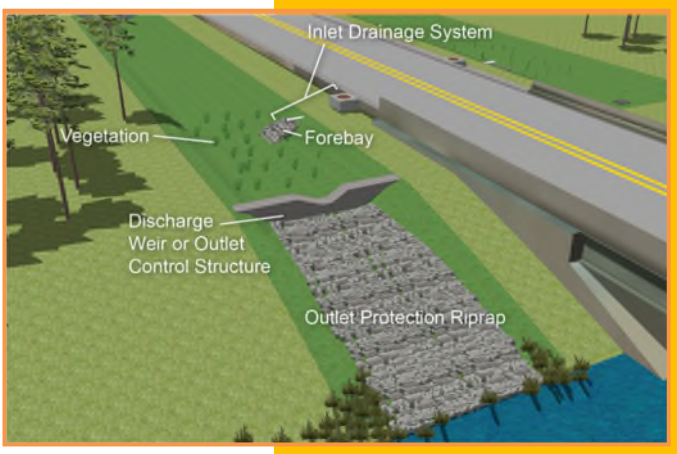
Georgia Department of Transportation



STORMWATER SYSTEM INSPECTION AND MAINTENANCE MANUAL

March 2020

This manual complies with NPDES Stormwater (MS4) Permit Number GAR041000

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ARCADIS Design & Consultancy for natural and built assets
In association with
AECOM

Stormwater System Inspection and Maintenance Manual

Prepared for:
Georgia Department of Transportation

Prepared by:
Arcadis U.S., Inc.
2839 Paces Ferry Road
#900
Atlanta
Georgia 30339
Tel 770 431 8666
Fax 770 435 2666

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Revision No	Date Issued	Location	Description
1	March 2020	Section 2	Updated to four-tier condition assessment rating for post-construction BMPs.
		Section 3	Added GDOT Policy 61612-1 Roadway Inspection Form instructions to Existing Maintenance Practices.
		Section 4	Updated text to be consistent with the drainage inventory database terminology.
		Section 5	Updated route inspection requirements and compliance inspection requirements. Added a discussion on special designs or alternative BMPs not in the manual.
		Section 5	Revised filter strips and grassed channels to be inspected through Day Inspection policy.
		Section 5-10	Removed OGFC inspection and maintenance information and replaced with text referencing the GDOT's pavement management system.
		Section 6-3	Deleted previous "Program Development" section. Revised description of schedule to reference and match permit requirements.
		Appendix B	Revised post-construction BMP inspection checklists to include note fields for major components.

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1 Introduction

1.1 Purpose

This Stormwater System Inspection and Maintenance Manual (I&M Manual) provides a basis for the inspection and maintenance of the Georgia Department of Transportation (GDOT) stormwater system, particularly those structures and conveyances associated with the Municipal Separate Storm Sewer System (MS4). This I&M Manual complies with the requirements of the General National Pollutant Discharge Elimination System (NPDES) Stormwater MS4 Permit No. GAR041000 (MS4 Permit) requiring GDOT to develop and implement programs to prevent or reduce stormwater pollution from its facilities and to perform routine maintenance activities within the permit area.

This I&M Manual presents a program for the long-term inspection and routine maintenance of the drainage system (collection and conveyance) and post-construction stormwater best management practices (BMPs) designed for filtering and/or detention (e.g., detention ponds, wetlands, enhanced dry swales, bioretention basins, and filter strips, among others). It includes recommended inspection frequencies, checklists, and procedures for maintaining the drainage system and post-construction BMPs that are subject to the MS4 Permit. Post-construction stormwater BMPs are referred to as "post construction structures" in the MS4 Permit and they are permanent BMPs, as opposed to temporary BMPs used for erosion and sedimentation control on construction sites. BMPs included in this manual are limited to those that are presently approved for construction by GDOT. The drainage structures that make up the stormwater collection and conveyance system are referred to as “MS4 structures” in the MS4 Permit.

This I&M Manual defines a level and extent of service for the inspection and maintenance of drainage structures within GDOT rights-of-way inside its MS4 designated areas. The program, where possible and with enhancements focused on water quality aspects, incorporates and tailors established GDOT inspection and maintenance policies and practices as mechanisms to achieve the ultimate goals of properly maintaining stormwater BMPs to meet permit requirements.

1.2 Use of this I&M Manual

The guidelines included in this I&M Manual define a standard of practice that is complementary to other standards of practice adopted and implemented by GDOT including the Manual for Erosion and Sediment Control in Georgia, which supports construction activity, and the GDOT Manual on Drainage Design for Highways. This manual may also be used as guidance for the maintenance of drainage structures and water quality structures not subject to MS4 permit requirements.

The objectives of the standards of practice defined in this I&M Manual are to:

- Define inspection and maintenance practices that meet the requirements of the MS4 Permit.
- Define the practices needed to keep stormwater management facilities and their components functioning in accordance with their respective design objectives.

The need to update this I&M Manual will be evaluated periodically and subsequent updates will be undertaken, as needed. Any revisions will be submitted to the Georgia Environmental Protection Division (EPD). The MS4 Permit requires GDOT to verify that procedures documented in this I&M Manual are properly implemented. GDOT will review implementation of the I&M Manual by evaluating the corrective actions identified during compliance inspections and tracking whether the corrective actions have been completed.

2 GDOT Maintenance Policy

The Stormwater I&M Manual is part of GDOT's program to perform routine inspections and maintenance of drainage structures and post-construction stormwater BMPs in accordance with GDOT's MS4 permit requirements. The plan of operation, inspection, and maintenance presented in this manual is based on balancing MS4 Permit compliance, safety of the traveling public, legal obligations, and use of established GDOT maintenance policies and procedures. The plan of operation may change as warranted by modifications to one or more of these factors.

2.1 Extent of Service

For the purposes of GDOT's MS4 program, GDOT's extent of service for its stormwater system falls into two broad categories:

1. Category 1. Within GDOT properties and rights-of-way that are owned and operated by GDOT.
2. Category 2. Outside GDOT owned properties and rights-of-way but within GDOT permanent easements legally accepted by GDOT.

2.2 Level of Service

The policies for maintenance of GDOT's stormwater management system, of which this manual is a part, are based on safety of the public and its employees, flood hazard reduction, environmental protection, asset management goals, regulatory compliance, and fiscal responsibility, among others. The manual defines the frequency and types of inspections and maintenance actions desired to maintain the stormwater conveyance system and asset operation at an acceptable level. GDOT determines drainage structure and BMP condition through field data collection as described in this manual and uses the condition assessment to evaluate if maintenance is required. For drainage structures, condition ratings meeting the criteria highlighted in yellow in Table 1 (located in the Tables section of this manual) are identified as needing work. Drainage structures whose conditions meet these criteria are further prioritized for maintenance by each field district.

For the post-construction stormwater BMPs, each inspection item is assigned a condition rating using a four-tier system:

- *Level 1, Green*. Good condition. No corrective action required.
- *Level 2, Yellow*. Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).
- *Level 3, Orange*. Fair condition. Still functional, but needing non-critical repairs (see corrective action for further details).

- *Level 4, Red*. Poor condition. Needing maintenance, repair, and/or replacement (see corrective action for further details).

Post-construction BMP components whose conditions meet Level 3 and Level 4 are further prioritized for maintenance by each field district.

Inspection procedures and checklists for MS4 structure and post-construction stormwater BMPs and other related information are provided in the following sections and appendices to this I&M Manual:

- Section 4 – Drainage Structures
- Section 5 – Post-Construction Stormwater Best Management Practices
- Appendix A – Drainage Structure Inspection Checklists
- Appendix B – Post-Construction Stormwater BMPs Inspection Checklists

3 GDOT Maintenance Practices

GDOT has a multi-tiered approach to perform both routine and as-needed inspection, maintenance, and corrective actions for drainage structures and post-construction stormwater BMPs. The combination of internal GDOT policies and procedures, implementation of comprehensive maintenance contracts (CMCs), other maintenance services contracts with external contractors, and agreements with local municipalities allow GDOT to provide necessary coverage to achieve permit compliance. Historically, inspections have been centered on stormwater conveyance and condition assessment; however, this I&M Manual focuses on water quality issues, with parallel implementation of the GDOT Facilities Stormwater Pollution Prevention Plan (F-SWPPP) and Illicit Discharge Detection and Elimination Plan (IDDE Plan).

3.1 Existing Maintenance Practices

GDOT maintains a system of practices that address the inspection and maintenance of drainage structures within various operations. The procedures described in this I&M Manual are an integral part of this system, which includes guidelines from the following documents:

- *Manual on Drainage Design for Highways*. This manual provides an overview of drainage guidelines and references to appropriate design procedures to address environmental issues and other site-specific concerns. GDOT recently expanded this manual to include design guidance for post-construction stormwater BMPs.

- *GDOT Policy 61612-1 Roadway Inspection Form Instructions.* The policy provides instructions for completing a roadway inspection report and states that the Maintenance Area Manager is responsible for the condition of the entire roadway and roadside, including pavement system, drainage, shoulders, vegetation, guardrail, signs, pavement markings, and bridges. The roadway inspection form is an exception report where only items that are deficient or need correction are reported.

- *Post-Construction BMP Maintenance and Construction Inspection Checklists.* These checklists will be used to document the condition of newly constructed BMPs during final inspection. The Environmental Compliance Specialist (ECS) uses the construction and maintenance inspection forms to evaluate the BMP after construction is complete and to document acceptance of maintenance responsibility.

- *Drainage Inspection Manual for Minor Drainage Structures*. Apart from general guidelines for the drainage inspection of minor drainage structures, this manual summarizes the material handling and storage procedures for use during storm sewer system repair. The manual presents a program to be used for inspection of drainage structures, including MS4 classified structures. These inspections, scheduled from December 1 to March 31, are conducted by routine maintenance personnel, but the Assistant Area Engineer of Maintenance is responsible for confirming that these

inspections and maintenance are performed correctly. Other non-routine inspections are performed and instances of repair, modification by construction, or abandonment are documented. The inspection procedures follow the GDOT Drainage Inspection Manual for Minor Drainage Structures.

Inspection criteria of the Drainage Inspection Manual for Minor Drainage Structures are as follows:

- Purpose of the inspection
- Inlet/outlet conditions
- Inlet/outlet ditch conditions
- Siltation, debris, pollutants.

The Biennial Drainage Structure Inspection Form includes:

- Structure location
- Stream type
- Pipe information
- Inlet and outlet headwall, apron, and end section details
- Structural conditions
- Corrective actions required for cleaning, repair, or replacement.

Acquired data from these inspections are entered into the Biennial Drainage Inspection Module of the Georgia Asset Management System (GAMS) or a similarly capable database that tracks the overall operational and structural conditions for drainage structures and corrective actions.

GDOTs Maintenance Management System (MMS) uses activity codes to describe and track certain maintenance activities. The following MMS activity codes are MS4 relevant maintenance activities:

- Activity 400: Manual Clean Drain Structure. This activity involves cleaning pipes, culverts, catch basins, drop inlets, and paved flumes by manually removing accumulated dirt and debris. A Special Performance Condition requires that structures be inspected routinely for cleaning based on the condition of the structure.
- Activity 405: Mechanical Clean Drain Structure. This activity involves mechanical cleaning of pipes, structures, and retention/detention facilities, including follow-up reporting if a structure requires additional corrective actions.
- Activity 410: Clean/Restore Ditches. This activity includes cleaning, reshaping, and re-establishment of vegetation of roadside and outfall ditches, and restoring the grade line if necessary to maintain adequate drainage. Special Performance Conditions require work as soon as practical in ditches where silt has accumulated or where obstructed or blocked drainage is evident.

- Activity 415: Pipe Install/Repair. This activity includes repairs or new installations of items such as pipe, headwalls, wing-walls, and aprons to maintain adequate drainage. Repairs may also be performed by internal lining or grouting.
- Activity 420: Build/Repair Concrete Structure. This activity involves repairs or construction of catch basins, drop inlets, ditch paving, curb and gutter, and septic tanks, among other items.
- Activity 540: Litter Patrol. This activity includes removal of unwanted and/or unauthorized objects from roadways and rights-of-way such as tire fragments, dead animals, and collected litter. Visual inspections of post-construction BMPs are performed during this activity.
- Activity 545: Litter Pick-up/Full. This activity includes full-width cleaning of continuous sections of the right-of-way to remove unsightly objects and obstructions to drainage. Special Performance Conditions require scheduling throughout the year as required, especially prior to mowing.
- Activity 900: Schedule Inspections. Description includes performing annual Pavement Conditions Evaluation System (PACES) inspections, Portland Cement Concrete (PCC) Pavement Evaluations, Day and Night Roadway Inspections, Drainage Inspections, and other assigned roadway inspections. Work categories reiterate the above inspection types as well as inspection of CMCs. Recommended procedures specify that inspections should be performed based on the most current GDOT policies, within the specified time frames.

GDOT will continue to perform preventive maintenance measures to reduce sources of sediment and debris from entering stormwater systems. These preventive maintenance measures may include highway sweeping efforts (both by GDOT and contracted) to remove dirt, grit, and sediment from the roadways and drainage system. GDOT will also continue trash and litter pick-up, with internal schedules for maintenance crews, and as part of right-of-way mowing contracts, CMCs, and other maintenance service contracts. GDOT's GAMS includes a summary which accounts for actual work quantities for a given period.

- *General Facility Environmental Guidelines*. These guidelines present procedures for material handling and storage for various activities conducted by GDOT. The guidelines are focused on GDOT operations, maintenance, storage, administrative, and public use facilities, each of which has some type of stormwater system. Typically, facilities are inspected twice annually for safety, general housekeeping, and facility handling of potential pollutants (e.g., fuels, oils, coolants, herbicides/pesticides, chemicals, used batteries, scrap tires, wash water, waste disposal). A Maintenance Facility Checklist, which is included in this document, identifies conditions found and provides guidance for any needed corrective actions. With the parallel development and implementation of the GDOT Facilities SWPPP,

each of these facilities within designated MS4 areas will undergo scheduled, site-specific MS4 inspections.

- *Integrated Roadside Vegetation Management Herbicides Standards Manual.* This manual summarizes the procedures for herbicide handling and storage.
- *Environmental Compliance, Requirements for GDOT Maintenance Activities and Operations.* This document presents requirements for GDOT maintenance activities and operations and outlines permit notifications that may be required by EPD and/or U.S. Army Corps of Engineers (USACE) for potential maintenance work. The tasks identified in the document include mechanical cleaning of drainage structures, ditch cleaning and restoration, storm drain pipe installation and repair, and culvert repair. According to this document, none of these tasks require a Notice of Intent with EPD or a Preconstruction Notification with USACE (unless work will be performed in live streams).
- *Drainage Maintenance Manual.* GDOT's maintenance personnel use this manual to identify drainage deficiencies and determine the best procedures for correcting them. Drainage facilities included in the manual are pipe and box culverts, storm sewers, drop inlets and catch basins, high shoulders, low shoulders/edge ruts, ditches, slope drains, flumes, and curbs and gutters.
- *Integrated Roadside Vegetation Management (IRVM) Straight Line Mowing Standards Manual.* This manual establishes uniform mowing procedures throughout the state.

3.2 Inspection and Maintenance Performed By Contractors

GDOT external specialty maintenance contracts will provide several services, including annual cleaning of identified storm drain structures. Whether included as an aspect of a district or statewide sweeping and (identified in Section 3.1 as a preventive measure) storm drain cleaning services contract or an interstate corridor-specific CMC, storm drainage structures will receive GDOT's attention via these contracts.

Contracts to provide highway sweeping services also include provisions for cleaning storm drainage structures and pipes. The scope of storm drainage structure cleaning involves removal, as feasible, of covering grates for items such as median barrier wall box inlets, drop inlets, catch basins, gutter drains, ramp drains, and bridge end drainage inlets, and vacuum removal of debris from the throat and chamber areas of the structures and from 15 feet in each direction of the connecting piping. The location, e.g. global positioning system (GPS) coordinates, GDOT district, route designation, and nearest milepost are collected, as feasible and based on the contract terms, for each structure, as well as any notation of corrective action recommended. In addition, through

highway sweeping, right-of-way mowing, or other contracts, litter and other debris encountered during these activities is removed, quantified, and disposed.

Other similar external contracts encompass a broader array of highway and right-of-way maintenance activities (e.g., inspecting drainage structures [biennially (or every other year)] and addressing inlet/outlet overgrowth of vegetation or erosion, damages due to siltation, cracking, joint failures, blockages).

Language requiring contractors to provide GDOT with maintenance records consistent with the drainage structure and post-construction stormwater BMP database will be included in all new maintenance contracts. District ECS and District Maintenance Contracts Engineers should be aware of the reporting requirement for each maintenance contract.

3.3 Inspection and Maintenance Performed by Others

GDOT will continue to enter into various contracts for maintenance of highways and memorandums of agreement with cities, counties, and other stakeholders in MS4 designated areas to perform new construction as well as maintenance of existing facilities under the terms of the agreements. These agreements will allow GDOT the necessary oversight to manage potential problems, conduct timely inspections, and perform corrective actions promptly and effectively. Details of these efforts as they relate to drainage structures may be tracked using GAMS.

4 Drainage Structures

GDOT has installed, operated, and maintained stormwater drainage structures to provide safe and effective drainage along its highways. These same systems may also transport roadway pollutants as water flows from impervious areas and erodes less stable surfaces. These pollutants may discharge to streams, rivers, lakes, marshes, and other water bodies. GDOT has measures in place to lessen pollutant loads. These measures include increasing efforts to reduce and pick up roadside litter, performing highway sweeping operations, cleaning catch basins and inlets and enhancing stormwater system inspection programs.

Drainage structures are defined as collection and conveyance system components comprising pipes, ditches, channels, swales, manholes, junction boxes, catch basins, drop inlets, and other structures designed to manage and safely direct storm runoff from roadways and GDOT facilities. Indicators of drainage structure problems include structural damage, erosion, corrosion, and blockages from animals, debris, siltation, and vegetation. Structural condition and the ability of drainage structures to allow water to flow through them relates directly to water quality. Failure or damage of these structures could lead to the release of sediment, debris, and potential pollutants to receiving waters.

The inspection and maintenance of drainage structures, as presented in this manual, extends the purpose of GDOT's current inspection and maintenance policy and procedures to reduce the potential of adversely affecting water quality. Drainage structures do not include bridge structures or roadway culverts[1] as defined by federal code and GDOT. The inspection and maintenance of these structures is not discussed in this manual.

