, treatment area consisting of a ponding area, surface mulch layer and planting bed, and a gravel underdrain system separated from the planting bed by a geotextile filter.

Table 7 outlines the design criteria accepted by Charleston County. Refer to Appendix A for recommended surface area calculations. Additional criteria must be met in order for the values in Table 7 to meet the drainage requirements:

- Bioretention areas which have an underdrain sized to handle peak flow, underlying soil texture does not matter.
- Each area will have one layer of uncompacted loamy sand to a depth of twenty-four (24) inches.
- The invert of an eighteen (18) inch circular riser will be one (1) foot above the top of media
- The EMS crest should be two (2) feet above the media and at least ten (10) feet wide.



Table 7: Bioretention Area (BRA) Design Criteria

Road Length	Road Width (ft)	Area of BRA	Area of BRA as Percent of Road Drainage Area
1/2 mile	10	1200	5%
	12	1400	5%
	18	1950	5%
	24	2700	5%

Water Draw Down Time

Design bioretention areas to fully de-water within a 24- to 48-hour period depending on the dimensions, filter media, and underdrain system. In order to allow for proper pollutant removal, design for the ponded runoff above the bioretention area surface to drain in a maximum of twelve (12) hours. Design for runoff within the filter media to drain within forty-eight 48 hours. Refer to Appendix A for the general equation used to determine the draw down time. Determining the total draw down time is a three-step process:

1. Determine the time it takes to drain the ponded water.
 - Utilize Darcy’s Equation to calculate the flow rate (cfs).
 - Calculate the total ponded water volume (feet³) by multiplying the bioretention area (feet²) by the ponded water depth (feet).
 - Divide the total ponded water volume (feet³) by the flow rate (cfs) to calculate the time to drain the ponded water (seconds).

2. Determine the time it takes to drain the saturated filter media.
 - Calculate the total volume of water contained in the filter media (feet³) by multiplying the bioretention area (feet²) by the filter media depth (feet) by the porosity (dimensionless) of the filter media.
 - Divide the filter media water volume (feet³) by the flow rate from Darcy’s Equation (cfs) to calculate the time to drain the ponded water (seconds).

3. Add up the time to drain the ponded water with the time that it takes to drain the filter media to calculate the total bioretention area draw down time.

Materials

Bioretention areas consist of an underdrain system, an internal water storage zone/ denitrification zone (if required), a filter media, an overflow system, plantings, a mulch layer, and a pre-treatment system.



Underdrain System

Place an underdrain system beneath the filter media for all bioretention areas as many of the native soils found in South Carolina do not allow for adequate infiltration.

Provide an underdrain system that consists of continuous closed joint perforated plastic pipe underdrains with a minimum four (4) inch diameter, an eight (8) inch minimum gravel filter layer, a nonwoven geotextile filter fabric to separate the gravel from the native soils and the gravel from the filter media, and a minimum four (4) inch diameter non-perforated PVC clean out wells.

The maximum spacing of pipe underdrains is ten (10) feet.

Design the underdrain system to safely pass the peak draw down rate calculated in the Water Draw Down Section.

Table 8: Underdrain Material Specifications

Material	Specification
Aggregate	Use course aggregate No. 57 or No. 5 consisting of crushed slag or gravel.
Pipe Underdrains	Use PVC perforated pipe (AASHTO M 252) underdrains with a minimum diameter of 4 inches.
Clean Out and Outlet Pipe	Use non-perforated pipe with a minimum diameter of 4 inches.
Nonwoven Geotextile Fabric	Use Class 2 Type C non-woven geotextile fabric.

Internal Water Storage Zone (Denitrification Zone)

If required for enhanced nitrogen and phosphorus removal, provide an internal water storage zone sized to hold the water quality volume below the outlet of the underdrain system. A nonwoven geotextile fabric is not required between this zone and the underdrain system. Provide a nonwoven geotextile fabric between the internal water storage zone and the underlying native soil. The internal water storage zone consists of the filter media and the stone used in the underdrain system. Adding a suitable carbon source like wood chips to the gravel in the internal water storage zone provides a nutrition source for anaerobic microbes and can enhance the denitrification process.

Design the Internal water storage zone to treat the water quality volume of runoff from the entire drainage basin. Calculate the surface area of the internal water storage zone area by dividing the water quality volume by the ponding depth (minimum 12 inches).

Provide a minimum of twelve (12) inches of Filter Media above the maximum ponding height of the internal water storage zone. Install a valve for dewatering the internal water storage zone if prolonged standing water occurs.

Filter Media

The filter media provides a medium for physical filtration for the stormwater runoff with enough organic matter content to support plant life by providing water and nutrients.



Ensure the filter media of the bioretention area is level to allow uniform ponding over the entire area. The maximum ponding depth above the filter media is nine (9) to twelve (12) inches to allow the bioretention area to drain within a reasonable time and to prevent long periods of plant submergence. Provide a filter media with a minimum infiltration rate of one (1) inch/hour and a maximum rate of six (6) inches/hour. The average porosity of the filter media is approximately 0.45H

The USDA textural classification of the filter media is Loamy Sand or Sandy Loam. The filter media is furnished, and on-site soils are not acceptable. Test the filter media to meet the criteria in Table 9.

Submit the source of the filter media and test results to the Engineer prior to the start of construction of bioretention areas. Do not add material to a stockpile of filter media once a stockpile has been sampled.

Allow sufficient time for testing. Utilize a filter media from a certified source or laboratory to reduce mobilization time and construction delays.

Use a filter media that is uniform, free of stones, stumps, roots, or other similar objects larger than two (2) inches excluding mulch. Do not mix or dump materials or substances within the Bioretention area that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations.

Test the filter media to meet the criteria shown in Table 9.

Should the filter media pH fall outside of the acceptable range, modify with lime (to raise pH) or iron sulfate plus sulfur (to lower pH). Uniformly mix lime or iron sulfate into the filter media prior to use in bioretention areas.