Routine inspection and maintenance of drainage structures must be conducted so that the structures function as designed structurally and hydraulically, and to prevent the potential discharge of pollutants to receiving waters. Two types of inspections are performed on drainage structures: day inspections and compliance inspections.

Day Inspections

Drainage structures are scheduled to be inspected at least annually during day inspections according to GDOT Policy 6162-1 Roadway Inspection Form Instructions. The Roadway Inspection Report form will be an exception report. Only items that are deficient or need correction are reported. Deficiencies will include those items normally performed by the Routine Maintenance Crews and those items performed by others. It will be the responsibility of the Maintenance Area Manager to ensure that deficiencies are corrected. Completion of Roadway Inspection Reports are recorded in GAMS using Activity 900 Schedule Inspections with work description of Day/Night Time Inspections.

[1]If the clear span is more than 20 feet (Drainage Inspection Manual for Minor Drainage Structures).

Inspection may also include observation and corrective action of potential illicit discharges, as defined in the IDDE Plan. Completion of work is recorded in GAMS using applicable activity codes.

Compliance Inspections

The frequency of compliance inspections is identified in the MS4 Permit and a summary of inspections is required for the MS4 annual report. Compliance inspections are stored in GDOT's MS4 drainage inventory database and are performed using detailed Drainage Structure Inspection Checklists provided in Appendix A. Although the checklists included in Appendix A provide the basics of the inspection criteria and may be manually used, an electronic process is the primary method for recording inspection data. Table 1, located in the Tables section of this manual, offers an abbreviated exhibit of the detailed attributes collected.

The State Maintenance Office identifies drainage structures for maintenance based on the condition assessment results from compliance inspections. Each district prioritizes the identified structures for maintenance, schedules, and completes the work. Districts send their prioritization and schedule to the Office of Design Policy and Support. The maintenance is performed following the maintenance approach and guidelines established in the *Drainage Maintenance Manual* and other existing maintenance practices. Completion of work is recorded in GDOT's MS4 drainage inventory database and in GAMS using applicable activity codes. Work completed is summarized in the MS4 annual report.

The remainder of this section presents structure specific inspection and maintenance procedures and protocols, incorporating relevant inspection protocols from the Drainage Inspection Manual for Minor Drainage Structures.

4.1 Pipe Systems

4.1.1 Description and Function of Structure

Pipe systems are linear systems designed to collect, convey, and direct roadway runoff safely and effectively away from the roadway surface. These component structures are typically part of an interdependent conveyance system. The impairment of one pipe segment can compromise the functionality of the larger system.

Pipe structures are constructed from a variety of materials in accordance with GDOT specifications. The most common pipe structures include concrete and corrugated metal conduits that are designed or constructed primarily for subsurface stormwater runoff conveyance.

4.1.2 Inspection and Maintenance

Pipe systems are subject to functional impairment by a variety of conditions, including:

- Blockage or obstruction due to vegetation, debris, sediment or other objects
- Cracks and/or joint separation
- Collapsed pipe
- Corrosion
- Root intrusion
- Bent or chipped pipe ends
- Leakage
- Liner damage
- Lack of stabilization
- Moderate erosion
- Severe erosion

Figures 4.1-1, 4.1-2, 4.1-3, and 4.1-4 depict some of these conditions.

Figure 4.1-1
Pipe Conveyance Blocked with Sediment

Figure 4.1-2
Pipe Separation

Figure 4.1-3
Pipe Conveyance with Trash

Figure 4.1-4
Severe Erosion and Collapse

The inspector observes and notes any of the following conditions on the checklist provided in Appendix A Form A-1 to determine appropriate actions to remedy functional impairments:

- Surface over the pipe system for settlement or lost cover.
- Scouring or undermining, including evidence of animal burrows.
- Blockage due to excessive vegetation, particularly trees or other woody vegetation.
- Blockage due to the deposition of sediment and other debris. The inspector should estimate the severity of the sediment or siltation by estimating the depth of the deposits relative to the diameter of the pipe and recording the information on the inspection form. Water, sediment, and other debris in the structure often prevent a

proper inspection of the structure. In these cases, every effort should be made to clear the structure so that an inspection can be performed.

- Pipe deformation or collapse. Pipes that have taken on a non-circular shape indicate a structural deficiency that could cause the structures to collapse and/or reduce the flow capacity of the system.
- Corrosion of metal pipes. Corrosion of the pipe reduces structural integrity and may create conditions for undermining and erosion. If the invert is rusted out and deformation is present, the pipe is in danger of collapse.

In some cases, due to the size, length, and/or condition of the structure, the inspector may not be able to perform the inspection. For these cases, blockage, erosion type, or defect attributes are noted as unknown. Districts should view these structures in the field to determine the type of maintenance corrective action required.

The inspector records the inspection, performance condition assessment, and recommend action on Form A-1 (Appendix A).

4.2 Ditches, Channels, and Swales

4.2.1 Description and Function of Structure

Ditches, channels, and swales are open, linear systems designed to safely and effectively collect, convey, and direct roadway runoff away from the roadway surface. These structures are typically part of a larger conveyance system with many interconnected components where the impairment of one component can compromise the functionality of the larger system.

These structures may be armored (e.g. concrete lined) but also include natural or grass channels. Enhanced vegetated swales and channels designed for filtering and/or detention to provide water quality treatment are designated as post-construction stormwater BMPs.

4.2.2 Inspection and Maintenance

Ditch, channel, and swale systems are subject to functional impairment by a variety of conditions, including:

- Concrete liner cracks, including damage from equipment or motor vehicles,
- Joint separation, or blowout
- Obstruction due to debris, sediment, animal activity, excessive vegetation, or other objects
- Lack of stabilization due to undermining or scouring of soils beneath channel linings causing structural failures of the concrete
- Root intrusion
- Out of bank flow (surcharged flow)

- Lack of adequate vegetative cover for grass-lined channels
- Moderate erosion
- Severe erosion

Figure 4.2-1 shows cracks and joint separation in the concrete channel. Note: removal of the vegetation may prevent further joint separation.

Figure 4.2-1
Cracks and Joint Separation in Concrete Channel

The inspector observes and notes any of the following conditions using Form A-2 in Appendix A to determine appropriate actions to remedy functional impairments.

Ditches, swales, and drainage channels should be maintained to the line, grade, depth, and cross section to which they were constructed or subsequently improved. Settlement should be corrected and repairs of broken or eroded surfaces should be made with appropriate materials.

Ditches, swales, and drainage channels should be kept reasonably clear of obstructing materials and kept clean of debris and trash that may impede the normal flow of water. These include gutters or curbs used along the side of a roadway surface to collect and control the flow of water and direct it to an inlet or outlet ditch, catch basin, or shoulder drain leading the water into a nearby stream or other natural watercourse.

The inspector records the ditch, swale, and drainage channel inspection, performance condition assessment, and recommended action on Form A-2 (Appendix A).

4.3 Manholes, Junction Boxes, Catch Basins, Inlets, and Outlets

4.3.1 Description and Function of Structure

Manholes, junction boxes, catch basins, inlets and outlets are junction and connection points for the linear system described in Section 4.2 and are designed to safely and effectively collect, convey, and direct roadway runoff away from the roadway surface. These structures are typically part of a larger conveyance system with many interconnected components where the impairment of one component can compromise the functionality of the larger system.

These structures are constructed conveyances made from a variety of materials in accordance with GDOT specifications.

4.3.2 Inspection and Maintenance

These structures are subject to functional impairment by a variety of conditions, including:

- Structural damage including from motor vehicles
- Cracks/joint separation at inlet and outlet connections
- Leaking due to cracks and joint separation
- Top covers broken or missing
- Corrosion
- Blockage in structure due to debris, sediment, vegetation, or other objects
- Moderate erosion
- Severe erosion

Some of these conditions are shown on Figures 4.3-1 through 4.3-4.

Figure 4.3-1
Missing Proper Cover

Figure 4.3-2
Debris Accumulation

Figure 4.3-3
Grate Blockage

Figure 4.3-4
Sediment/Debris Buildup

The inspector observes and notes any of the following conditions using Form A-3 in Appendix A to determine appropriate actions to remedy functional impairments.

Like other drainage structures, manholes, junction boxes, catch basins, inlets and outlets are subject to structural degradation, blockage, and sediment and debris accumulation. They must be routinely inspected and maintained to continually function as designed structurally and hydraulically and to prevent the potential discharge of pollutants to receiving waters.

These structures are typically found at GDOT facilities and along the highway right-of-way, and therefore have the potential to collect and accumulate sediment, debris, and trash.

Catch basins designed with a sump at the base act to trap sediment and debris. It is important to remove and properly dispose of the accumulated material in the sump so that it can continue to function as designed and reduce the amount of sediment, trash, and other debris that enters the storm drain and is transported to surface waters.

The routine removal of trash and other debris from inlet and outlets structures reduces the potential for clogging during storm events and reduces the amount of sediment and debris released to receiving waters.

The inspector records the inspection, performance condition assessment, and recommended action on Form A-3 (Appendix A).

5 Post-Construction Stormwater Best Management Practices

Table 4.2.5 of GDOT's Permit GAR041000, defines post-construction stormwater structures as those "designed for filtering and/or detention." These structures/controls are engineered to filter, infiltrate, detain, and/or retain stormwater flows to allow the removal of pollutants prior to discharge into waterways. Post-construction structures, also referred to as post-construction stormwater BMPs or permanent BMPs, are designed to stay in place and treat runoff from impervious surfaces. These are different from temporary erosion and sediment control practices used during construction (e.g., silt fences, sediment basins). Unlike many temporary BMPs used for sediment control during construction, most of the post-construction stormwater BMPs included in this manual rely on healthy vegetation to maximize pollutant removal effectiveness. During design, vegetation is specifically selected for each BMP to provide:

- Filtration of sediments and attached pollutants
- Infiltration and evapotranspiration of runoff
- Protection of soil from erosion

Most BMPs need to maintain a healthy stand of vegetation to achieve their water quality objectives. Post-construction stormwater BMPs are an important part of GDOT's stormwater infrastructure and need to be identified, inventoried, maintained, and inspected. Once identified, they are inventoried and recorded in GDOTs post-construction stormwater database. Only those structures in the database are subject to the MS4 Permit requirements and this I&M Manual unless the department includes others constructed for purposes other than MS4 compliance.

Maintenance

Regular maintenance of post-construction stormwater BMPs keeps them functioning as designed and reduces the need for costly major repairs. Table 2, located in the Tables section of this manual, defines regular maintenance activities and activity frequencies for common post-construction stormwater BMP types.

Maintenance personnel may encounter situations where a BMP has become significantly overgrown, damaged, or require significant repairs. For situations requiring construction type activities or significant clearing, Office of Environmental Services (OEnvS) should be contacted to ensure that no environmental permitting will be required prior to beginning work activities. This guidance should be especially followed in cases where streams, lakes, wetlands, or stream buffers may be disturbed. A special email address that is regularly monitored for questions specific to environmental concerns has been created to ensure guidance is provided where appropriate. Email guidance requests to Ecology_Submittals@dot.ga.gov.

Occasionally, maintenance personnel may encounter environmentally sensitive areas that require modifying the typical maintenance approach. ESAs are specifically designated areas that denote special conditions regarding environmental or cultural resources subject to protection by the state. These areas are indicated by ESA signage. Examples of protected resources can include but are not limited to:

- Threatened or endangered plant species
- Cultural or historical areas
- Stream buffers or wetlands

ESA Sign with Restriction Guidance

Typical ESA Sign

Encountering an ESA does not prevent maintenance on facilities such as BMPs but may require adjusting procedures to restrictions noted by the presence of the ESA. Examples of ESA restrictions that might be found include:

- Seasonal mowing restrictions due to threatened or endangered plant species
- Restrictions on the use of pesticides / herbicides
- Limits on digging due to nearby cultural / historical resources
- Limits on clearing due to buffers, etc.

It may not be possible to determine the restrictions imposed by ESAs while in the field performing work. Therefore, should ESA signage be encountered, maintenance personnel should stop work in and adjacent to the ESA and contact the OEnvS. OEnvS will research the ESA to determine what restrictions were put in place at the time the ESA was established. Email guidance requests for ESAs to Ecology_Submittals@dot.ga.gov. Once guidance has been provided by OEnvS, a maintenance plan should be developed to achieve required maintenance activities while complying with ESA restrictions.

Post- construction stormwater BMPs are subject to two types of inspections: route inspections and compliance inspections.

Route Inspections

Except for open-graded friction course (OGFC), post-construction stormwater BMPs are inspected at least annually during route inspections. Completion of route inspections are recorded in GAMS using Activity 540 Litter Patrol with a work description of MS4 Route Inspection. The frequency of route inspections may be increased depending upon past maintenance history or the risk associated with safety or non-compliance should the BMP fail to perform as designed. Route inspections may also be required after major storm events. Maintenance personnel performing route inspections at a minimum look for:

- Erosion
- Trash
- Condition of vegetation
- Structure damage
- Damage to inlet or outlet structures

Corrective actions identified during route inspections are reported to the ECS for further investigation. Completion of maintenance or repair work is recorded in GAMS using applicable activity codes.

Compliance Inspections

The frequency of compliance inspections is identified in the MS4 Permit and the inspection results are required for the MS4 annual report. Compliance inspections are performed according to the BMP type. Compliance inspections for filter strips and grass channels are conducted during Day Inspections according to GDOT Policy 6162-1 Roadway Inspection Form Instructions. The Roadway Inspection Report form will be an exceptions report. Only items that are deficient or need correction are reported.

Compliance inspections for enhanced swales, infiltration trenches, sand filters, dry detention basins, wet detention ponds, stormwater wetlands, bioslopes, and bioretention basins are conducted using the inspection checklists provided in Appendix B. Although the checklists included in Appendix B provide the basics of the inspection criteria and may be manually used, an electronic process is the primary method for recording inspection data. OGFC BMP compliance inspections are conducted as part of GDOT's pavement evaluation system (PMS) and are discussed in Section 5.11.

Maintenance needs or corrective actions identified during compliance inspections are reported to the ECS or Area Engineer who prioritizes and schedules the work. The type of work and date completed is recorded by the ECS and submitted to the Office of Design Policy and Support (ODPS) to include in the annual report.

Sections 5.1 through 5.12 describe the major components, function, and inspection and maintenance requirements for:

- Filter Strips
- Grass Channels
- Enhanced Swales
- Infiltration Trenches
- Sand Filters

- Dry Detention Basins
- Wet Detention Ponds
- Stormwater Wetlands
- Bioslopes
- Bioretention Basins
- Open Graded Friction Course
- Optional Components

The above post-construction stormwater BMPs are also identified and described in the GDOT Manual on Drainage Design for Highways (Drainage Design Manual). Inspectors should refer to the Drainage Design Manual for design and performance specifications. For BMPs not included in Section 5 of this manual, inspectors should reference project design drawings and specifications for specific maintenance information or manufacturer recommendations for manufactured devices. BMPs designed prior to the Drainage Design Manual may be assigned to one of the BMP types and inspected using the corresponding inspection process.

5.1 Filter Strips

5.1.1 Description and Function of Structure

Filter strips are uniformly graded and permanent areas of dense vegetation located between runoff pollutant sources (e.g., road and highway shoulders, medians, other paved areas) and post-construction stormwater BMPs or receiving water bodies. Vegetated filter strips may be constructed of turf, meadow grasses, or other dense vegetation. Filter strips may also surround a drainage structure (e.g., drop inlet), as shown on Figure 5.1-1.

Figure 5.1-1 Channel between Filter Strip (left), Filter Strip around Drop Inlet (right),

Filter strips remove pollutants from stormwater runoff through increased sedimentation. Filter strips require sheet flow across the filter strip to perform as designed which may necessitate the inclusion of a level spreader at the top of the slope of the filter strip. Filter strips reduce the stormwater temperature and encourage filtration and infiltration, which are facilitated by vegetation. Figure 5.1-2 shows a typical filter strip configuration and components.

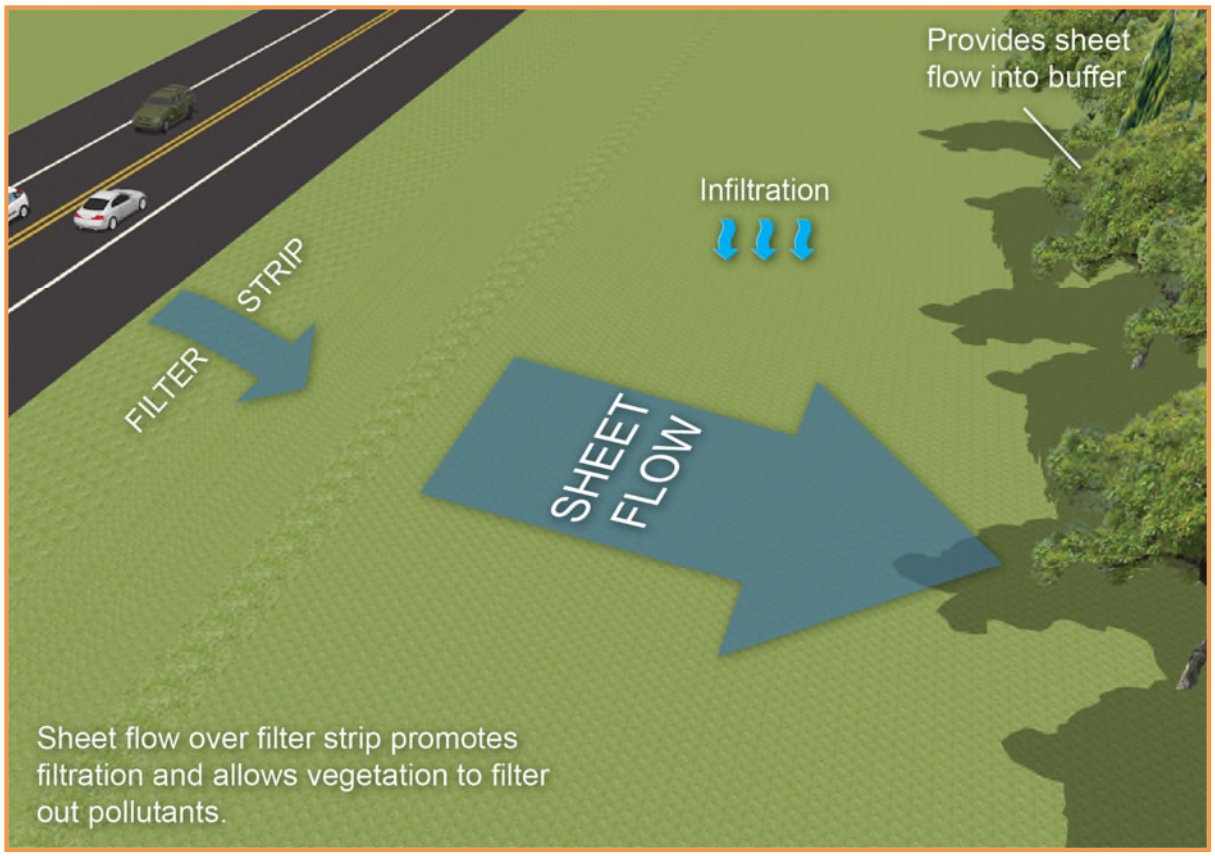


Figure 5.1-2 Typical Filter Strip Configuration and Components

The following key functional features of filter strips must be maintained:

- Runoff sheet flows across the entire filter strip.
- Uniform sheet flow conditions at the interface of the filter strip and the adjacent land cover, such as the buffer shown on Figure 5.1-2.
- Energy dissipation structures (if present), such as flow spreaders or gravel diaphragms to control inflow velocity and erosive energy.
- Dense and uninterrupted vegetation.

Section 5.1.2 recommends inspection and maintenance practices for maximizing filter strip performance.

5.1.2 Inspection and Maintenance

Filter strips are preferred BMPs because they are adaptable in a linear setting and are highly cost-effective. Inspections of filter strips should be conducted at least annually during periodic route inspections. Compliance inspections of filter strips are conducted during Day Inspections according to GDOT Policy 6162-1 Roadway Inspection Form Instructions (Appendix C). The Roadway Inspection Report form will be an exceptions report. Only items that are deficient or

need correction are reported. Deficiencies will include those items normally performed by the Routine Maintenance Crews and those items performed by others. It will be the responsibility of the Maintenance Area Manager to ensure that deficiencies are corrected. Completion of Roadway Inspection Reports are recorded in GAMS using Activity 900 Schedule Inspections with work description of Day/Night Time Inspections.

5.2 Grass Channel

5.2.1 Description and Function of Structure

A grass channel is typically a broad and shallow vegetated channel with trapezoidal or parabolic geometry and a slight longitudinal slope, and is used to convey and treat stormwater runoff. Figure 5.2-1 shows two examples of a roadside grass channel. A grass channel functions as a "biofilter" and is planted with grassy vegetation to filter and capture sediment to improve water quality. A grass channel is commonly used as part of a “treatment train” approach to improve water quality. A grass channel differs from the enhanced dry swale design because it does not have engineered filter media to promote additional pollutant removal and therefore has a lower pollutant removal rate than an enhanced dry or wet swale. A grass channel in pervious soil reduces stormwater runoff volume by partially infiltrating runoff from small storm events. Figure 5.2-2 shows a typical grass channel configuration and components.

Figure 5.2-1 Two Examples of a Roadside Grass Channel

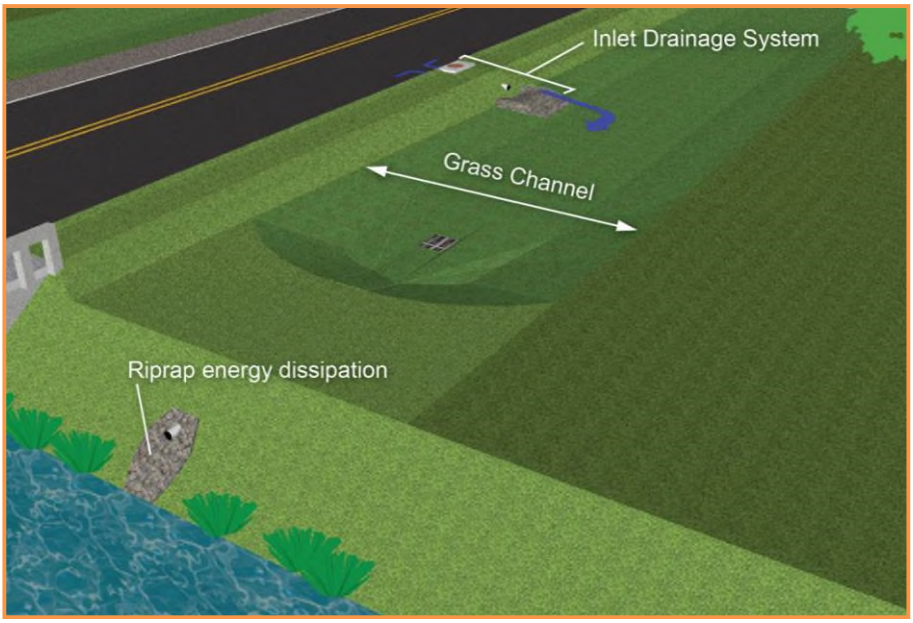


Figure 5.2-2 Typical Grass Channel Configuration and Components

Key functional features of grass channels that must be maintained include:

- Serve as pretreatment for other post-construction stormwater BMPs in a "treatment train" system.
- Maintain dense and uninterrupted vegetation for optimal filtration.

Section 5.2.2 recommends inspection and maintenance practices for maximizing grass channel performance.

5.2.2 Inspection and Maintenance

Inspections of grassed channels should be conducted at least annually during periodic route inspections. Compliance inspections of grass channels should be conducted during Day Inspections according to GDOT Policy 6162-1 Roadway Inspection Form Instructions. The Roadway Inspection Report form will be an exception report. Only items that are deficient or need correction are reported. Deficiencies will include those items normally performed by the Routine Maintenance Crews and those items performed by others. It will be the responsibility of the Maintenance Area Manager to ensure that deficiencies are corrected. Completion of Roadway Inspection Reports are recorded in GAMS using Activity 900 Schedule Inspections with work description of Day/Night Time Inspections.

Gravel Diaphragm (optional) and Stone Check Dam (optional)

See Section 5.12 for guidance on inspection and maintenance of optional components.

5.3 Enhanced Swales

5.3.1 Description and Function of Structure

Enhanced swales are vegetated open channels designed and constructed to capture and treat stormwater runoff. Figure 5.3-1 shows examples of two types of enhanced swales: enhanced dry swale and enhanced wet swale. Enhanced swales are considered low impact development (LID) and green infrastructure (GI) practices. Specific features are incorporated in the design of the swales to enhance stormwater pollutant removal effectiveness, distinguishing the enhanced swale from a grass channel post construction stormwater BMP.

Figures 5.3-2 and 5.3-3 show typical configurations and components of enhanced dry swale and enhanced wet swale, respectively. Enhanced dry swales are designed to temporarily capture runoff behind a series of small earthen berms placed across the flow and along the length of the swale. Runoff enters the swale through a forebay which is designed and constructed to reduce velocity and promote sedimentation. Runoff leaves the forebay and enters the swale where it infiltrates through a filter media into an underdrain which freely discharges to a ditch, channel, pipe system, or outfall located at that end of the enhanced swale.

Enhanced wet swales have a permanent pool of water maintained by a weir or other structure located at the end of the swale. Runoff will enter the swale displacing clean water located within the swale. Over time, the pollutants will settle out or be removed by wetland vegetation between storm events.

Key functional features of enhanced dry swales that must be maintained include:

- Filter bed of engineered soil media that filters pollutants from stormwater.
- Underdrain system that collects the filtered stormwater and discharges the filtered water downstream.
- Vegetation that provides pollutant removal and aesthetic benefits.

Key functional features of enhanced wet swales that must be maintained include:

- Channel designed to retain water.
- Wetland vegetation that provides pollutant removal and aesthetic benefits.

Figure 5.3-1 Examples of a Dry (left) and a Wet Swale (right) (source: Georgia Stormwater Management Manual [GSMM], Volume 2)

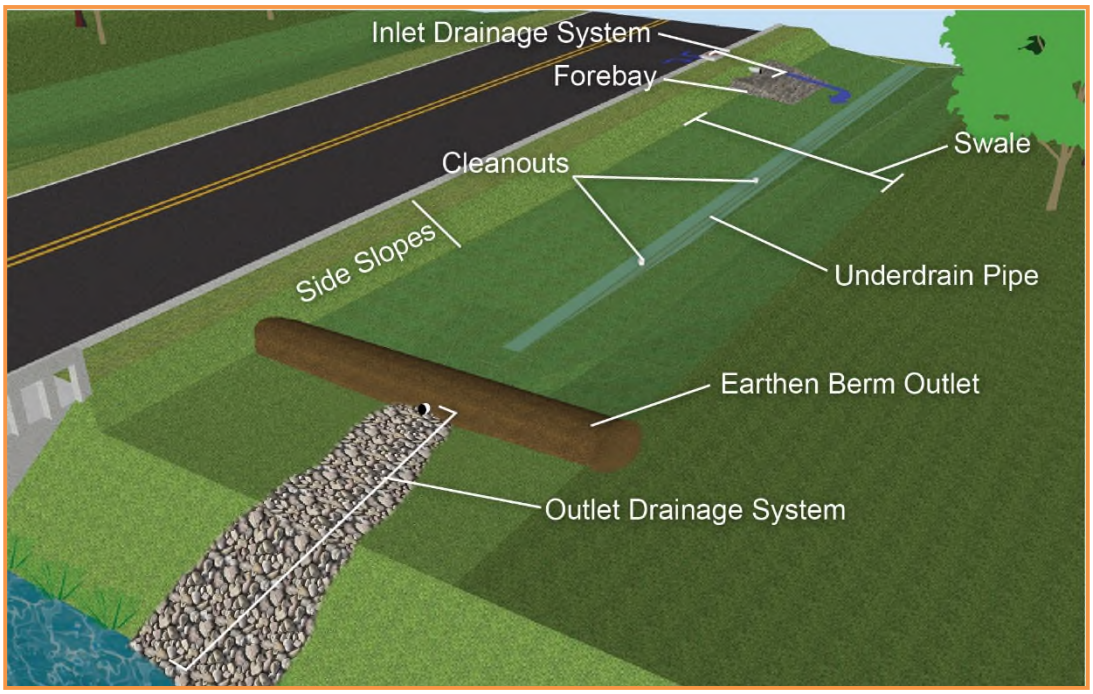


Figure 5.3-2 Typical Enhanced Dry Swale Configuration and Components

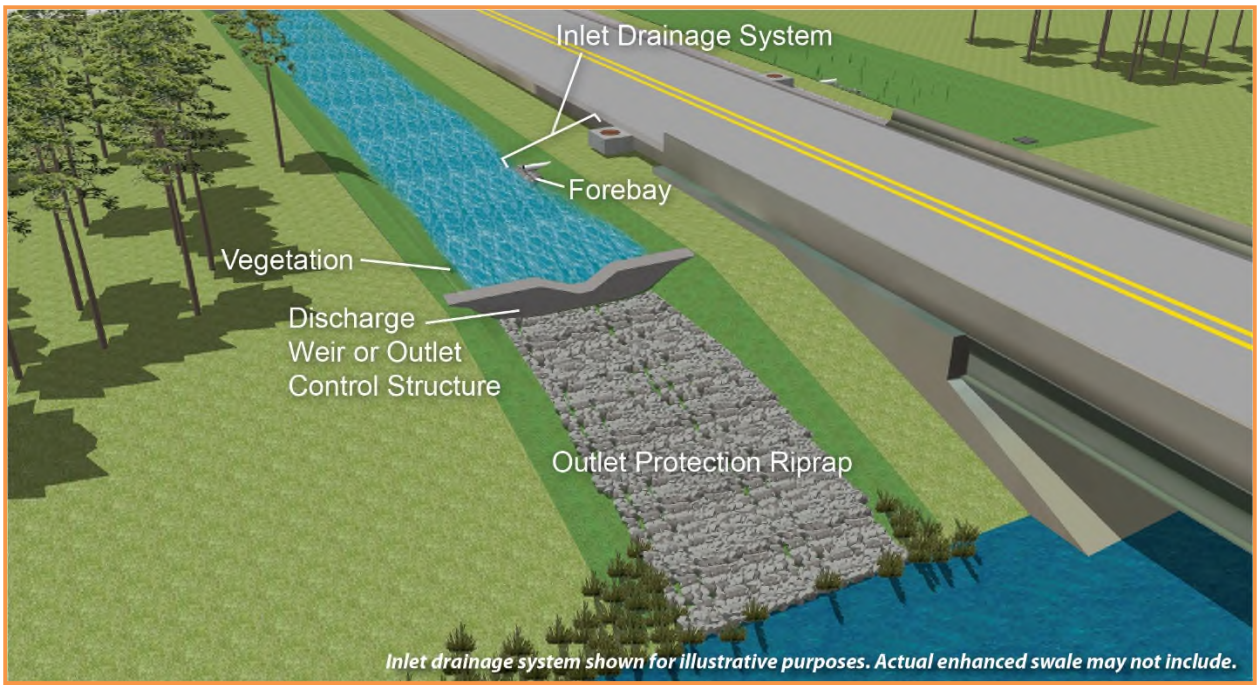


Figure 5.3-3 Typical Enhanced Wet Swale Configuration and Components

Section 5.3.2 recommends inspection and maintenance practices for maximizing enhanced swale performance.

5.3.2 Inspection and Maintenance

Enhanced swales are adaptable in a linear setting and are moderately cost-effective. Inspections of enhanced swales should be conducted at least annually during periodic route inspections. The inspector documents observed conditions during compliance inspections using Form B-1 (Appendix B), determines appropriate actions to remedy functional impairments per this I&M Manual, and documents routine or as-needed maintenance performed.

Inlet and Outlet Drainage Systems

Enhanced swales may not have a structural inlet and flow may enter directly from the roadway via a filter strip. Section 5.1 discusses filter strip inspections and maintenance. There are three potential outlet control structure configurations for enhanced swales: retaining wall outlet weir, earth berm outlet, and concrete drop inlet.

- **A1: Inspect for trash, debris, and sediment:**
  - Remove trash and vegetative debris or sediment that has the potential to inhibit flow into or out of the enhanced swale.
- **A2: Inspect for signs of erosion:**
  - Repair eroded areas by resodding or reseeding. Sod should be thin cut and with a low clay content. Restore compacted fill, filter fabric, and rock riprap (if present). If erosion is a recurring problem, consult a design professional.
  - Identify and control the source of erosion damage if soil is exposed or erosion is evident in the channel bottom or side slopes.
  - Check the upstream areas for bank stability and evidence of seeping water or scour holes.

- **A3: Inspect inlet and outlet pipes for damage or clogging:**
    - Repair or replace damaged piping if needed.
    - If clogged, remove material and identify and mitigate the source of sediment or debris.

Forebay

- **B1: Inspect for sediment accumulation in forebay:**
    - Remove and dispose of sediment off site if it appears to occupy more than 50 percent of the forebay's storage capacity.
    - If surrounding soil is disturbed during cleanout of the forebay, reseed any areas of bare soil.

- **B2: Inspect forebay for presence of woody vegetation:**
    - Remove vegetation that threatens the function or integrity of the forebay such as woody vegetation that may cause structural deterioration or make removal of sediment from the forebay difficult.

- **B3: Inspect for erosion protection materials that are no longer intact:**
  - Replace materials as needed.
  - Repair or reshape the overflow spillway (where flow exits the forebay), taking care to maintain the design elevation of the spillway. Repair, supplement, or replace erosion protection materials as needed.

Swale

- **C1: Inspect swale for trash or debris:**
  - Remove and properly dispose of trash and debris.

- **C2: Inspect for areas of unhealthy vegetative cover, bare areas, or dying vegetation:**
  - Inspect vegetative cover, which should be maintained at a coverage of 70 percent. Reseed and add topsoil to bare areas.
  - If needed, perform soil testing and carefully apply/add materials to improve soil conditions. Also, provide lime and one-time fertilizer application if soil testing indicates that fertilization is needed.
  - Install erosion control mat on eroded areas and steeper slopes as needed.
  - If due to unusually dry conditions, water where practical.
  - If compaction is a concern, aerate the soil using a core aerator that collects cores, or collect cores by hand and dispose of the cores in an area that will not impact stormwater or receiving waters. Aerate only during times of the year when grass is actively growing.
  - If the problem persists, determine the source of the problem (e.g., soil, drainage) and perform corrective actions.

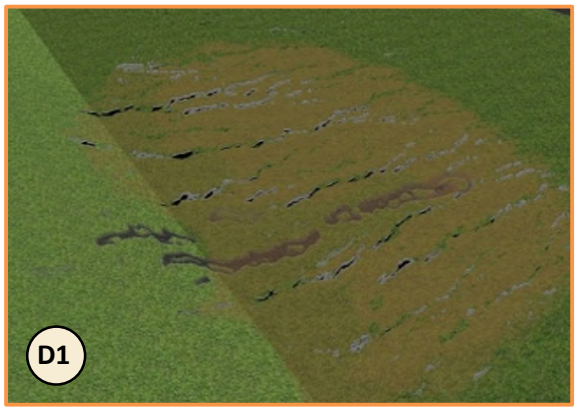
- **C3: Inspect swale for areas of erosion or gullies forming:**
    - Runoff from side slopes must enter the swale as sheet flow. Runoff collected in ditches should empty into a forebay or riprap pad before entering the swale. Consider installing a forebay or riprap pad if none is in place and there are signs of erosion from concentrated flow.
    - Repair eroding areas by filling/regrading and re-establishing ground cover.
    - Use sod where possible and provide adequate erosion protection until repaired areas have stabilized.
    - Provide lime and one-time fertilizer application if needed.

- **C4: Inspect swale area for woody vegetation:**
  - Remove woody vegetation that can cause flow to channelize.
  - Remove vegetation that threatens the function or integrity of the swale.
- **C5: Inspect dry swale for ponded water that is present 24 to 48 hours after a storm event:**
  - If a dry swale exhibits signs of poor drainage, determine cause of standing water (e.g., clogged filter media or underdrain, high groundwater table, localized low areas from heavy equipment or compacted soil, significant erosion) and roto-till or cultivate and regrade if necessary. Check cleanouts and flush if needed.
- **C6: Inspect grass swale for accumulated sediment:**
  - Remove sediment from within the swale area when reaches a depth of 1 to 3 inches. Regrade if necessary and re-establish vegetation.