Table 9: Bioretention Filter Media Material Specifications

Item	Percent of Total Filter Media by Weight	ASTM Sieve Size	Percent Passing by Weight
Sand* Clean, Washed, Well Graded, No Organic Material <i>Aggregate No. FA-10</i> <i>ASTM C-33 Concrete Sand</i> <i>AASHTO M-6</i> <i>AASHTO M-43, No. 9 or No. 10</i>	80% Max	3/8-inch	100
		No. 4	95-100
		No. 8	80-100
		No. 16	50-85
		No. 30	25-60
		No. 50	10-30
		No. 100	2-10
Screened Topsoil <i>Loamy Sand or Sandy Loam</i> <i>ASTM D5268</i> <i>(imported or manufactured topsoil)</i> <i>Max 5% clay content</i>	15% Max.	2-inch	100
		1-inch	95- 100
		No. 4	75-100
		No. 10	60-100
		No. 200	10-50
		0.002-mm	0-5
Organic Matter in the form of	5% Min	3/8-inch	85-100



Item	Percent of Total Filter Media by Weight	ASTM Sieve Size	Percent Passing by Weight
Compost, Leaf Compost, Peat Moss or Pine bark Nursery Mix**		No. 8	50-80
		No. 30	0-40

**Do not use lime stone screenings.*

*** Potting grade pine bark with no particles larger than 1/2 inches.*

Table 10: Filter Media Chemical Analysis

Item	Criteria	Test Method
Corrected pH	6.0 – 7.5	ASTM D4972
Magnesium	Minimum 32 ppm	*
P-Index	0-30	USDA Soil Test
Phosphorus (Phosphate - P ₂ O ₅)	Not to exceed 69 ppm	*
Potassium (K ₂ O)	Minimum 78 ppm	*
Soluble Salts	Not to exceed 500 ppm	*

** Use authorized soil test procedures.*

Modify the filter media with magnesium sulfate if the filter media does not meet the minimum requirement for magnesium. Modify the filter media with potash if the filter media does not meet the minimum requirement for potassium. Uniformly mix magnesium sulfate and potash into the filter media prior to use in Bioretention areas.

A filter media that fails to meet the minimum requirements must be replaced. Table 11 shows the recommended depth of the filter media.



Table 11: Bioretention Filter Media Depth

Vegetation	Filter Media Depth (feet)
Turf Grass Only	2.0
Native Grasses or Shrubs	3.0
Small Trees	4.0

Overflow System

Design an overflow system to pass runoff volumes greater than the water quality volume away from the Bioretention area. Place an outflow structure at the elevation of the maximum nine (9) to twelve (12) inch ponding depth above the bioretention area surface to carry excess runoff to a stormwater conveyance system or stabilized outlet.

Plantings

Use plantings that conform to the standards of the current edition of American Standard for Nursery Stock as approved by the American Standards Institute, Inc. For bioretention applications near roadways, consider site distances and other safety concerns when selecting plant heights. Consider human activities which may damage the plantings, cause soil compaction, or otherwise damage the function of the bioretention area when selecting plant species. Table 12 shows plantings suitable for bioretention areas in Charleston County.

Use plant materials that have normal, well-developed stems or branches and a vigorous root system. Only use plantings that are healthy and free from physical defects, plant diseases, and insect pests. Symmetrically balance shade and flowering trees. Ensure major branches do not have V-shaped crotches capable of causing structural weakness. Ensure trunks are free of unhealed branch removal wounds greater than a one (1) inch diameter. Use plant species that are tolerant to wide fluctuations in soil moisture content. Use plantings capable of tolerating saturated soil conditions for the length of time anticipated for the water quality volume, as well as anticipated runoff constituents. Acceptable bioretention area plantings include:

- Turf Grass Only - Use turf grass species that have a thick dense cover, are slow growing, are applicable to the expected moisture conditions (dry or wet), do not require frequent mowing, and have low nutrient requirements. The preferred method of establishing turf grass is sodding. Use temporary erosion control blankets to provide temporary cover when establishing turf grass by seeding.
- Native Grasses and Perennials - Create a low maintenance native grass or wildflower meadow with native grasses and native perennial species. Temporary erosion control blankets may be used in lieu of a hardwood mulch layer. Plant native grasses and perennials of the same species in clusters 1.0 to 1.5 feet on-center.
- Shrubs - Provide shrubs a minimum of two feet in height. Do not plant shrubs near the inflow and outflow points of the Bioretention area. Plant shrubs of the same species in clusters ten (10) feet on-center.



- Trees - Provide trees with a minimum one (1) inch caliper. Plant trees near the perimeter of the Bioretention area. Do not plant trees near the inflow and outflow points of the bioretention area. Do not plant trees directly above underdrains. Plant trees at a density of one tree per 250 square feet.