- **C7: Inspect and check that proper mowing height is maintained for dry swales:**
    - Mow grass within the swale according to the IRVM Straight Line Mowing Standards Manual.

Side Slopes

- **D1: Inspect side slopes for evidence of erosion, rills, or gullies forming:**
    - Repair erosion after heavy storms.
    - Replace eroded soil to conform to the original geometry.
    - Rake, seed, and apply/add materials to improve soil conditions to re-establish vegetation.
    - Provide lime and a one-time fertilizer application if needed.
    - Install matting in steep areas.



Check Dam

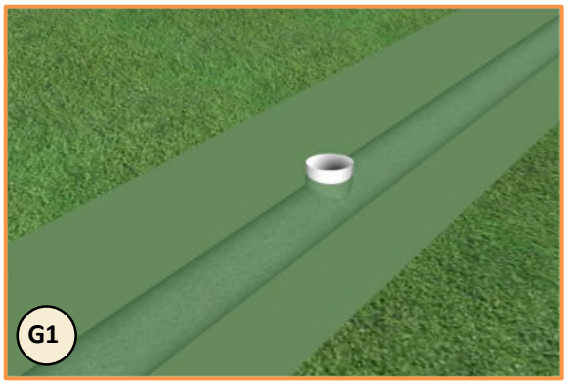
- **E1: Inspect for trash, debris, vegetation, or excessive sediment present:**
    - Remove and properly dispose of trash, debris, vegetation that threatens the function or integrity of the check dam, and sediment.
    - Use a string trimmer when mowing around check dams to avoid damaging the check dam's structure.
- **E2: Inspect for evidence of erosion around the sides of the check dam:**
    - Replace riprap and stone as needed and repair erosion; rebuild or reshape check dams according to design dimensions and elevations as necessary.

Wetland Vegetation (for Wet Swales)

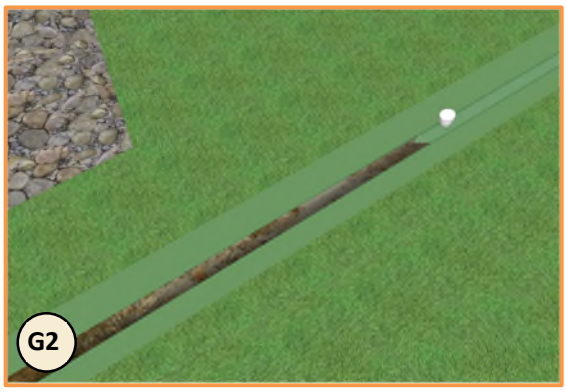
- **F1: Inspect to determine if vegetation is impacting the function or integrity of the swale:**
  - The IRVM Herbicide Standards Manual addresses the treatment of undesirable vegetation.
  - Multiple wetland cells may exist between check dams; inspect the wet swale thoroughly.
- **F2: Inspect for unhealthy or dead plants:**
  - Replace dead or unhealthy plants using the original design drawings or landscaping plan if necessary.
  - Attempt to determine the reason why the plants are unhealth or dying (e.g., soil, hydrology, disease) and fix the problem before replanting.

Underdrain (for Dry Swales)

- **G1: Inspect for missing or damaged cleanout caps:**
  - Replace cleanout caps that are missing, cracked, or otherwise damaged. Damaged or missing caps will allow stormwater to exit the basin untreated.



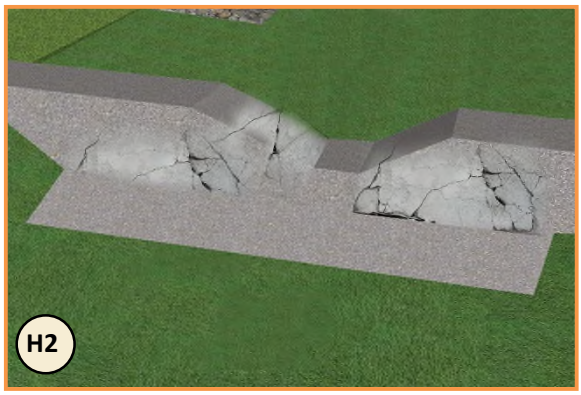
- **G2: Inspect for standing water to check for a clogged underdrain system:**
  - Perform flow testing of underdrain and if water does not exit freely, the underdrain is likely clogged. Use a high-pressure hose to flush out the underdrain system by spraying directly into the cleanouts.
  - Repair or replace the underdrain system if flushing does not allow water to drain freely. Repairs and replacement will be conducted in accordance with the original design specifications.
  - Consider flushing the underdrain system annually if it has a tendency to plug. Use a bucket or hose to pour water into cleanout and observe outlet control structure for flow.



Discharge Weir or Berm

- **H1: Trash, debris, vegetation, or excessive sediment is obstructing flow through the weir:**
  - Remove and properly dispose of trash, debris, vegetation that threatens the function or integrity of the weir or berm, and sediment.

- **H2: Evidence of damage to weir or berm:**
  - Configuration may include a weir or a berm.
  - If damage to a weir exists, report to maintenance personnel for assessment and replacement if necessary.
  - Repair eroding areas on the berm by filling and/or regrading and re-establishing ground cover. Use sod where possible and provide adequate erosion protection until repaired areas have stabilized.
  - Provide lime and one-time fertilizer application if needed.
  - If necessary, restore the berm to the dimensions and elevations shown on the



construction plans; use suitable backfill and compact as indicated on the construction plans/specifications.

Gravel Diaphragm (optional)

See Section 5.12 for guidance on the inspection and maintenance of optional components.

5.4 Infiltration Trench

5.4.1 Description and Function of Structure

Infiltration trenches are excavations typically filled with washed aggregate or media that create an underground reservoir to capture, hold, and infiltrate stormwater runoff. A typical infiltration trench design includes an inlet drainage system that conveys runoff to a forebay where velocity is reduced and sedimentation occurs. The captured runoff enters into the infiltration trench and gradually exfiltrates through the bottom and sides of the trench into the subsoil over a 2- to 3-day period. By diverting runoff into the soil, an infiltration trench reduces the runoff volume discharging downstream, recharges groundwater and preserves base flows in receiving streams.

Infiltration systems are limited to areas with high soil permeability where the water table and/or bedrock are located well below the bottom of the trench. These systems can be designed and constructed with underdrains and include overflow structures to safely handle larger storm events. The volume capacity of an infiltration trench may be increased using perforated pipe or other GDOT-approved structures that are designed and installed in conjunction with the aggregate.

Infiltration trenches require a filter strip or other pretreatment BMP to limit the amount of sediment that enters the infiltration trench. Sediment clogs the infiltration trench causing standing water. Infiltration trenches can have an exposed aggregate surface or may have a vegetated (grassed) surface. The grassed surface can function to limit sediment entry into the underlying media.

An infiltration trench with a filter strip acting as pretreatment is shown on Figure 5.4-1.

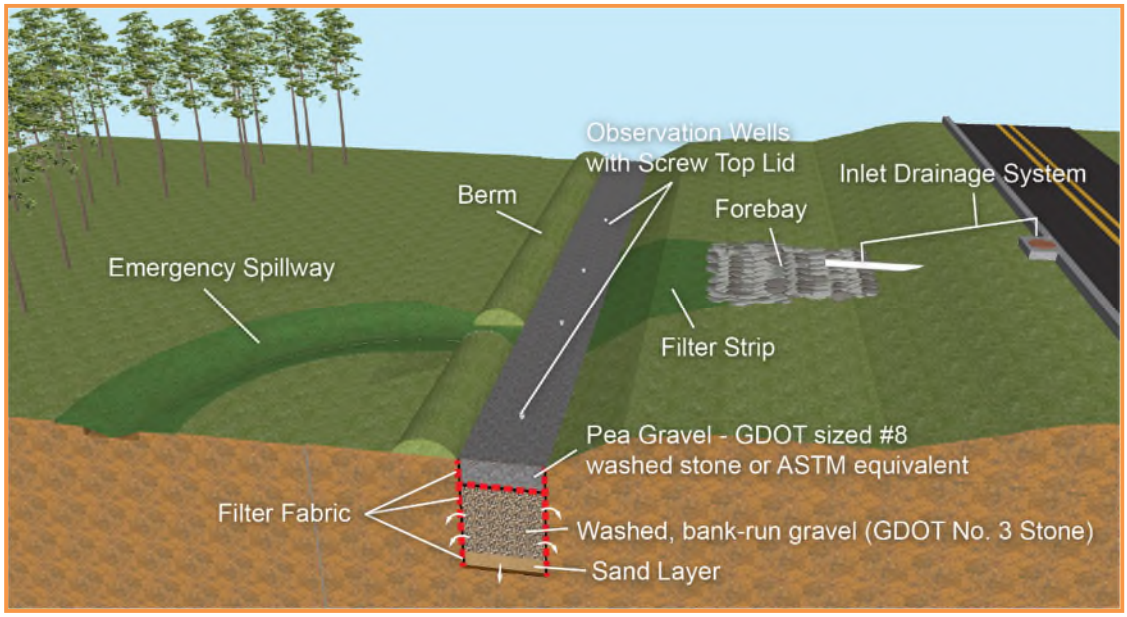


Figure 5.4-1 Typical Infiltration Trench Configuration and Components

Section 5.4.2 recommends inspection and maintenance practices for maximizing infiltration trench performance.

5.4.2 Inspection and Maintenance

Infiltration trenches receive pollutant removal credit and offer high pollutant removal capabilities when properly designed and maintained.

Infiltration trenches can either be used 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 used as retrofits. Unlike other structural stormwater controls, they can easily fit into the perimeter or other unused areas of developed sites. Median strip infiltration trenches use a grass filter strip to direct sheet flow to the trench. Multiple trenches can be incorporated on larger sites or in the upland area of large sites to reduce the amount of runoff downstream that needs treatment. Infiltration devices are frequently used to infiltrate runoff from adjacent impervious surfaces, such as parking lots.

Inspect infiltration trenches annually during periodic route inspections. Standing water observed after 72 hours or more of dry weather may indicate clogging. Check observation wells and cleanouts as needed.

The inspector documents observed conditions during compliance inspections using Form B-2 (Appendix B), determines appropriate actions to remedy functional impairments per this I&M Manual and documents routine or as-needed maintenance performed.

Inlet Drainage System

- **A1: Inspect for trash, debris, and sediment:**
  - Remove trash and vegetative debris or sediment that has the potential to inhibit flow into the infiltration trench.
- **A2: Inspect these areas for signs of erosion:**
  - Repair eroded areas by resodding or reseeding. Restore compacted fill, filter fabric, and rock riprap (if present). If erosion is a recurring problem, consult a design professional.
  - Identify and control the source of erosion damage if native soil is exposed or erosion channels are forming.
  - Check the upstream areas for bank stability and evidence of seeping water or scour holes.
- **A3: Inspect piping for damage or clogging:**
  - Repair or replace damaged piping if needed.
  - If clogged, remove material and identify and mitigate the source of sediment or debris.

Forebay

- **B1: Inspect sediment accumulation in forebay:**
  - Remove and dispose of sediment off site if it appears to occupy more than 50 percent of the forebay's storage capacity.
  - If surrounding soil is disturbed during cleanout of the forebay, reseed and stabilize any areas of bare soil.
- **B2: Inspect forebay for presence of woody vegetation:**
  - Remove vegetation that threatens the function or integrity of the forebay such as woody vegetation that may cause structural deterioration or make removal of sediment from the forebay difficult.
- **B3: Inspect condition of erosion protection materials in forebay:**
  - Replace materials as needed.
  - Repair or reshape the forebay, taking care to maintain the design elevation and design dimensions. Repair, supplement, or replace erosion protection materials as needed.

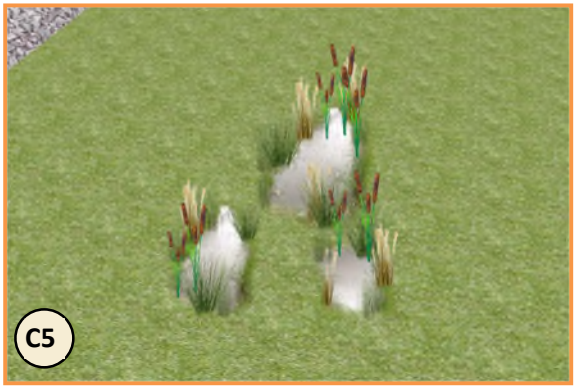
Filter Strip

- **C1: Inspect filter strip for trash and/or debris:**
  - Remove and properly dispose of trash and debris.
- **C2: Inspect for areas of unhealthy grass cover, bare areas or dying grass:**
  - Inspect overall vegetative cover, which will be maintained at a coverage of 70 percent. Reseed and add topsoil to bare areas.
  - Provide lime and one-time fertilizer application if soil testing indicates that pH adjustment and fertilization are needed.
  - Install erosion control mat on eroded areas and steeper slopes as needed.
  - If due to unusually dry conditions, water where practical.
  - If compaction is a concern, aerate the soil using a core aerator that collects cores and dispose of the cores in an area that will not impact stormwater or receiving waters. Aerate only during times of the year when grass is actively growing.
  - If the problem persists, determine the source of the problem (e.g., soil, drainage).
  - If needed, perform soil testing and carefully apply/add materials to improve soil conditions.

- **C3: Inspect filter strip for areas of erosion or formation of gullies:**
  - Runoff must enter the strip as sheet flow.
  - Regrade the soil if necessary to remove the gully. Plant ground cover and water, if practical, until it is established.
  - Repair eroding areas by filling/regrading and re-establishing ground cover.
  - Use sod where possible and provide adequate erosion protection until repaired areas have stabilized.
  - Provide lime and one-time fertilizer application if needed.

- **C4: Inspect filter strip area for woody vegetation:**
  - Remove woody vegetation that can cause flow to channelize.
  - Remove vegetation that threatens the function or integrity of the filter strip.

- **C5: Inspect for areas of standing water:**
  - Dewater and discharge to an approved location. Regrading may be required.
  - If a filter strip exhibits signs of poor drainage, determine cause of standing water (e.g., compacted soil, significant erosion) and regrade if necessary.



- **C6: Sediment is accumulating within filter strip:**
  - Remove sediment from the filter strip area if it begins to cover and kill grass. Re-establish vegetation and regrade if necessary.

- **C7: Inspect vegetation density:**
  - Mow grass according to the IRVM Straight Line Mowing Standards Manual within the filter strip at a height to maintain a dense vegetative cover.

Berm and Emergency Spillway

- **D1: Inspect areas around berm for erosion:**
  - Repair eroding areas by filling/regrading and re-establishing ground cover.
  - Use sod where possible and provide adequate erosion protection until repaired areas have stabilized.
  - Provide lime and one-time fertilizer application if soil testing indicates that pH adjustment and fertilization are needed.
  - If necessary, restore the berm to the dimensions and elevations shown on the construction plans; use suitable backfill and compact as indicated on the construction plans/specifications.

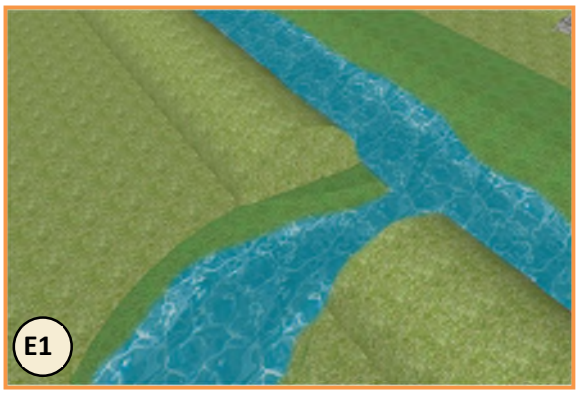
- **D2: Inspect base of berm for sediment accumulation:**
  - Gather and remove sediment with hand tools when possible. Pay attention to the top and toe of the slope where sediment is likely to gather.
  - Apply/add materials to improve soil conditions, if needed and re-establish vegetation.
  - If sediment accumulation is excessive, ensure that pretreatment measures are functioning properly and that the contributing drainage area is properly stabilized.

- **D3: Inspect emergency spillway for trash, debris, or woody vegetation:**
  - Remove trash, debris, and vegetation that threatens the function or integrity of the spillway.

- **D4: Inspect grass height and the condition of concrete or riprap in the emergency spillway:**
    - Mow grass according to the IRVM Straight Line Mowing Standards Manual
    - Repair or replace concrete or riprap if it is in poor condition.

Infiltration Trench

- **E1: Inspect for water ponding on surface of infiltration trench 72 hours or more after a storm event:**
    - Refer to Section 5.12 if the infiltration trench includes a perforated pipe, which provides additional storage.
    - Remove and replace the topsoil or first layer of stone and the top layer of filter fabric if ponding occurs for longer than 72 hours.
    - If trench fails to infiltrate, the trench will likely need complete reconstruction to restore percolation.
    - Inspect observation wells to determine water level (if below the surface) and if appropriate infiltration is being achieved.
    - Replace observation well/cleanout caps that are missing, cracked, or otherwise damaged.



- **E2: Inspect vegetation growing on the surface of the trench:**
    - Remove woody vegetation that threatens the function or integrity of the infiltration trench.

Underdrain (optional), Gravel Diaphram (optional), and Perforated Pipe for Additional Storage (optional)

See Section 5.12 for guidance on the inspection and maintenance of optional components.

5.5 Sand Filters

5.5.1 Description and Function of Structure

Sand filters (also referred to as filtration basins) are multi-chambered structures that treat stormwater by filtration through a sand media and include an underdrain collection system. Most sand filter systems consist of two-chamber structures. The first chamber is a sediment forebay or sedimentation chamber, which removes floatables and heavy sediment. The second chamber is a filtration chamber, which removes additional pollutants by filtering the runoff through a sand bed.

The filtered runoff is typically collected and returned to the conveyance system, although it can also be partially or fully exfiltrated into the surrounding soil in areas with porous soil. Sand filters are designed to completely drain the specified water quality volume within 40 hours and reaerate between rainfall events.