Table 12: Plantings Suitable for Bioretention

Botanical Name	Common Name	Height	Zone ¹	Light	Description
Small Trees Under 30-foot Tall					
Aesculus pavia	Red Buckeye	10-15 ft.	2	Sun /shade	Spring flowers, prefers part shade, may defoliate early in season.
Amalanchier canadensis	Serviceberry	12-20 ft.	2	Sun / part shade	Salt resistant; moist to average soils; Tolerates part shade; Multi-stem grey bark, early spring white flowers, early purple berries, red in fall; high wildlife value, fruits for birds.
Carpinus caroliniana	Ironwood American Hornbeam	30 ft.	1,3	Sun /shade	Shade tolerant, handles inundation of water, unique silver fluted trunk.
Cercis canadensis	Eastern Redbud	20-35 ft.	1,2	Part shade/ shade	Shade tolerant. Moist soils but not too wet; Drought tolerant; many good cultivars.
Chionanthus virginicus	Fringe Tree	20 ft.	2	Sun /shade	Moist soils; excellent small urban tree; Can be shrubby; fragrant pendulous white spring flowers and gold fall color.
Cornus amomum	Silky Dogwood	6-12 ft.	3	Sun	Flood tolerant; intermediate drought & heat resistant; fruit for birds.
Crataegus aestivalis	Mayhaw May Hawthorn	20 ft.	3	Sun	Thorn attractive to nesting birds, red fruit, purple to scarlet in fall.
Crataegus marshallii	Hawthorn	25 ft.	3	Sun /shade	Slender, thorny, or sometimes thorn less, branches. White blossoms followed by bright-red, persistent fruits. Leaves become colorful in fall. Seasonally poor drainage is okay.
Persea borbonia (evergreen)	Redbay	12-25 ft.	3	Sun / part shade	Evergreen small tree or large shrub, some salt tolerance
Magnolia virginiana (evergreen)	Sweetbay Magnolia	15-30 ft.	3	Sun / part shade	Sun to shade semi-evergreen, fragrant flowers, bright red berries, often multi-stem.
Shrubs					
Callicarpa americana	Beautyberry	6 ft.	2	Sun / shade	Average to droughty soils ; no anaerobic tolerance; Striking purple berries on new growth, yellow fall color, sun to part shade; well-suited for mountains.
Cephalanthus occidentalis	Button Bush	8 ft.	3	Part shade / shade	Tolerates flooding, white button flowers persist, attracts hummingbirds; salt-tolerant.
Clethra alnifolia	Sweet Pepperbush	8 ft.	2	Sun/ shade	Extremely fragrant white or pink flowers in summer, yellow in fall; Excellent for coastal gardens due to salt-tolerance.
Ilex verticillata	Common Winterberry	6-10 ft.	3	Sun / part shade	Flood tolerant intermediate drought resistance; Soil must be sandy loam, intolerant to coarse soils (loamy sand). White flowers with red berries retained in winter; well-suited for mountains.
Itea virginica	Virginia Sweetspire	3-6 ft.	3	Sun/ shade	Medium shrub. Fragrant white tassel flowers, deep red or purple fall foliage. Very flood & drought tolerant; salt resistant; Hi anaerobic tolerance. Prefers moist soils.
Lindera benzoin	Spicebush	6-12 ft.	2	Part shade / shade	Very early chartreuse flowers, fragrant leaves, pale yellow fall color. Suitable for Coast.
Virburnum dentatum	Arrowwood	10 ft.	3	Sun/ shade	White flowers, bright blue berry clusters, very tolerant to many soils.
Viburnum nudum	Possumhaw Viburnum	6-12 ft.	3	Sun / part shade	Very flood tolerant & drought tolerant; salt resistant; spring flowers, fruit for birds, fall color, tolerates part shade.
Sabal minor (evergreen)	Dwarf Palmetto	5-8 ft.	3	Sun / shade	Drought tolerant; some salt tolerance; heat resistant. Native palm that slowly spreads with black berries. Suitable for Coast.
Ilex vomitoria (evergreen)	Yaupon Holly	8-15 ft.	1,2	Sun / part shade	High drought tolerance, No anaerobic tolerance. Red fruit in fall & winter. Long lasting translucent berries.
Myrica cerifera (evergreen)	Wax Myrtle	15-20 ft.	1,2	Sun / part shade	Very flood tolerant; excellent salt & resistance; medium drought resistance; medium anaerobic tolerance; medium N fixing. Fragrant leaves, berries for candles, can prune as a hedge.
Wetness Zone¹	<p>1 Plants that, once established, withstand drought (3-4 weeks without rainfall); Establishment is 1-2 yrs for trees & shrubs, 1 yr for perennials & grasses</p> <p>2 Plants that grow best in moist to average soils and only tolerate short periods (1-2 days) of flooding.</p> <p>3 Plants that tolerate longer periods of flooding (3-5 days), but also grow in moist to average soils.</p>				



Perennials					
<i>Amsonia tabernaemontana</i>	Eastern Bluestar	1-3 ft.	3	Sun / part shade	Wetland plant that is Drought resistant; pale blue tubular flowers.
<i>Asclepias incarnata</i>	Swamp Milkweed	2-4 ft.	3	Sun	Pink rose-purple blooms in mid-summer, attracts butterflies. Thrives in mucky clay soils.
<i>Asclepias tuberosa</i>	Butterfly Milkweed	2-3 ft.	1	Sun / part shade	Prefers well-drained sandy soils. Tolerates drought. Striking and rugged plant with orange flowers that attract butterflies. Slow to establish and easy to grow from seed.
<i>Chelone glabra</i>	White Turtlehead	1-4 ft.	3	Sun	Snapdragon type white flowers, often lavender tinged. Attracts butterflies and hummingbirds. Suitable for Coast.
<i>Eupatorium dubium</i>	Joe Pye Weed	3-6 ft.	3	Sun	Rapid grower with large pink to purple flowers that attract butterflies. Has no salt tolerance.
<i>Helianthus angustifolius</i>	Swamp Sunflower	4-7 ft.	3	Sun / part shade	Tall yellow daisy flowers with maroon center. Good seed source for birds. Salt-tolerant.
<i>Hibiscus moscheutos</i>	Rose Mallow Swamp Mallow	3-8 ft.	3	Sun / part shade	Huge white to pink flowers that attract hummingbirds. Salt-tolerant.
<i>Lobelia cardinalis</i>	Cardinal Flower	1-6 ft.	3	Sun/ shade	Drought resistant; Bioretention soil must be sandy loam - intolerant to coarse soils (loamy sand). Brilliant red flower spikes that attract butterflies and hummingbirds.
<i>Rudbeckia fulgida</i>	Black-eyed susan	1-3 ft.	2	Sun	Moist to dry soils; showy flowers; other species & cultivars. Self-sows and produces abundant offsets.
<i>Solidago spp.</i>	Goldenrod	1-4 ft.	3	Sun	Thin sprays of arching flowering stems occur at the top of sturdy stems. <i>S. sempervirens</i> (Seaside Goldenrod): salt-tolerant. Most species are suitable.
<i>Vernonia noveboracensis</i>	Ironweed	5-8 ft.	3	Sun	Tall red-purple flower clusters late summer & early fall that attract butterflies. Tolerates inundation.
Grasses					
<i>Andropogon gerardii</i>	Big Bluestem	6-8 ft.	1,2	Sun / part shade	Bunch grass with a blue-green color turning maroon-tan color in fall. Deep roots and drought resistant. Moderately tolerant of acidity and salinity
<i>Chasmanthium latifolium</i>	River Oats	2-4 ft.	1,3	Sun / part shade	Clump forming. Dangling oats are ornamental and copper in fall. Medium drought and anaerobic tolerance; showy seed clusters, spreads by seed.
<i>Elymus virginicus</i>	Virginia Wild Rye	2-4 ft.	1,3	Sun / part shade	Lush green, upright growing grass.
<i>Muhlenbergia capillaris</i>	Muhly Grass	1-3 ft.	1,3	Sun	In the fall, creates a stunning pink to lavender floral display. Functions well in meadow gardens. Salt-tolerant.
<i>Panicum virgatum</i>	Panic Grass Switch grass	3-6 ft.	1,3	Sun / part shade	Clump forming grass very tolerant of flooding and tolerates dry soils and is drought resistant; some salt-tolerance; fuzzy flower heads.
<i>Schizachyrium scoparium</i>	Little Bluestem	2-3 ft.	1,2	Sun / part shade	Clump grass that attracts birds and mammals. Blue-green stems that turn mahogany-red with white seed tufts in the fall. Readily reseeds. Suitable for the Coast.
<i>Sorghastrum nutans</i>	Indiangrass	3-6 ft.	1,2	Sun / part shade	Tall, bunching sod-former, with broad blue-green blades and a large, plume-like, soft, golden-brown seed head. Fall color is deep orange to purple. Drought tolerant.
<i>Spartina patens</i>	Saltmeadow Cordgrass	1-3 ft.	1,3	Sun	Spreads to form mass, fine-textured, salt-tolerant
Ferns					
<i>Osmunda cinnamomea</i>	Cinnamon Fern	3-4 ft.	3	Part shade / shade	Ideal for moist areas of Bioretention area. Non-flowering plant that reproduces by spores.
<i>Osmunda regalis</i>	Royal Fern	2-3 ft.	3	Part shade / shade	Tolerates year-round shallow water.
Wetness Zone¹	<p>1 Plants that, once established, withstand drought (3-4 weeks without rainfall); Establishment is 1-2 yrs for trees & shrubs, 1 yr for perennials & grasses</p> <p>2 Plants that grow best in moist to average soils and only tolerate short periods (1-2 days) of flooding.</p> <p>3 Plants that tolerate longer periods of flooding (3-5 days), but also grow in moist to average soils.</p>				