There are two primary sand filter system designs: surface sand filter and perimeter sand filter. These designs are shown on Figure 5.5-1 and summarized below:

- *Surface Sand Filter*. The surface sand filter is a ground-level open air structure that consists of a pretreatment sediment forebay and a filter bed chamber. This system is typically located offline and may be constructed as an excavation with earthen embankments or as a concrete or block structure.
- *Perimeter Sand Filter*. The perimeter sand filter is an enclosed filter system that is typically constructed just below grade in a vault along the edge of an impervious area, such as a parking lot. The system consists of a sedimentation chamber and a sand bed filter. Runoff flows into the structure through a series of inlet grates located along the top of the control.

Figure 5.5-1 Surface Sand Filter (left) and Perimeter Sand Filter (right) source GSMM (2016)

Figures 5.5-2 and 5.5-3 show the typical configurations and components of a surface sand filter and perimeter sand filter, respectively.

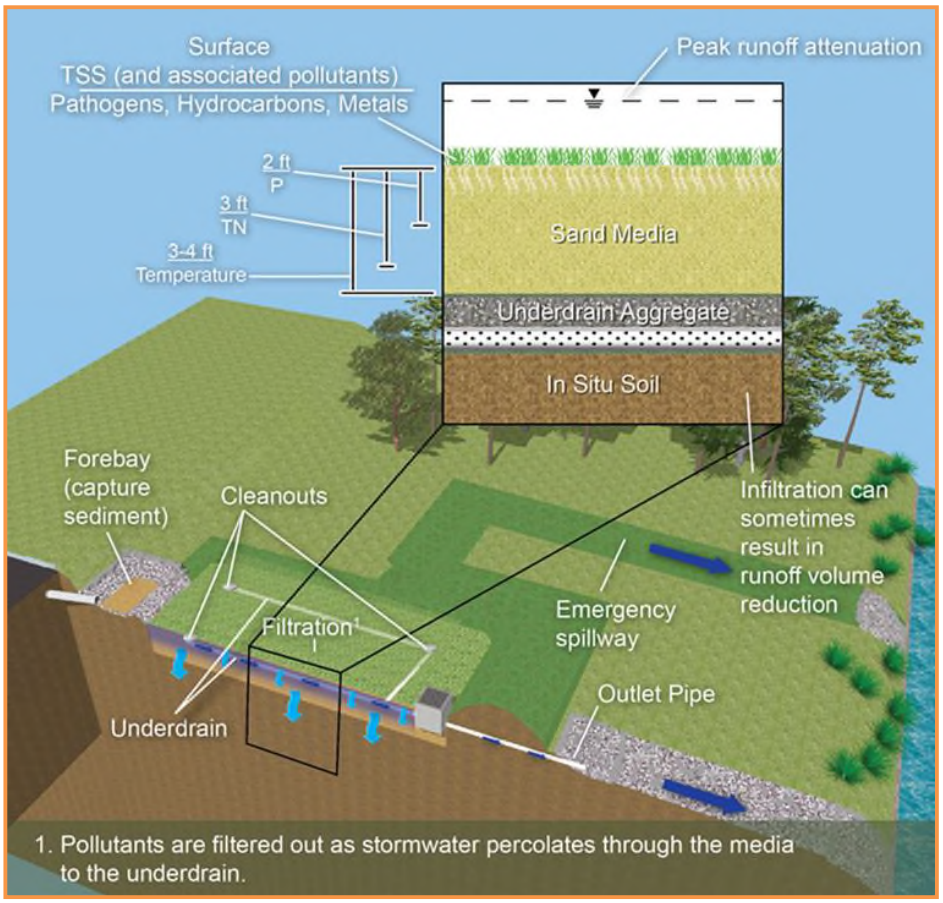


Figure 5.5-2 Typical Surface Sand Filter Configuration and Components

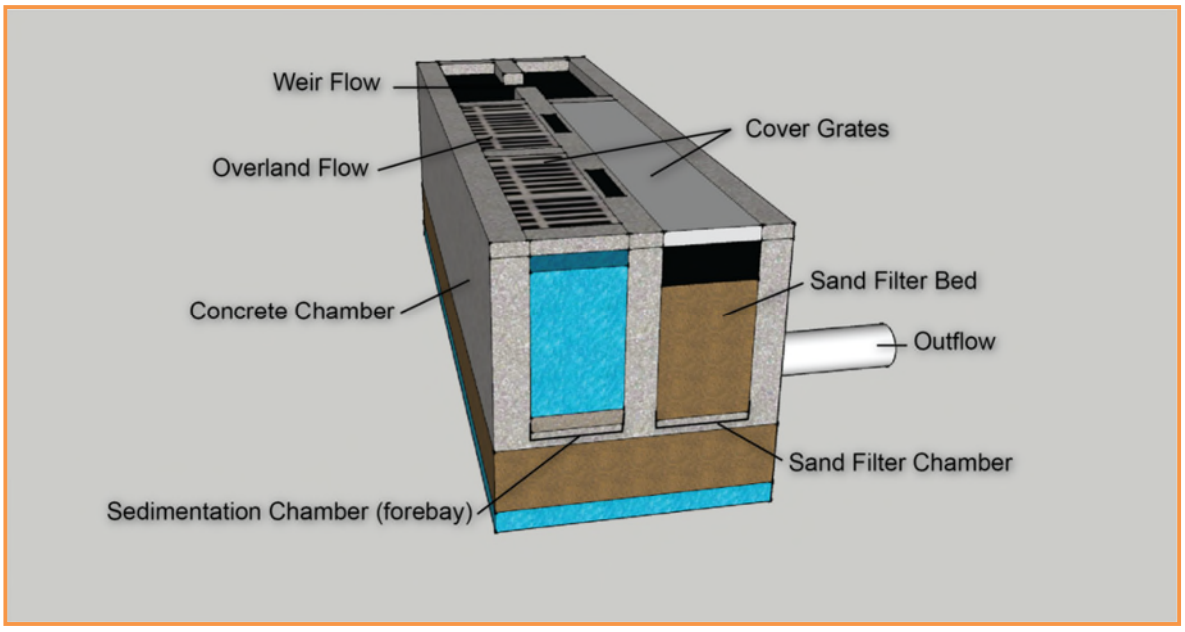


Figure 5.5-3 Typical Perimeter Sand Filter Configuration and Components

Key functional features of sand filters include:

- Forebay to capture sediment and debris prior to filtering runoff through the sand filter bed.
- Underdrain system to collect water after filtering through the filter bed
- Outlet/outflow structure and spillway sized to meet design objectives and safely convey stormwater downstream.

Section 5.5.2 recommends inspection and maintenance practices for maximizing sand filter performance.

5.5.2 Inspection and Maintenance

Inspections of sand filters should be conducted at least annually during periodic route inspections. The inspector documents observed conditions during compliance inspections using the Form B-3 (Appendix B), determines appropriate actions to remedy functional impairments per this I&M Manual, and documents routine or as-needed maintenance performed.

Inlet and Outlet Drainage Systems

- **A1: Inspect for trash, debris, and sediment:**
  - Remove trash and vegetative debris or sediment that has the potential to inhibit flow into the sand filter.
- **A2: Inspect these areas for signs of erosion:**
  - Repair eroded areas by resodding or reseeding. Restore compacted fill, filter fabric, and rock riprap (if present). If erosion is a recurring problem, consult a design professional.
  - Identify and control the source of erosion damage if soil is exposed or erosion is evident in the channel bottom or side slopes.
  - Check the upstream areas for bank stability and evidence of seeping water or scour holes.
- **A3: Inspect inlet and outlet pipes and inlet grates for damage or clogging:**
  - Repair or replace damaged grates and/or piping if needed.
  - If clogged, remove material and identify and mitigate the source of sediment or debris.

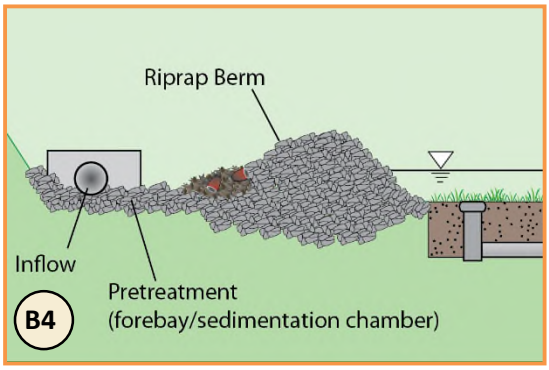
Forebay/Sedimentation Chamber

- **B1: Inspect for sediment accumulation in forebay or sedimentation chamber:**
  - Remove sediment in forebay/ sedimentation chamber when sediment depth is greater than 6 inches.
  - Reseed any areas of bare soil if surrounding soil is disturbed during cleanout of the forebay.

- **B2: Inspect for woody vegetation in forebay:**
  - Remove vegetation that threatens the function or integrity of the forebay such as woody vegetation that may cause structural deterioration or make removal of sediment from the forebay difficult.

- **B3: Inspect status of erosion protection materials:**
  - Replace materials as needed.
  - Repair or reshape the forebay, taking care to maintain the original elevation and dimensions of the forebay. Repair, supplement, or replace erosion protection materials as needed.

- **B4: Inspect the perforated stand-pipe and/or riprap berm:**
    - Note: In newer designs the perforated standpipe may be replaced by a porous riprap berm.
    - Remove sediment or debris from trash rack, perforations, and riprap berm.
    - Remove overgrown vegetation if it has the potential to restrict flow through weirs or orifices.
    - Repair or replace damaged, corroded, or missing components.



Filter Bed

- **C1: Inspect area for trash or debris:**
  - Remove and properly dispose of trash and debris.
- **C2: Inspect areas for unhealthy grass cover, bare areas, or dying grass in surface sand filters:**
  - Monitor overall vegetative cover, which should be maintained at a coverage of 70 percent. Reseed and add topsoil to bare areas.
  - If needed, perform soil testing and carefully apply/add materials to improve soil conditions. Provide lime and one-time fertilizer application if soil testing indicates that pH adjustment and fertilization are needed.
  - Install erosion control mat on eroded areas and steeper slopes as needed.
  - Determine the source of the problem (e.g., soil, hydrology, disease). If sod was used, ensure that it was not grown in clay or impermeable soil. Replace sod if necessary.
- **C3: Inspect areas for presence of erosion or formation of gullies in the filter bed:**
  - If erosion has occurred, re-establish turf grass (seed or sod).
  - If channelization has occurred, re-establish the proper grade of the basin bottom by removing sediment and filling in, then re-establish vegetation.
  - Provide lime and one-time fertilizer application if needed.

- **C4: Inspect surface type filter bed area for woody vegetation:**
  - Remove woody vegetation that can cause flow to channelize.
  - Remove vegetation that threatens the function or integrity of the filter bed.

- **C5: Inspect surface filter beds for water ponding more than 72 hours after a storm event:**
  - Check outlet structure for clogging. If cattails or other wetland vegetation emerge, water is likely remaining in the basin too long. Possible causes include clogged filter media, high groundwater table, clogged outlet, or localized low areas from heavy equipment or soil compaction.

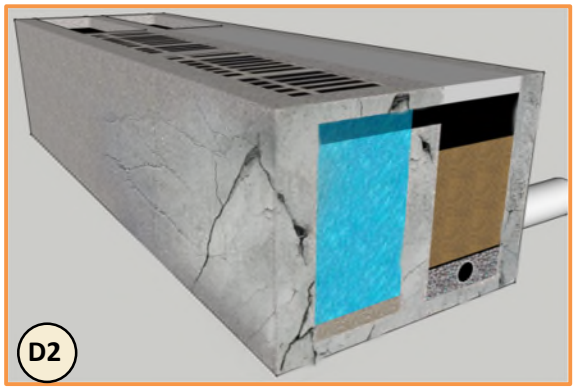
- **C6: Inspect filter bed for sediment accumulation.**
  - Remove the sediment if it is clogging the filter media or has reached a depth of 3 inches. Dispose of the sediment in a location where it will not cause impacts to streams or the BMP. Revegetate disturbed areas immediately with sod (preferred) or seed protected with securely staked erosion mat. Search for the source of the sediment and remedy the problem if possible.
  - Significant sediment accumulation impairs the pollutant removal capabilities of the filter bed by reducing the available storage for the water quality volume and can clog the filter media causing the basin to fail.
  - The top 2 to 5 inches of media are typically removed and replaced every 3 to 5 years for low sediment applications, more often for areas of high sediment yield or high oil and grease.

- **C7: Inspect vegetation height for surface sand filters:**
    - Mow grass according to the IRVM Straight Line Mowing Standards Manual within filter bed.
    - Consider potential negative effect of compaction from mowing equipment. Consider using hand trimmers where practical.

Side Slopes (Surface Sand Filter)/Vault (Perimeter Sand Filter)

- **D1: Inspect for evidence of erosion, rills or gullies forming on side slopes:**
    - Repair erosion after heavy storms.
    - Replace eroded soil to conform to the original geometry.
    - Rake, seed, and apply/add materials to improve soil conditions and re-establish vegetation.
    - Provide lime and a one-time fertilizer application if needed.
    - Install erosion control matting in steep areas if needed.

- **D2: Inspect for evidence of degrading structural components on perimeter sand filter or leaks at the joints in the concrete structure or at other components, allowing groundwater to enter or runoff to escape untreated.**
    - Make necessary repairs or replace the structure if repairs cannot be made.



Embankment and Emergency Spillway

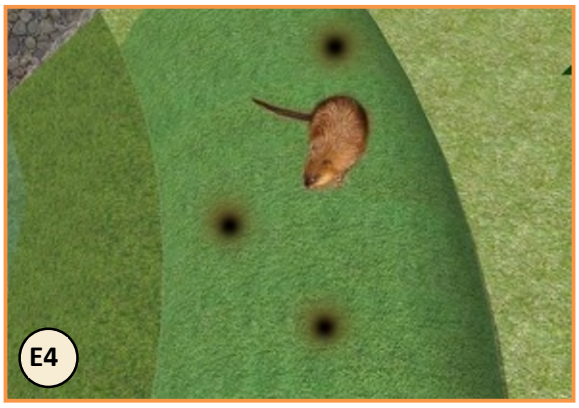
- **E1: Inspect for shrubs or trees growing on the embankment:**
    - Remove shrubs or trees immediately.
    - Fill/regrade and re-establish ground cover as necessary.

E2: Inspect grass cover for poor health and/or erosion:

- Repair eroding areas by filling/regrading and re-establishing ground cover.
- Use sod where possible and provide adequate erosion protection until repaired areas have stabilized.
- Water and provide lime and one-time fertilizer application if needed.
- Consult a professional landscaper if needed.

- **E3: Inspect for signs of seepage on the downstream face:**
  - Consult a design professional. This could indicate a serious issue and cause the embankment to fail.

- **E4: Inspect for evidence of animal activity:**
  - Repair animal burrows.

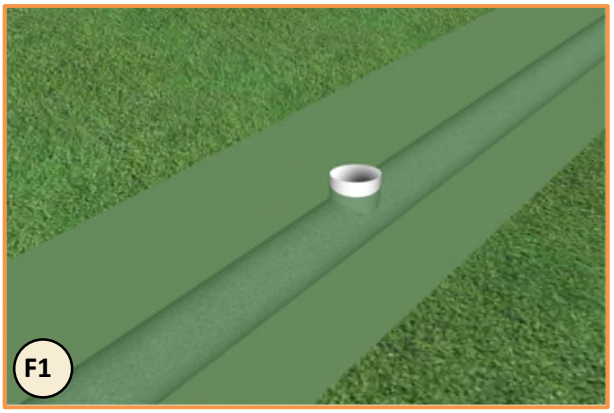


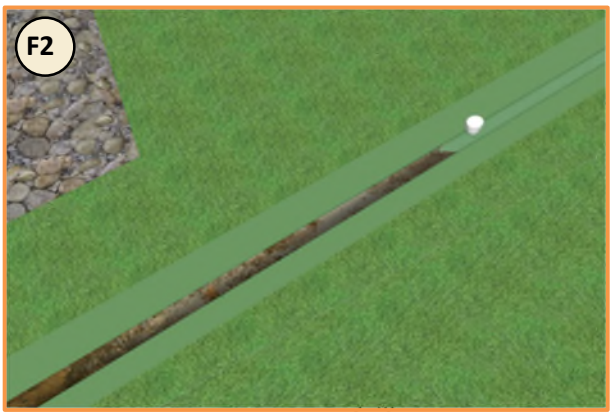
- **E5: Inspect for signs of settling, scouring, cracking, or sloughing:**
  - Repair by adding soil and/or regrade where needed. Compact as indicated in the original design documents and re-establish vegetation. Consult a design professional if needed and follow any applicable dam safety rules.

- **E6: Inspect for trash, debris, or woody vegetation in emergency spillway.**
    - Remove trash, debris, and vegetation that threatens the function or integrity of the spillway.
- **E7: Inspect grass height and condition of concrete or riprap:**
    - Maintain grass at a height according to the IRVM Straight Line Mowing Standards Manual.
    - If the emergency spillway is constructed of concrete or riprap, repair if in poor condition.

Underdrain

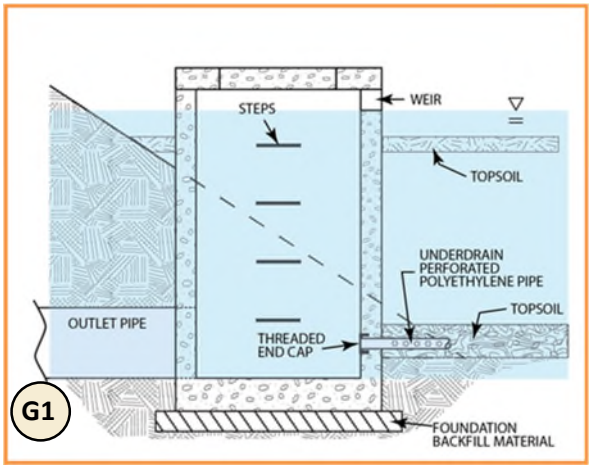
- **F1: Cleanout caps are missing or damaged:**
    - Replace cleanout caps that are missing, cracked, or otherwise damaged. Damaged or missing caps will allow stormwater to exit the basin untreated.
- **F2: Inspect for signs of standing water to determine if underdrain system is clogged:**
    - If there is standing water 72 hours after rainfall, use a bucket or hose to pour water into a cleanout and observe outlet control structure for flow. If water does not exit freely, the underdrain is likely clogged. Use a high-pressure hose to flush out the underdrain system by spraying directly into the cleanouts.
    - Repair or replace underdrain systems if flushing does not allow water to drain freely. Repair and replace in accordance with the original design specifications.



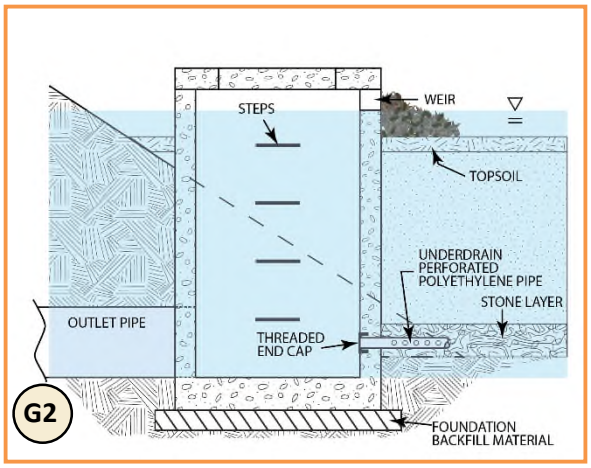


Outlet Control Structure

- **G1: Inspect water around outlet control structure**
  - If the outlet appears to be clogged or blocked, remove material blocking the outlet opening. Replace the outlet if there are signs of excessive corrosion or damage.
  - Inspect for leaks that may allow untreated runoff to bypass the sand media.



- **G2: Inspect outlet structure or trash rack (if present) for trash, debris, damage, or corrosion:**
  - Remove trash and debris from outlet structure
  - Replace trash rack if it is corroded or damaged. Replace the trash rack according to design specifications.



5.6 Dry Detention Basins

5.6.1 Description and Function of Structure

Dry detention basins are impoundments designed to temporarily store stormwater runoff and drain completely following storm events. The primary functions of dry detention basins are to attenuate and reduce peak flow rates from storm events and to remove solids.

Dry detention basins can be designed and constructed in several configurations and sized to fit the volume of runoff as well as site constraints. Dry detention basins can incorporate hardened low-flow channels or include landscaping features. The Manual on Drainage Design for Highways presents a detailed description of dry detention basins.

Figure 5.6-1 comprises photographs that depict two variations of dry detention basins.

Figure 5.6-1 Dry Detention Basin with Low-Flow Channel (left) and Dry Detention Basin with Landscaping (right)

Figure 5.6-2 shows the typical configuration and components of a dry detention basin.

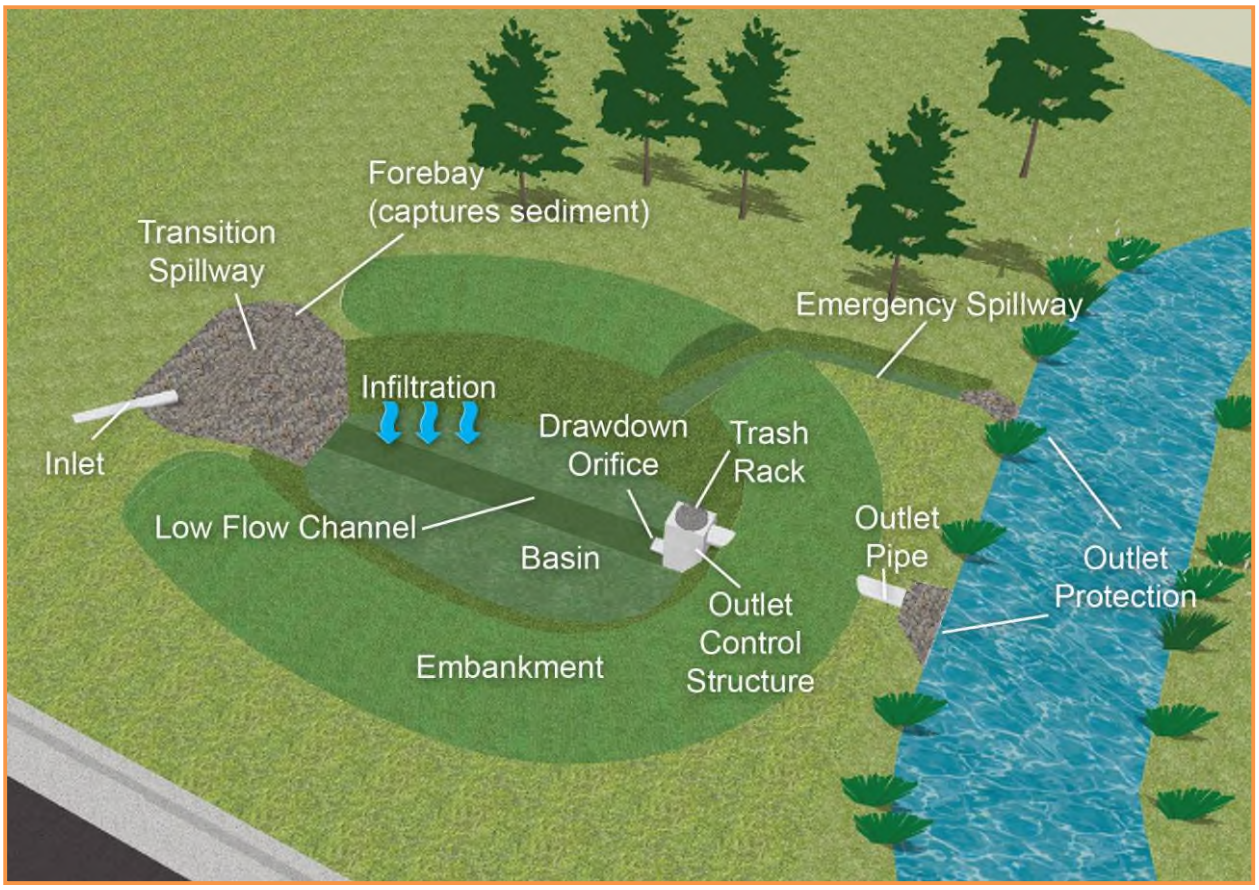


Figure 5.6-2 Typical Dry Detention Basin Configuration and Components

Key functional features of dry detention basins include:

- Forebay designed to provide pretreatment by capturing debris and sediment and to reduce the velocity of runoff entering the basin.
- Low-flow channel designed to promote infiltration and interception of suspended sediment and reduce the potential for nuisance conditions (e.g., odors, insects, weeds).
- Basin area storage volume to meet volume-based design objectives and hearty vegetation to enhance pollutant removal.
- Outlet structure and spillway sized to meet design objectives and safely convey stormwater downstream.

The Section 5.6.2 recommends inspection and maintenance practices for maximizing dry detention basin performance.

5.6.2 Inspection and Maintenance

Inspections of dry detention basins should be conducted at least annually during periodic route inspections. The inspector documents observed conditions during compliance inspections using Form B-4 (Appendix B), determines appropriate actions to remedy functional impairments per this I&M Manual, and documents routine or as-needed maintenance performed.

Inlet and Outlet Drainage Systems

- **A1: Inspect for trash, debris, and sediment:**
  - Remove trash and vegetative debris or sediment that has the potential to inhibit flow into the dry detention basin.
- **A2: Inspect these areas for signs of erosion:**
  - Repair eroded areas by resodding or reseeding. Restore compacted fill, filter fabric, and riprap (if present). If erosion is a recurring problem, consult a design professional.
  - Identify and control the source of erosion damage if soil is exposed or erosion is evident in the channel bottom or side slopes.
  - Check the upstream areas for bank stability and evidence of seeping water or scour holes.
- **A3: Inspect inlet and outlet pipes for damage or clogging:**
  - Repair or replace damaged piping if needed.
  - If clogged, remove material and identify and mitigate the source of sediment or debris.

Forebay

- **B1: Inspect for sediment accumulation in forebay:**
  - Remove and dispose of sediment off site if it appears to occupy more than 50 percent of the forebay's storage capacity.
  - If surrounding soil is disturbed during cleanout of the forebay, reseed any areas of bare soil.
- **B2: Inspect for woody vegetation in forebay:**
  - Remove vegetation that threatens the function or integrity of the forebay such as woody vegetation that may cause structural deterioration or make removal of sediment from the forebay difficult.
- **B3: Inspect condition of erosion protection materials:**
  - Replace materials as needed.
  - Repair or reshape the forebay, taking care to maintain the original design elevation and dimensions. Repair, supplement, or replace erosion protection materials as needed.

Low-Flow Channel (if present)

- **C1: Inspect low-flow channel for accumulation of sediment:**
  - Search for the source of the sediment and remedy the problem if possible. Remove the sediment if it has reached a depth of 3 inches or is covering vegetation. Dispose of the sediment in a location where it will not cause impacts to streams or the BMP.
  - Replace riprap or turf reinforcement mat (TRM) if needed after sediment removal.

- **C2: Inspect low-flow channel for signs of erosion, formation of gullies, or problems with TRM:**
  - If erosion has occurred, re-establish turf grass (seed or sod).
  - Provide lime and one-time fertilizer application if needed.
  - Repair or replace TRM as necessary. TRM may not be visible; do not disturb TRM if vegetation is well-established and adequate to protect against erosion.
  - If TRM has been installed, inspect for damage and verify that it is properly toed in and anchored.

- **C3: Inspect low-flow channel for the emergence of woody vegetation:**
  - Remove vegetation that threatens the function or integrity of the low-flow channel.

Basin

- **D1: Inspect area for trash or debris:**
  - Remove and properly dispose of trash and debris.

- **D2: Inspect areas for unhealthy vegetative cover, bare areas, or dying vegetation:**
  - Monitor overall vegetative cover, which will be maintained at a coverage of 70 percent. Reseed and add topsoil to bare areas.
  - Dry detention basins may have soggy bottoms, making mowing costly and difficult. The use of water-tolerant, hardy, and slow-growing grass is recommended for the bottom of these basins. Consult the Manual on Drainage Design for Highways to determine ideal species for the site conditions and replant to maintain dense vegetation cover.
  - If needed, perform soil testing and carefully apply/add materials to improve soil conditions. Provide lime and one-time fertilizer application if soil testing indicates that pH adjustment and fertilization are needed.
  - Install erosion control mat on eroded areas and steeper slopes as needed.
  - If due to unusually dry conditions, water where practical.
  - Determine the source of the problem, (e.g., soil, hydrology, disease) and take corrective action. If sod was used, ensure that it was not grown in clay or impermeable soil. Replace sod if necessary.

- **D3: Inspect areas for presence of erosion or formation of gullies in the basin:**
  - If erosion has occurred, re-establish turf grass (seed or sod).
  - If channelization has occurred, re-establish the design grade of the basin

bottom by removing sediment, and filling in, and re-establishing vegetation. Maintain the slope within the basin if a low-flow channel is present. Ensure that the entire bottom of the basin slopes toward the channel.
    - Provide lime and one-time fertilizer application if needed.

- **D4: Inspect basin area for woody vegetation:**
    - Remove woody vegetation that inhibits inspection and maintenance.
    - Remove vegetation that threatens the function or integrity of the basin.

- **D5: Inspect basin for water that ponds for more than 5 days after a storm event:**
    - Check for cattails or other wetland vegetation as indicators that water has remained in the basin too long.
    - Check outlet structure for clogging and remove debris.
    - If ponding appears to be due to a design issue, consult a design professional.
    - Possible causes of ponding include a high groundwater table, clogged outlet, or localized low areas from compaction caused by heavy equipment. Regrade basin if necessary.

- **D6: Inspect basin for sediment accumulation:**
    - Search for the source of the sediment and remedy the problem if possible. Remove sediment if it has reached a depth of 3 inches. Dispose of the sediment in a location where it will not cause impacts to streams or the BMP. Revegetate disturbed areas immediately with sod (preferred) or seed protected with securely staked erosion mat.
    - Removal of accumulated sediment is extremely important. A significant accumulation of sediment impairs the pollutant-removal capabilities of the

basin by reducing the available storage for the water quality volume.

Embankment, Slopes and Emergency Spillway

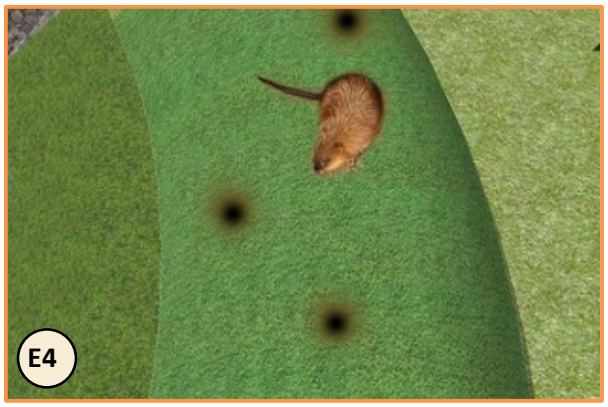
- **E1: Inspect for shrubs or trees growing on slopes or the embankment:**
  - Remove shrubs or trees and roots on embankment (dam) if height is greater than 10-feet on embankment.
  - Determine hazard level for trees on slopes and recommend removal accordingly.
  - Fill/regrade and re-establish ground cover as necessary immediately upon vegetation removal.

- **E2: Inspect vegetation cover for poor health and/or erosion:**
  - Repair eroding areas by filling/ regrading and re-establishing ground cover.
  - Use sod where possible and provide adequate erosion protection until repaired areas are well-stabilized.
  - Provide lime and one-time fertilizer application if needed.
  - Consult a professional landscaper if needed.

- **E3: Inspect for signs of seepage on the downstream face.**
  - Consult a design professional. This could indicate a serious issue and cause the embankment to fail.

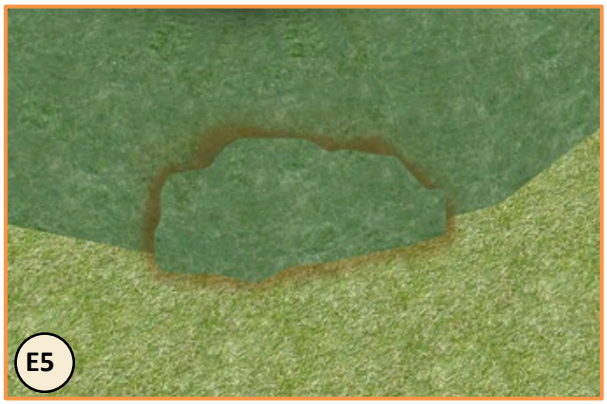
E4: Inspect for evidence of animal activity:
  - Repair animal burrows.

- **E5: Inspect for signs of settling, scouring, cracking, or sloughing:**
  - Repair by adding soil and/or regrade where needed. Compact as indicated in the original design documents, and re-establish vegetation. Consult a design professional if needed and follow any applicable dam safety rules.



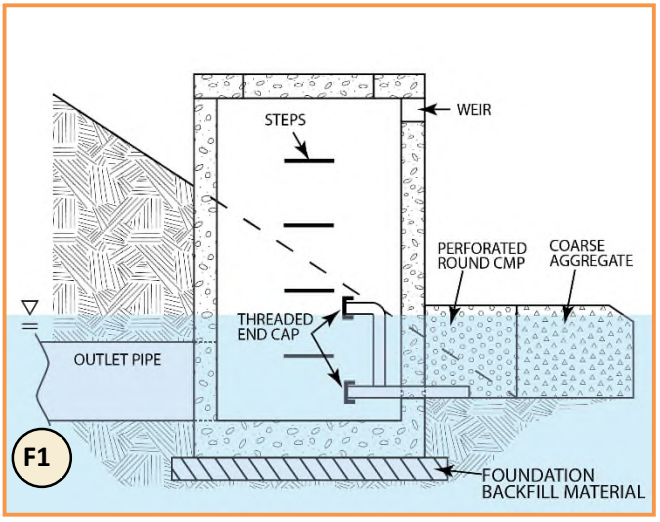
- **E6: Inspect for trash, debris, or woody vegetation in the emergency spillway:**
  - Remove trash, debris, and vegetation that threatens the function or integrity of the spillway.

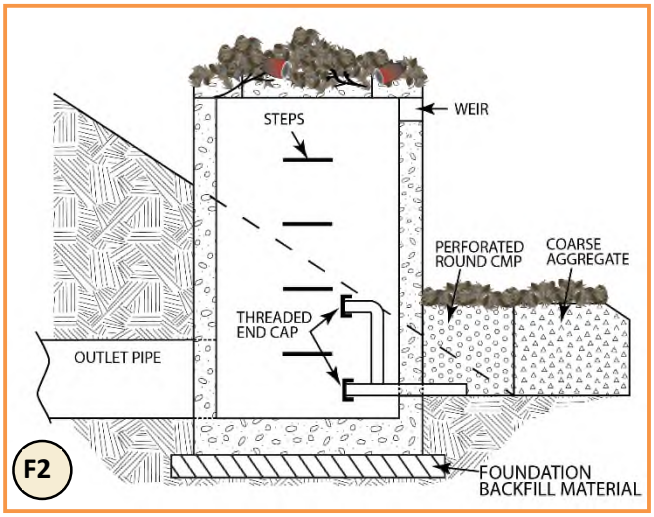
- **E7: Inspect vegetation and the condition of concrete or riprap in the emergency spillway:**
  - Mow grass according to the IRVM Straight Line Mowing Standards Manual.
  - Repair or replace concrete or riprap if it is in poor condition.



Outlet Control Structure

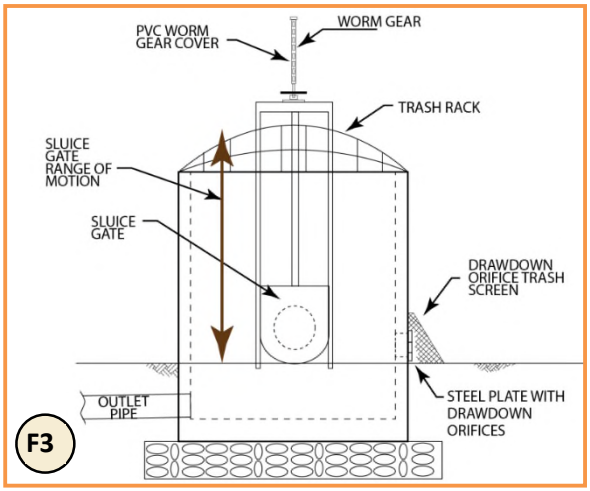
- **F1: Inspect for standing water around outlet control structure. If there is standing water above the outlet/orifice for more than 5 days after a storm event, this may indicate that the outlet/orifice is blocked:**
    - If the outlet appears to be clogged or blocked and standing water prevents access to the structure, hip waders or a small boat may be needed to make the necessary repairs. Do not enter the standing water unless you have been trained to do so. Trained contractors can be hired to make needed repairs.
    - If the water level in the basin is above the outlet/orifice opening, follow proper safety precautions before opening the sluice gate or valve (if present) or pumping out the basin.
    - Remove sediment or debris around trash screen. After the basin has been drained, remove the trash screen to access the outlet/orifice opening. Return the sluice gate to its original position.
    - Remove sediment and debris blocking the flow into the outlet/ orifice. Replace the outlet/orifice if there are signs of excessive corrosion.