Planting Plan

A bioretention area landscape plan includes all planting types, total number of each species, and the location of each species used. The plan includes a description of the contractor's responsibilities including a planting schedule, installation specifications, initial maintenance, a warranty period, and expectations of plant survival. A planting plan includes long-term inspection and maintenance guidelines. Use planting plans prepared by a qualified landscape architect, botanist, or qualified extension agent. Use native plant species over non-native species. Ornamental species may be used for landscaping effect if they are not aggressive or invasive.

Mulch Layer

Provide a uniform three (3) inch layer of mulch on the surface of the bioretention area that provides an environment to enhance plant growth, enhance plant survival, suppresses weed growth, reduce erosion of the filter media, maintain soil moisture, trap fine sediments, promote the decomposition of organic matter, and pre-treat runoff before it reaches the filter media.

Provide shredded hardwood bark that consists of bark from hardwood trees milled and screened to a maximum four (4) inch particle size, uniform in texture, free from sawdust and foreign materials, and free from any artificially introduced chemical compounds detrimental to plant life. Provide mulch that is well aged a minimum of six (6) months.

Do not use pine needle or pine bark mulch due to the ability of floatation.

Use alternative surface covers such as native groundcover, erosion control blankets, river rock, or pea gravel as directed by the RCE. Use alternative surface covers based on function, cost, and maintenance.

Do not provide a mulch layer for bioretention areas that utilize turf grass as the vegetation material.

Pre-treatment System

Provide a pre-treatment system to reduce incoming velocities, evenly spread the flow over the entire bioretention area, and to trap coarse sediment particles before they reach the filter media. Several pre-treatment systems are applicable, depending on whether the bioretention area receives sheet flow, shallow concentrated flow, or deeper concentrated flows. The following are appropriate pre-treatment options:

- Forebay (for channel flow): Located at pipe inlets or curb cuts leading to the bioretention area consisting of energy dissipation and flow dispersion sized for the expected peak discharge rate. The forebay may be formed by a wooden or stone check dam or an earthen or rock berm. Ensure the forebay is protected with the proper erosion prevention measures. The forebay does not require an underlying filter media.
- Grass Filter Strips (for sheet flow): Extend a minimum of ten (10) feet from edge of pavement to the upstream edge of the bioretention area with a maximum slope of 5%.
- Gravel or Stone Diaphragms (for sheet or concentrated flow): Located at the edge of pavement or other inflow point, running perpendicular to the flow path to promote settling. Size the stone according to the expected peak discharge rate.



- Curb stops with cut outs. The cut out height is no greater than one (1) inch with a maximum length of six (6) inches. Space cutouts no less than six (6) feet apart on center.
- Level Spreaders (for sheet flow): Gravel, landscape stone, or concrete level spreader located along the upstream edge of the bioretention area. Level spreaders successfully reduce incoming energy from the runoff and convert concentrated flow to sheet flow that is evenly distributed across the entire Bioretention area.
- This requires a two (2) to four (4) inch elevation drop from a hard-edged surface into the bioretention area.
- Manufactured Stormwater Devices (MTDs): An approved MTD may be used to provide pre-treatment.

Construction Requirements

Do not construct bioretention areas until all contributing drainage areas are stabilized as directed by the RCE. Do not use bioretention areas as sediment control facilities for during construction sediment control. Do not operate heavy equipment within the perimeter of bioretention areas during excavation, underdrain placement, backfilling, planting, or mulching.

Separate bioretention areas from the water table to ensure groundwater does not enter the facility leading to groundwater contamination or bioretention failure. Ensure a vertical distance of four (4) feet between the bottom of the bioretention area and the seasonally high ground water table.

Site Preparation

Pre-treat stormwater runoff to reduce the incoming velocities, evenly spread the flow over the entire bioretention area, and provides removal of coarse sediments. Because bioretention areas are sensitive to fine sediments, do not install them on sites where the contributing area is not completely stabilized or is periodically being disturbed.

Installation

Bioretention areas work best when constructed off-line, capturing only the water quality volume. Divert excess runoff away from the bioretention area or collect excess runoff with an overflow system. Install bioretention areas around the natural topography to complement the surrounding landscape by fitting around sensitive areas, natural vegetation, roads, driveways, and parking lots. Bioretention areas have a minimum width of ten (10) feet and a minimum flow length of forty (40) feet to establish a strong healthy stand of vegetation.

Excavation

Excavate the bioretention area to the dimensions, side slopes, and elevations shown on the plans. Excavate bioretention areas to the required depth based on the plantings utilized. Ensure excavation minimizes the compaction of the bottom of the bioretention area. Operate excavators and backhoes on the ground adjacent to the bioretention area or use low ground-contact pressure equipment. Do not operate heavy equipment on the bottom of the bioretention area. Remove excavated materials from the bioretention area and dispose of them properly.



Underdrain System

Prior to placing the underdrain system, alleviate compaction on the bottom of the bioretention area by using a primary tilling operation such as a chisel plow, ripper, or subsoiler to a depth of twelve (12) inches. Substitute methods must be approved by the RCE. Rototillers typically do not till deep enough to reduce the effects of compaction from heavy equipment.

Remove any ponded water from the bottom of the excavated area. Line the excavated area with a Class 2, Type C nonwoven geotextile fabric.

Place a layer of No. 57 aggregate three (3) feet wide and minimum of three (3) inches deep on top of the nonwoven filter fabric. Place the pipe underdrains on top of the underlying aggregate layer. Lay the underdrain pipe at a minimum 0.5 percent longitudinal slope. The perforated underdrain drain pipe may be connected to a stormwater conveyance system or stabilized outlet. Cap the ends of underdrain pipes not terminating in an observation well.

Install observation wells/cleanouts of non-perforated vertically in the bioretention area. Install observation wells and/or clean-out pipes at the ratio of one minimum per every 1,000 square feet of surface area as shown on the plans. Connect the wells/cleanouts to the perforated underdrain with the appropriate manufactured connections as shown on the Plans. Extend the wells/cleanouts six (6) inches above the top elevation of the bioretention area mulch layer and cap with a screw cap.

Place No. 57 aggregate around the pipe underdrain system to a minimum depth of eight (8) inches. Place a Class 2, Type C nonwoven geotextile fabric between the boundary of the gravel and the filter media to prohibit the filter media from filtering down to the perforated pipe underdrain.

Place an outflow structure at the elevation of the maximum nine (9) to twelve (12) inch ponding depth of the bioretention area to carry excess runoff from the bioretention area to a stormwater conveyance system or stabilized outlet.

Internal water storage zone(Denitrification Zone)

Create the internal water storage zone by adding a 90 degree angle (elbow) to the outlet of the underdrain system that is perpendicular (vertical) to the horizontal underdrain. The 90 degree elbow extends to a minimum height of twelve (12) inches above the invert of the underdrain system. The pipe from the elbow will reconnect with the underdrain pipe upstream of the overflow spillway. Install a valve at the 90 degree elbow to allow drainage of the internal water storage zone. Install the 90 degree elbow and valve in the primary outlet structure or in an access well for a means of opening/closing the valve.

Filter Media

Install a permeable, non-woven geotextile filter fabric between the filter media and the on-site soils. Place and grade the filter media using low ground-contact pressure equipment or excavators and/or backhoes operating on the ground adjacent to the bioretention area. Do not use heavy equipment within the perimeter of the bioretention area before, during, or after the placement of the filter media.

Place the filter media in vertical layers with a thickness of twelve (12) to eighteen (18) inches. Compact the filter media by saturating the entire bioretention area after each lift of filter media is placed until water flows from the underdrain system. Apply water for saturation by spraying or sprinkling. Perform saturation



of each lift in the presence of the RCE. Do not use equipment to compact the filter media. Use an appropriate sediment control BMP to treat any sediment-laden water discharged from the underdrain during the settling process.

Test the installed filter media to determine the actual infiltration rate after placement. Ensure the infiltration rate is within the range of one (1) to six (6) inches per hour.

Plantings

Plant all bioretention areas grasses, native grasses, perennials, shrubs, trees, and other plant materials specified to applicable landscaping standards.

Ensure all plant materials are kept moist during transport and on-site storage. Plant the root ball so one-eighth ($\frac{1}{8}$) of the ball is above final filter media surface. Ensure the diameter of the planting pit/hole is at least six (6) inches larger than the diameter of the planting ball. Set and maintain the plant straight during the entire planting process. Thoroughly water all plantings after installation.

Brace trees using two (2) inch by two (2) inch stakes only as necessary. Ensure stakes are equally spaced on the outside of the tree ball.

Mulch

Immediately mulch the entire bioretention area to a uniform thickness of three (3) inches after all plantings are in place. Do not use mulch for bioretention areas that utilize turf grass as the only vegetation material.

Inspection and Maintenance

Regular inspection and maintenance is critical to the effective operation of bioretention areas.

The surface of the ponding area may become clogged with fine sediments over time. Perform light core aeration or cultivate unvegetated areas as required to ensure adequate filtration. Other required maintenance includes but is not limited to:

- Perform pruning and weeding to maintain appearance periodically as needed.
- Replace or replenish mulch periodically as needed.
- Remove trash and debris periodically as needed.

Table 13 outlines the maintenance requirements for bioretention areas.



Table 13: Bioretention Maintenance Requirements

Required Maintenance	Frequency
Pruning and weeding	As needed
Remove trash and debris	As needed
Inspect inflow points for clogging and remove any sediment	Semi-annual (every 6 months)
Repair eroded areas and re-seed or sod as necessary	Semi-annual (every 6 months)
Mulch void areas	Semi-annual (every 6 months)
Inspect trees and shrubs to evaluate their health	Semi-annual (every 6 months)
Remove and replace dead or severely diseased vegetation	Semi-annual (every 6 months)
Remove invasive vegetation	Semi-annual (every 6 months)
Nutrient and pesticide management	Annual, or as needed
Water vegetation, shrubs ,and trees	Semi-annual (every 6 months)
Remove mulch, reapply new layer	Annual
Test filter media for pH	Annual
Apply lime if pH < 5.2	As needed
Add iron sulfate + sulfur if pH > 8.0	As needed
Place fresh mulch over entire area	As needed
Replace pea gravel diaphragm	Every 2 to 3 years if needed