- **F2: Inspect trash rack for trash, debris, damage, or corrosion.**
    - Remove trash and debris from trash rack.
    - Replace trash rack according to design specifications if it is corroded or damaged.

- **F3: If applicable, ensure that all movable components (i.e., sluice gate or valves) are operable through their full range of motion:**
    - Remove sediment or debris within and near the movable component.
    - If lubrication is necessary, lubricate with a marine-type grease. For screw-type sluice gates, a polyvinyl chloride cover is recommended to protect the worm gear from corrosion.
    - If components are damaged beyond repair, consult a design professional for guidance on replacement.



5.7 Wet Detention Ponds

5.7.1 Description and Function of Structure

A wet detention pond is an engineered earthen impoundment that maintains a permanent pool of water, with additional storage capacity for detaining and attenuating peak flows of stormwater runoff. Wet detention ponds consist of several components designed to control inflow and outflow and to maintain the permanent pool of water.

Wet detention ponds function to provide both water quality and flood control management. The attenuation of peak flows of stormwater runoff reduces flooding and erosion. The permanent pool, in combination with vegetation and bottom soil, provides for the capture and biological treatment of a variety of common pollutants carried in stormwater runoff.

Wet detention ponds can be designed and constructed in several configurations and sized to fit the volume of runoff as well as site constraints. The Manual on Drainage Design for Highways presents a detailed description of wet detention ponds. Figure 5.7-1 comprises photographs that depict a wet detention pond along a roadway that is part of a conveyance channel and a wet detention pond at a maintenance yard.

Figure 5.7-1
Wet Detention Pond as Part of a Conveyance Channel (left) and Wet Detention Pond at a DOT Maintenance Facility (right) (photos courtesy of GSMM and NCDOT)

Figure 5.7-2 shows the typical configuration and components of a wet detention pond.

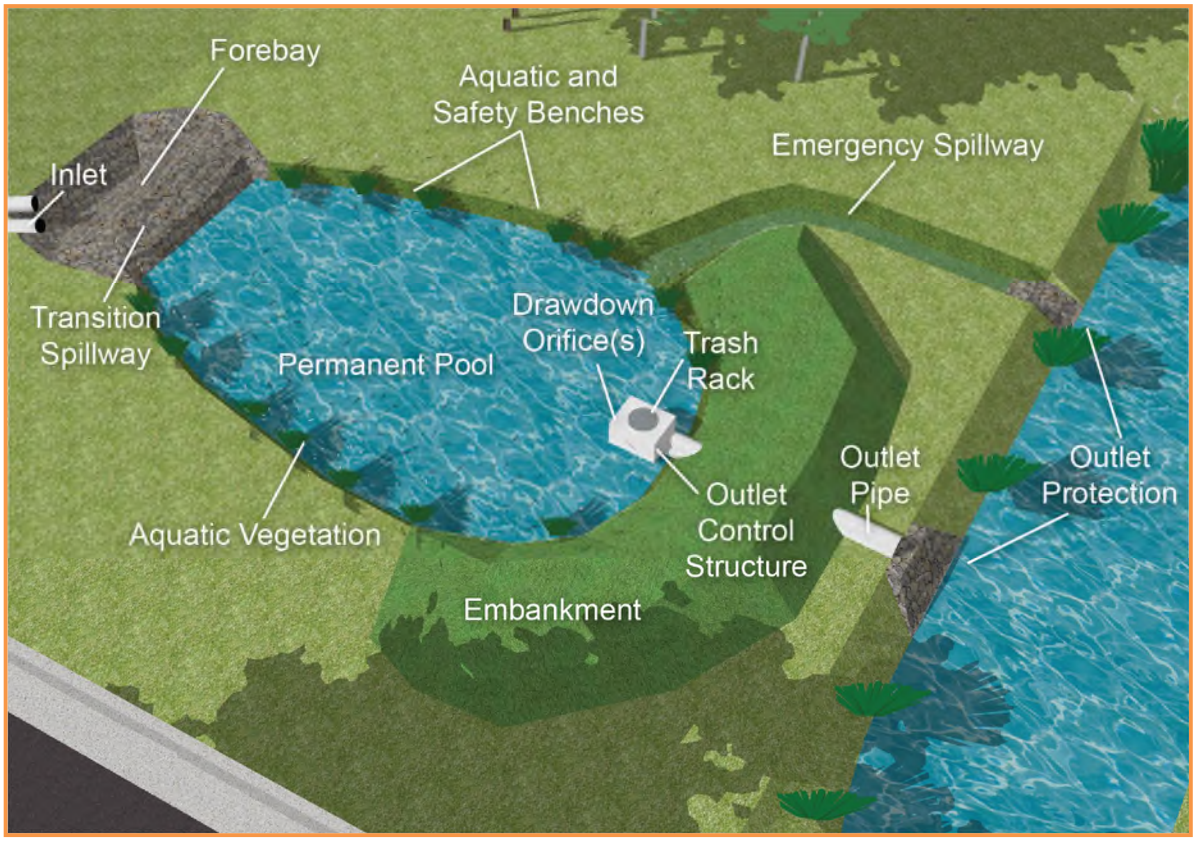


Figure 5.7-2
Typical Wet Detention Pond Configuration and Components

Key functional features of wet detention ponds that must be maintained include:

- Permanent pool of water that provides water quality benefits and should be maintained even during dry months.
- Drawdown orifice/device in order to detain stormwater runoff and release it over 24 hours.
- Aquatic and safety benches around the perimeter of the pond provide sure footing and an area to establish beneficial vegetation.
- Safety features, such as fences or other barriers used to minimize the hazards associated with the permanent pool.

The Section 5.7.2 recommends inspection and maintenance practices for maximizing wet detention pond performance.

5.7.2 Inspection and Maintenance

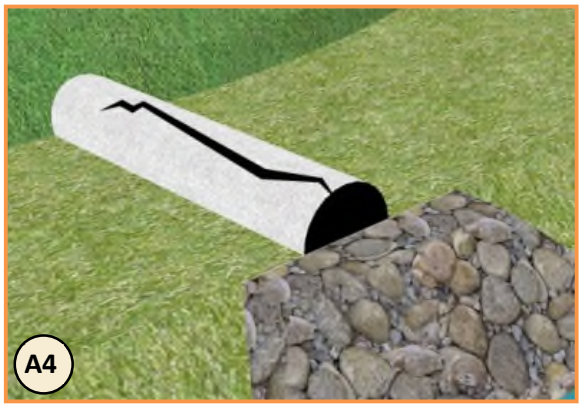
Inspections of wet detention ponds should be conducted at least annually during periodic route inspections. The inspector documents observed conditions during compliance inspections using Form B-5 (Appendix B), determines appropriate actions to remedy functional impairments per this I&M Manual, and documents routine or as-needed maintenance performed.

Inlet and Outlet Drainage Systems

- **A1: Inspect for trash, debris, and sediment:**
  - Remove trash and vegetative debris or sediment that has the potential to inhibit flow into the wet detention pond.

- **A2: Inspect these areas for signs of erosion:**
  - Repair eroded areas by resodding or reseeding. Restore compacted fill, filter fabric, and rock riprap (if present). If erosion is a recurring problem, consult a design professional.
  - Cause of erosion damage must be identified and controlled if soil is exposed or erosion is evident.
  - Check the upstream areas for bank stability and evidence of seeping water or scour holes.

- **A3: Inspect inlet channel, ditch, and outlet for woody vegetation:**
  - Remove vegetation that threatens the function or integrity of the inlet channel, ditch or outlet.



- **A4: Inspect inlet and outlet pipes for damage or clogging:**
  - Repair or replace damaged piping if needed.
  - If clogged, remove material and identify and mitigate the source of sediment or debris.

Forebay

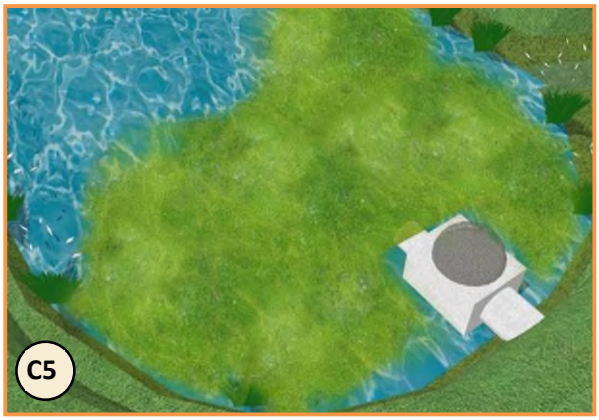
- **B1: Inspect for sediment accumulation in forebay:**
  - Remove sediment in forebay when sediment depth is greater than 6 inches.
  - Reseed any areas of bare soil if surrounding soil is disturbed during cleanout of the forebay.
- **B2: Inspect for woody vegetation in the forebay:**
  - Remove vegetation that threatens the function or integrity of the forebay such as woody vegetation that may cause structural deterioration or make removal of sediment from the forebay difficult.
- **B3: Inspect condition of erosion protection materials:**
  - Replace materials as needed.
  - Repair or reshape the forebay, taking care to maintain the original design elevation and dimensions. Repair, supplement, or replace erosion protection materials as needed.

Pond

- **C1: Inspect the water level to verify it is at or near the design normal water level:**
  - The water level must be at or near the invert of the drawdown device except within 24 hours after storm events and during prolonged dry periods.
  - If the outlet appears to be clogged or blocked and standing water prevents access to the structure, trained contractors may be needed to make the necessary repairs. Never attempt to enter the wet pond unless you have been trained to do so.
- **C2: Inspect the pond for sediment accumulation:**
  - Remove sediment if it has accumulated to a depth of 12 inches or more. Use the basin bottom elevation from the design plans as a baseline. Remove and dispose of the sediment in a location where it will not cause impacts to streams or the pond.
- **C3: Inspect the pond for woody vegetation:**
  - Remove vegetation that threatens the function or integrity of the pond such as vegetation prone to clogging outlet structures.
- **C4: Inspect the pond for trash or debris:**
  - Remove trash and debris.

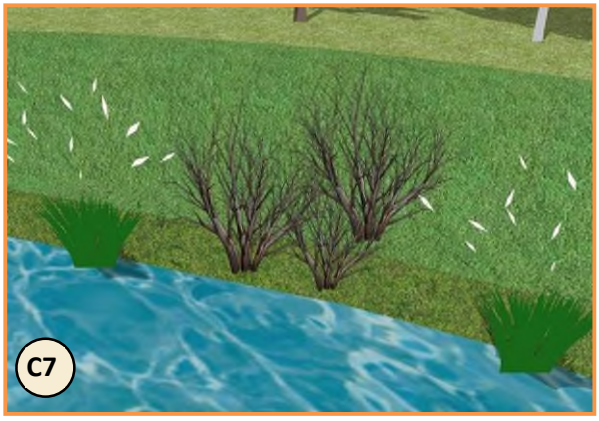
C5: Inspect the pond surface for algal growth:

- When algae covers 50 percent or more of the pond, consult a professional to develop a management plan to remove and prevent reoccurrence of algal growth.
- Physical removal of the algae is an option, but reoccurrence is likely.
- Chemical control options are available. Consult the Georgia Department of Agriculture to obtain the appropriate pesticide application license.



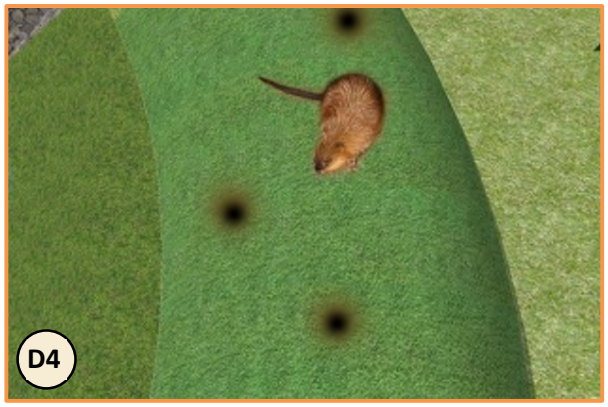
- **C6: Inspect the safety bench for erosion:**
  - Re-establish vegetation; fertilize upon re-establishment only if needed according to soil test recommendations. The use of fertilizer may be restricted in some areas.

- **C7: Inspect the aquatic and safety benches for dead, unhealthy, or undesirable plant material:**
  - Replace dead or unhealthy plant material, taking care to determine whether appropriate vegetation is present. Consult design drawings if necessary to confirm that intended plant species are present.
  - Remove undesirable vegetation by hand if possible or by wiping them with pesticide (do not spray pesticide).
  - Licenses with special endorsements may be required to apply pesticides in an aquatic environment.

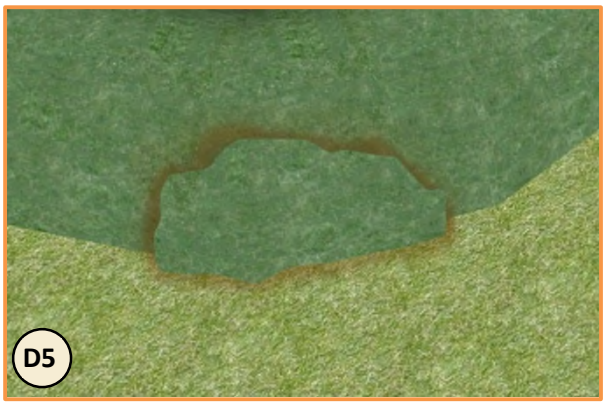


Embankment and Emergency Spillway

- **D1: Inspect for shrubs or trees growing on the embankment and the emergency spillway:**
  - Remove shrubs or trees immediately.
  - Fill/regrade and re-establish ground cover as necessary.
- **D2: Inspect vegetation for poor health and/or erosion:**
  - Repair eroding areas by filling/ regrading and re-establishing ground cover.
  - Use sod where possible and provide adequate erosion protection until repaired areas are well-stabilized.
  - Provide lime and one-time fertilizer application if needed.
  - Consult a professional landscaper if needed.
- **D3: Inspect for signs of seepage on the downstream face:**
  - Consult a design professional. This could indicate a serious issue and cause the embankment to fail.
- **D4: Inspect for evidence of animal activity:**
  - Use traps to remove muskrats and consult a professional to remove beavers.
  - Repair animal burrows.

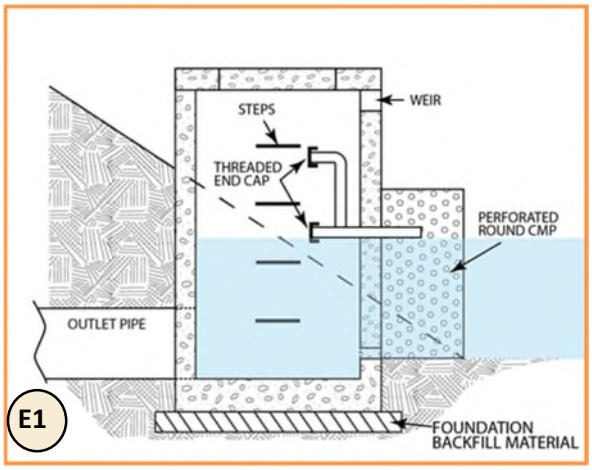


- **D5: Inspect for signs of settling, scouring, cracking, or sloughing:**
    - Repair by adding soil and/or regrade where needed. Compact as indicated in the original design documents and re-establish vegetation. Consult a design professional if needed and follow any applicable dam safety rules.
- **D6: Inspect for trash, debris, or woody vegetation in emergency spillway:**
    - Remove trash, debris, and vegetation that threatens the function or integrity of the spillway.
- **D7**: **Inspect vegetation and the condition of concrete or riprap in the emergency spillway:**
    - Mow grass according to the IRVM Straight Line Mowing Standards Manual.
    - Repair or replace concrete or riprap if it is in poor condition.

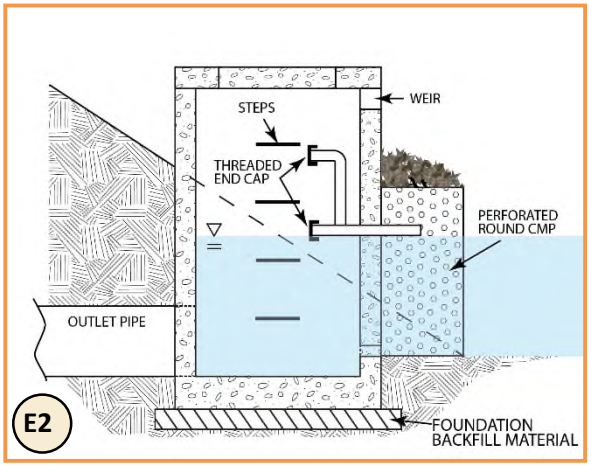


Outlet Control Structure

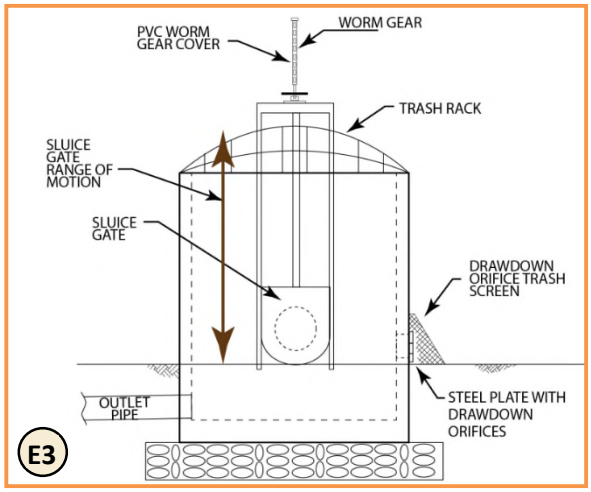
- **E1: Ensure that water is flowing freely through the outlet control structure; if the water level is above the outlet, this indicates that the drawdown device is blocked:**
    - If the outlet appears to be clogged or blocked and standing water prevents access to the structure, use hip waders or a small boat to make the necessary repairs. Do not enter the standing water unless you have been trained to do so. Trained contractors can be hired to make needed repairs.
    - If the water level in the pond is above the outlet, follow proper safety precautions before opening the sluice gate or valve or pumping out the pond.
    - After the pond has been drained, remove the trash screen to access the outlet. Return the sluice gate or valve to its original position.
    - Remove sediment and debris blocking the flow into the outlet. Replace any damaged or corroded components.