Figure 3: Bioretention Area Details

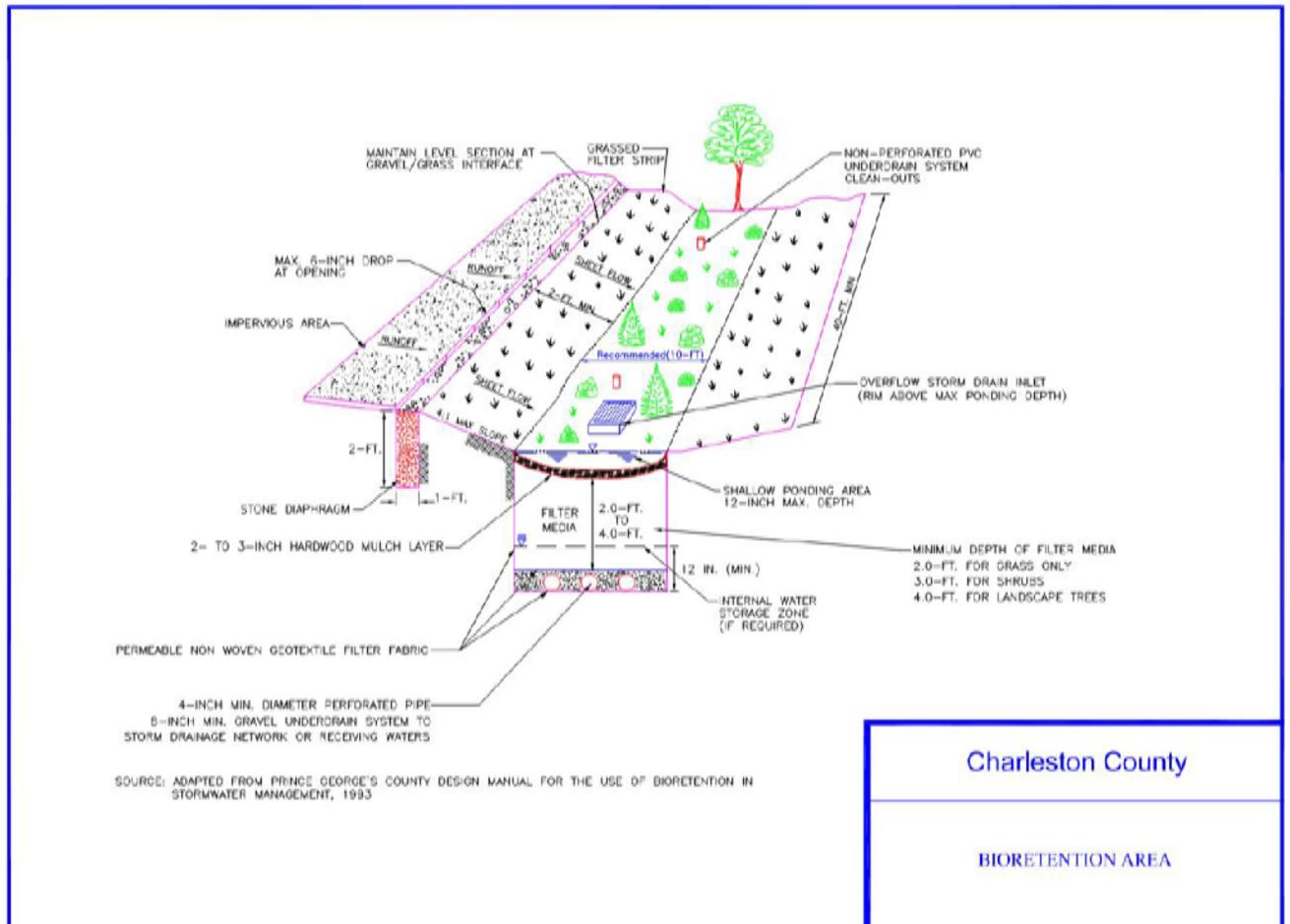
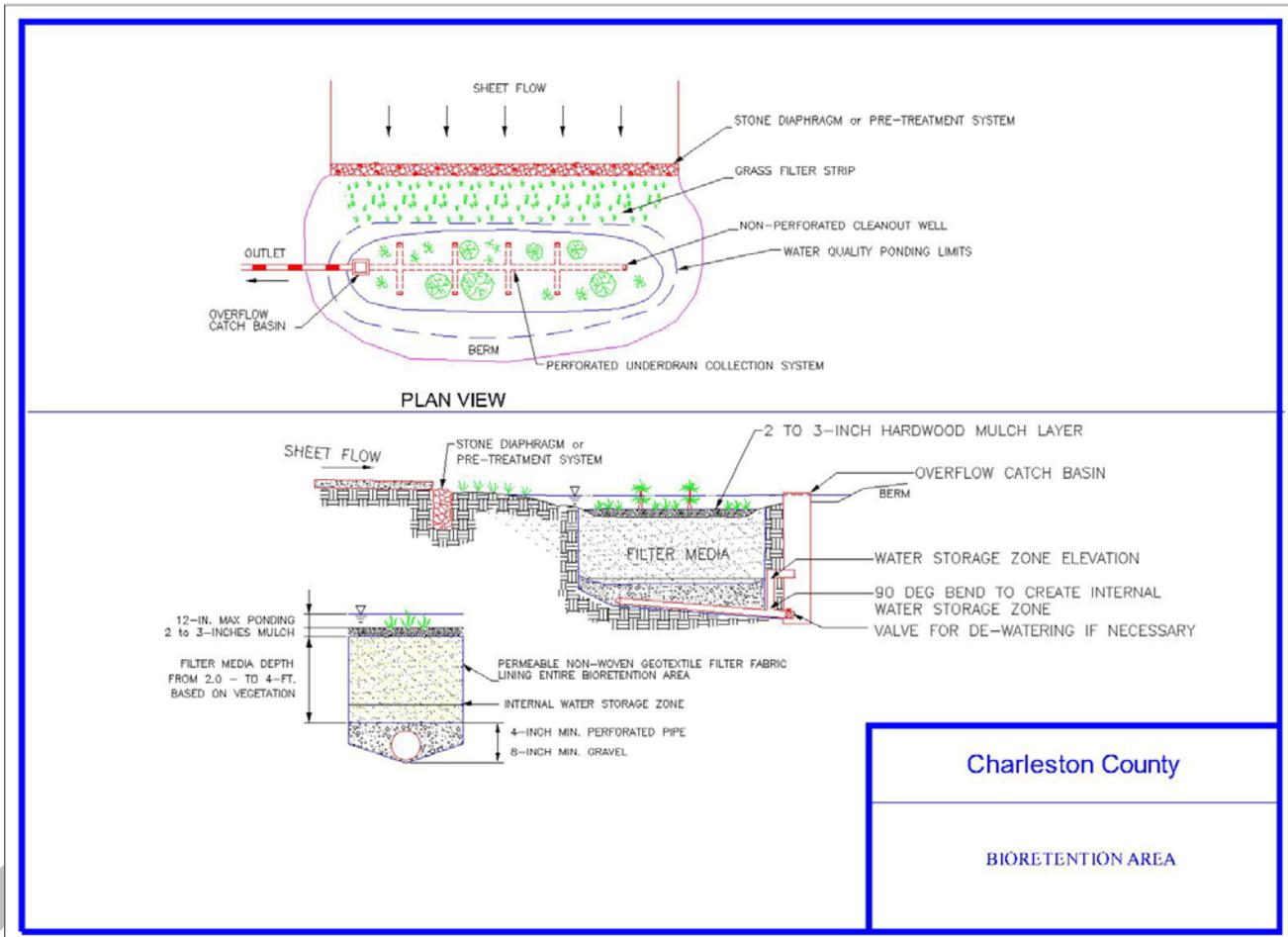


Figure 4: Bioretention Area Cross-section Details



Site Constraints

Bioretention is applicable for small sites where stormwater runoff rates are low and can be received into the bioretention area as sheet flow. Because bioretention areas are sensitive to fine sediments, do not install them on sites where the contributing area is not completely stabilized or is periodically being disturbed.



Enhanced Bioswale

Description

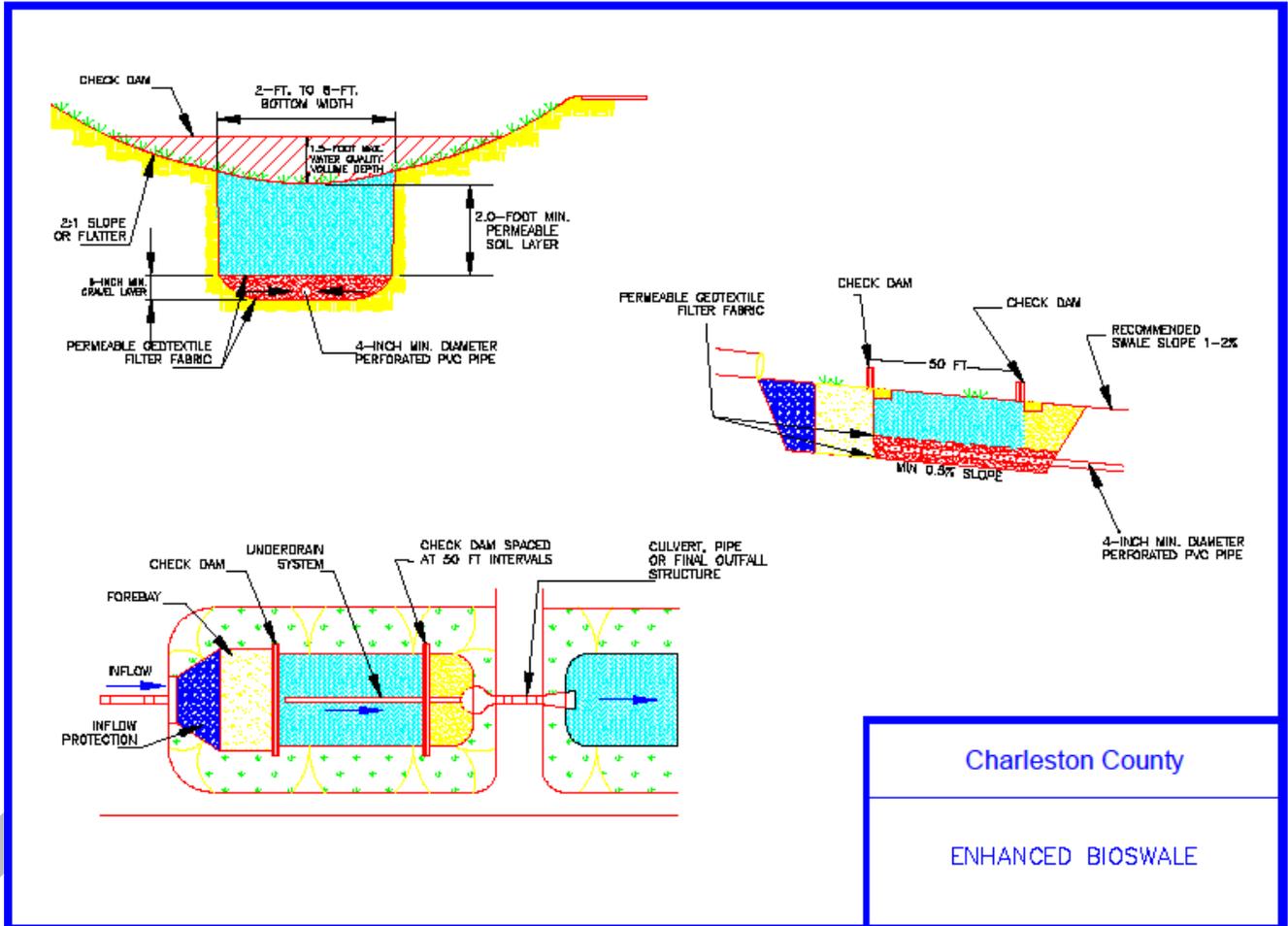
Bioswales are modified vegetated swales that use bioretention media beneath the swale to improve water quality and reduce the runoff volume and peak runoff rate. The bioretention media enhances infiltration, water retention and nutrient and pollutant removal. Infiltration can be enhanced by adding rock check dams at specified intervals along the conveyance.

Table 14 provides the design criteria for enhanced bioswales in Charleston County. Figure 5 provides a detail drawing as guidance for the design of enhanced bioswales.

Table 14: Enhanced Bioswale for 80% Annual TSS Trapping

Parameters	Lane Width (ft)	Longitudinal Slope	Check Dam spacing (ft)	
-Up to 300 ft. of road length to 100 ft. of bioswale length	10	0.5%	45	
		1%		
2%		30		
4%				
6%				
-Enhanced bioswale side slopes 3:1 or flatter		12	0.5%	45
-Enhanced bioswale bottom width must be at least 3 ft.			1%	
-Sandy Loam media in enhanced bioswale			2%	30
-Check dams at least 1 ft tall	4%			
-Check dam constructed with 2 in. or smaller stones or coir (or similar filtering material) logs	18	6%	45	
		0.5%		
		1%	30	
		2%		
	24	4%	20	
		6%		
		0.5%	45	
		1%		
		2%	30	
		4%		
		6%	20	

Figure 5: Enhanced Bioswale Details



Maintenance

The primary maintenance requirements include periodic mowing, clearing of debris, and sediment removal. It is recommended that the grass should not be cut shorter than the design flow depth. Routine inspections should be performed to ensure the system is functioning properly. The inspector should check for erosion, blockages and evidence of ponding water.



Stormwater Manufactured Treatment Devices

Stormwater Manufactured Treatment Devices (MTDs) function as stormwater treatment devices before stormwater runoff is discharged off-site or to receiving water bodies, and may be incorporated into a series of water quality best management practices to remove pollutants from stormwater runoff. MTDs are not designed, or intended to store a volume of water for water quality treatment. MTD Pollutant removal efficiencies are variable and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity and other factors.

Use MTDs designed to filter and trap trash, sediment, totals suspended solids (TSS), oil and grease, metals, hydrocarbons and other pollutants. Provide MTDs that combine settling, filtration, and various biological processes into one controlled system. MTDs approved for use in Charleston County are:

- MTD Type 1 - Separation Devices (Standard Stormwater MTD)
- MTD Type 3 - Catch Basin Inserts (Unique Project requirements)

Manufacturers' specifications with certified third party testing results must be submitted and approved by the Public Works Director prior to permit application submission.

Design Criteria

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

MTDs are to be designed to treat the entire water quality event (WQE) with no by-pass for a minimum 80% Total Suspended Solids (TSS) removal efficiency. The WQE flow rate is a separate flow rate from the Level of Service (LOS) flow rate. In addition to meeting the required treatment efficiency for the WQE, the MTD must be capable of passing the specified LOS flow rate (i.e. 10-year storm event) without causing adverse hydraulic impact to upstream portions of the drainage system and without causing any re-suspension or scour of previously trapped pollutants, or the MTD may be required to be placed off-line.

Ensure site constraints (available right of way and available depth) allow the installation of a single MTD for design peak water quality flow rates up to eight (8) cfs. Additional MTDs may be required for water quality event flow rates greater than eight (8) cfs.

The drainage area contributing to an MTD must be 85% impervious or greater in order to use this calculation methodology.

Ensure tail water conditions are accounted for in the MTD design.

MTD Components and Performance Requirements



1. Stormwater Manufactured Treatment Devices (MTDs) Type 1

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

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

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

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

MTD Type 1 must have the following properties:

- Designed for a minimum 80% Total Suspended Solids (TSS) removal efficiency (ASTM D-3977-97 SSC) of coarse sand (125-micron-mean size, OK-110, or F-95 Silica Sand) for the peak flow rate from the water quality event for average influent concentrations ranging from 100 mg/L to 300 mg/L.
- Use settling, separation, swirling, and centrifugal force techniques to remove pollutants from storm water runoff.
- Contain no moving components that require an external power source such as electricity, gas powered engines or generators.

2. Stormwater Manufactured Treatment Devices (MTDs) Type 3

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

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

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



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

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

1. Designed for a minimum 80% Total Suspended Solids (TSS) removal efficiency (ASTM D-3977-97 SSC) for:
2. Coarse sand (125-micron-mean size, OK-110, or F-95 Silica Sand) with average influent concentrations ranging from 1,500 mg/L to 2,000 mg/L (6% target sediment to water concentration) using ASTM 7351 or equivalent laboratory testing methods.
3. Street sweeping sediment load (average particle size of 200 micron) with average influent concentrations ranging from 24,000 mg/L to 26,000 mg/L (2.5% target sediment to water concentration) using ASTM 7351 or equivalent laboratory testing methods.
4. Use separation, settling, swirling, centrifugal force, and filtering techniques to remove pollutants from stormwater runoff.
5. Contain no moving components that require external power sources such as electricity, gas powered engines or generators.
6. Are capable of removing the pollutants of concern for the unique Project requirements.

Drawing Requirements

As part of the permit submittal, submit Working Drawings, Material Certification, and Certification that the MTD meets the requirements of this Specification to the Public Works Director. Ensure the Working Drawings contain at a minimum, MTD name and model and/or serial number, MTD dimensioning, MTD and storm sewer invert elevations, installation drawings, and instructions that completely describe the MTD bearing the seal and signature of a South Carolina registered Professional Engineer. Drawings may be submitted to the Public Works Director in electronic form; PDF format is preferred.



Qualified Product List

Table 15 outlines Charleston County’s approved list of MTD Type 1 manufacturers. Manufacturers’ specifications with certified third party testing results must be submitted and approved by the Public Works Director prior to permit application submission.

Table 15: MTD Type 1 Qualified Product List

Manufacturer	Treatment Device	Contact Number	Website
Contech Construction Products, Inc. 15909 Prestwoods Ln. Huntersville, NC 28078	CDS Products	Phone (704) 502-7485 Fax (877) 511-8119	www.contech-cpi.com
Hydro International 94 Hutchins Dr. Portland, Maine 04102	Downstream Defender First Defense	Phone (207) 756-6200 Fax (207) 756-6212	www.hydro-int.com
Krister Enterprises, Inc. 360 Sutton Place Santa Rosa, CA 95407	Flo Gard Dual Vortex Separator	Phone (707) 524-8181 Fax (707) 524-8186	www.kristar.com
Rinker Materials 208 Randolph St. Thomasville, NC 27360	Stormceptor System	Phone (800) 475-6302 Fax (336) 475-9200	www.rinkerstormceptor.com

*This is not intended to endorse or exclude any manufacturer

There are no qualified manufacturers for type 3 MTDs at this time.



Charleston County Bridge Runoff Requirements

Waterbody Classification	Average Daily Traffic (ADT)		
	<500	>500 - <30,000	>30,000
ORW within 1000 feet of shellfish beds	Bridge Deck Treatment*	Bridge Deck Treatment*	Bridge Deck Treatment*
ORW not within 1000 feet of shellfish beds	Adjacent Roadway Treatment	Adjacent Roadway Treatment	Bridge Deck Treatment*
SFH Waters within 1000 feet of shellfish beds	Adjacent Roadway Treatment	Bridge Deck Treatment*	Bridge Deck Treatment*
SFH Waters not within 1000 feet of shellfish beds	Adjacent Roadway Treatment	Adjacent Roadway Treatment	Adjacent Roadway Treatment
If in a TMDL Watershed or discharging to a 303d listed waterbody impaired for: Cd, Cr, Cu, Ni, Pb, Zn	Adjacent Roadway Treatment	Bridge Deck Treatment*	Bridge Deck Treatment*
If in a TMDL Watershed or discharging to a 303d listed waterbody impaired for: FC or DO	No treatment necessary, limit the use of scupper drains as much as feasibly possible	Adjacent Roadway Treatment	Adjacent Roadway Treatment
SA, SB or FW not in a TMDL watershed or discharging to a 303d listed waterbody or in a TMDL or discharging to a 303d waterbody impaired for pollutants not specifically listed above	No treatment necessary, limit the use of scupper drains as much as feasibly possible	No treatment necessary, limit the use of scupper drains as much as feasibly possible	No treatment necessary, limit the use of scupper drains as much as feasibly possible