- **E2: Inspect trash rack for trash, debris, damage, or corrosion:**
    - Remove trash and debris from trash rack.
    - Replace trash rack according to design specifications if it is corroded or damaged.



- **E3: Ensure movable components (e.g., sluice gates, valves) are operable through their full range of motion:**
    - Remove sediment or debris within and near the movable component.
    - If lubrication is necessary, lubricate with a marine-type grease.
    - If components are damaged beyond repair, consult a design professional for guidance on replacement.



5.8 Stormwater Wetlands

5.8.1 Description and Function of Structure

Stormwater wetlands function similar to wet detention ponds. Stormwater wetlands are earthen impoundments that maintain a permanent pool of water and may have additional storage for detaining runoff and attenuating peak flows. However, stormwater wetlands are shallower than wet detention ponds and have larger areas of wetland vegetation. Varying shallow water depths (wetland zones) increase aquatic plant diversity. Stormwater wetlands provide detention benefits (e.g., reduced peak flows and preventing stream channel erosion) and runoff water quality treatment. The permanent pool provides an area for sediment storage, which reduces TSS and the associated pollutants adhering to these particles. Contact with the permanent pool and wetland vegetation results in chemical and biological processes that reduce nutrients, metals, and pathogens.

Figure 5.8-1 depicts a shallow stormwater wetland adjacent to a parking area, similar to what may be found at a GDOT rest area, and a pocket wetland treating runoff from a roadway.

Figure 5.8-1
Shallow Stormwater Wetland (left) and Pocket Stormwater Wetland (right)
(photos courtesy of GSMM)

Typical components and configuration for a stormwater wetland are shown on Figure 5.8-2.

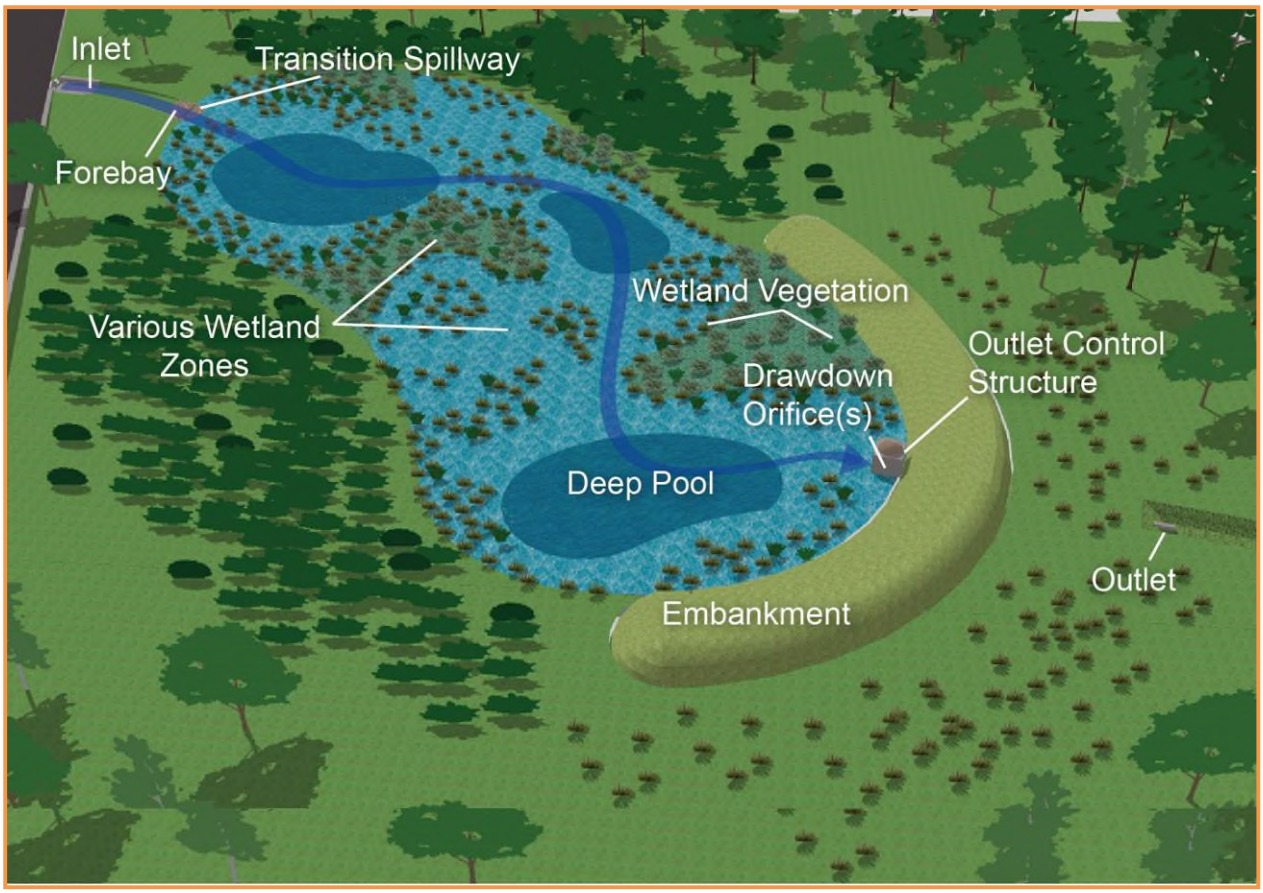


Figure 5.8-2
Typical Components and Configuration for a Stormwater Wetland

Key functional features of stormwater wetlands include:

- Forebay designed to provide pretreatment by capturing debris and sediment and to reduce the velocity of runoff entering the stormwater wetland.
- Permanent pool of water with varying depths that provides water quality benefits and sustains wetland vegetation.
- Drawdown orifice/device used to temporarily detain stormwater runoff after a storm event.

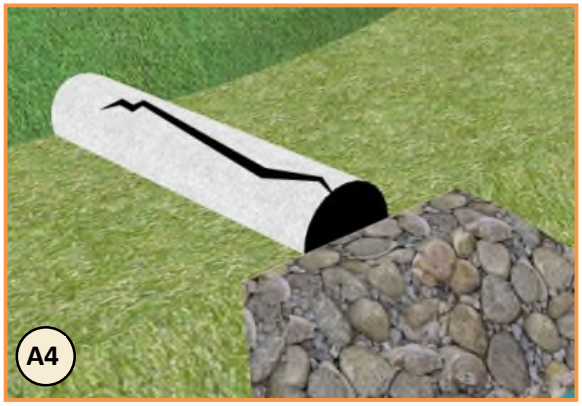
The Section 5.8.2 recommends inspection and maintenance practices for maximizing stormwater wetland performance.

5.8.2 Inspection and Maintenance

Comprehensive inspections of stormwater wetlands should be conducted at least annually during periodic route inspections. The inspector documents observed conditions during compliance inspections using Form B-6 (Appendix B), determines appropriate actions to remedy functional impairments per this I&M Manual, and documents routine or as-needed maintenance performed.

Inlet and Outlet Drainage Systems

- **A1: Inspect for trash, debris, and sediment:**
  - Remove trash and vegetative debris or sediment that has the potential to inhibit flow into the stormwater wetland.
- **A2: Inspect these areas for signs of erosion:**
  - Repair eroded areas by resodding or reseeding. Restore compacted fill, filter fabric, and rock riprap (if present). If erosion is a recurring problem, consult a design professional.
  - Identify and control the source of erosion damage if soil is exposed or erosion is evident.
  - Check the upstream areas for bank stability and evidence of seeping water or scour holes.
- **A3: Inspect inlet channel, ditch, and outlet for woody vegetation:**
  - Remove vegetation that threatens the function or integrity of the inlet channel, ditch, or outlet such as woody vegetation or vegetation prone to clogging the outlet structure.
- **A4: Inspect inlet and outlet pipes for damage or clogging:**
  - Repair or replace damaged piping if needed.
  - If clogged, remove material and identify and mitigate the source of sediment or debris.

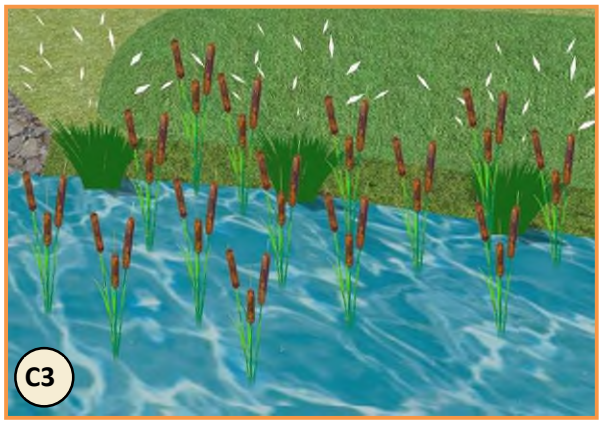


Forebay

- **B1: Inspect for sediment accumulation in forebay.**
  - Remove sediment in forebay if sediment occupies more than 50 percent of the forebay's storage capacity. Use the sediment depth marker to determine depth. If no marker was installed, use best professional judgment.
  - Reseed any areas of bare soil if surrounding soil is disturbed during cleanout of the forebay.
- **B2: Inspect for woody vegetation in forebay:**
  - Remove vegetation that threatens the function or integrity of the forebay such as woody vegetation that may cause structural deterioration or make removal of sediment from the forebay difficult.
- **B3: Inspect condition of erosion protection materials:**
  - Replace materials as needed.
  - Repair or reshape the transition spillway, taking care to maintain the original elevation and design dimensions of the transition spillway. Repair, supplement, or replace erosion protection materials as needed.

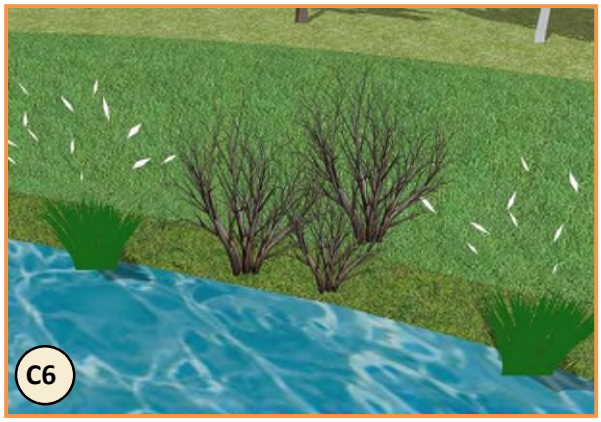
Wetland Zones/Pools

- **C1: Inspect for inadequate aquatic plant density compared to design (see final approved planting plan):**
  - Consult a design professional for vegetation re-establishment and provide them with the final approved planting plan. Use of fertilizer is restricted in some locations and applicators must be licensed.
- **C2: Inspect the pools for sediment accumulation:**
  - Remove sediment if it accumulates to the point of reducing the original design depth by 75 percent or more. Unlike other stormwater controls, sediment will not be removed from a stormwater wetland by dredging. Dredging a wetland negatively impacts the vegetative cover. Remove solids from a wetland only if it is deemed critical to the functioning of the wetland. If dredging is unavoidable, spread the top layer of dredged material over the wetland to aid in re-establishing vegetation.
- **C3: Inspect wetland zones for undesirable vegetation:**
  - Remove vegetation that threatens the function or integrity of the wetland such as vegetation prone to clogging the outlet structure.
  - Remove undesirable vegetation by physical removal or by hand wiping with aquatic glyphosate (wear gloves). Do not spray because the herbicide will kill all vegetation it contacts.
- **C4: Inspect wetland zones for trash or debris:**
  - Remove trash and debris.



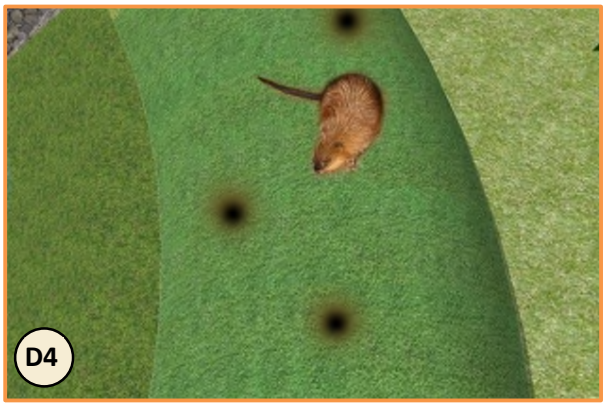
- **C5: Inspect the wetland surface for algal growth:**
  - When algae covers 50 percent or more of the pool, consult a professional to develop a management plan to remove and prevent reoccurrence of algal growth.
  - Physical removal of the algae is an option, but reoccurrence is likely.
  - Chemical control options are available. Consult the Georgia Department of Agriculture to obtain the appropriate pesticide application license.

- **C6: Inspect wetland zones for dead or unhealthy plant material:**
  - Replace dead or unhealthy plant material, taking care to determine whether appropriate vegetation is present. Consult design drawings if necessary to confirm that intended plant species are present.
  - Remove undesirable vegetation by hand if possible or by wiping them with pesticide (do not spray pesticide).
  - Licenses with special endorsements may be required to apply pesticides in an aquatic environment.

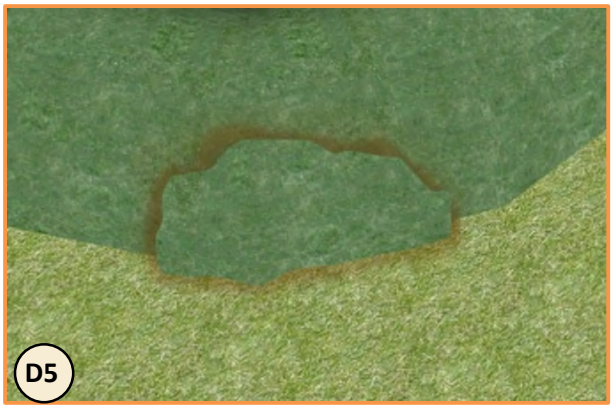


Embankment and Emergency Spillway

- **D1: Inspect for shrubs or trees growing on the embankment and emergency spillway:**
  - Remove shrubs or trees immediately.
  - Fill/regrade and re-establish ground cover as necessary.
- **D2: Inspect vegetation for poor health and/or erosion:**
  - Repair eroding areas by filling/ regrading and re-establishing ground cover.
  - Use sod where possible and provide adequate erosion protection until repaired areas are well-stabilized.
  - Provide lime and one-time fertilizer application if needed.
  - Consult a professional landscaper if needed.
- **D3: Inspect for signs of seepage on the downstream face:**
  - Consult a design professional. This could indicate a serious issue and cause the embankment to fail.
- **D4: Inspect for evidence of animal activity:**
  - Use traps to remove muskrats and consult a professional to remove beavers.
  - Repair animal burrows.

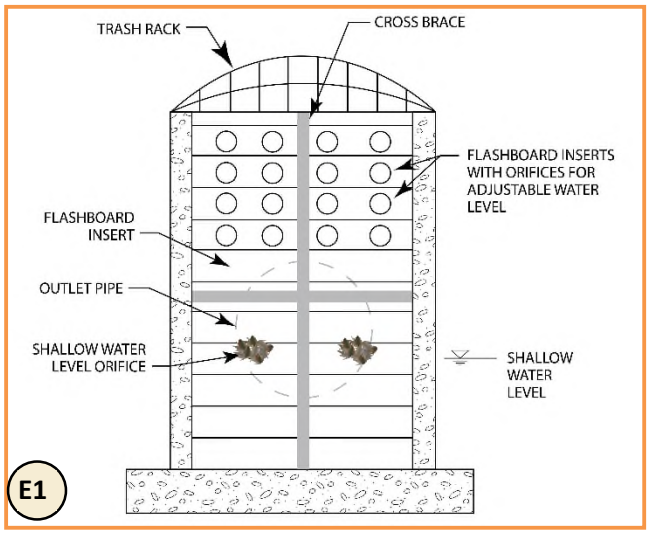


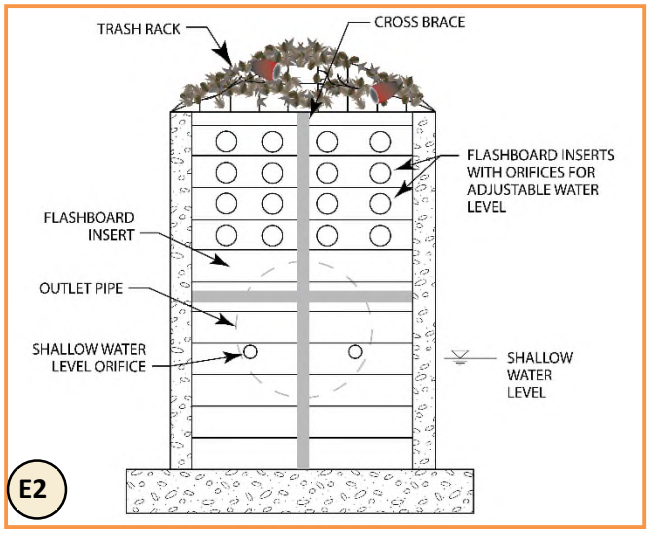
- **D5: Inspect for signs of settling, scouring, cracking, or sloughing:**
    - Repair by adding soil and/or regrade where needed. Compact as indicated in the original design documents and re-establish vegetation. Consult a design professional if needed and follow any applicable dam safety rules.
- **D6: Inspect for trash, debris, or woody vegetation in the emergency spillway:**
    - Remove trash, debris, and vegetation that threatens the function or integrity of the spillway.
- **D7: Inspect grass height and the condition of concrete or riprap in the emergency spillway:**
    - Mow grass according to the IRVM Straight Line Mowing Standards Manual.
    - Repair or replace concrete or riprap if it is in poor condition.



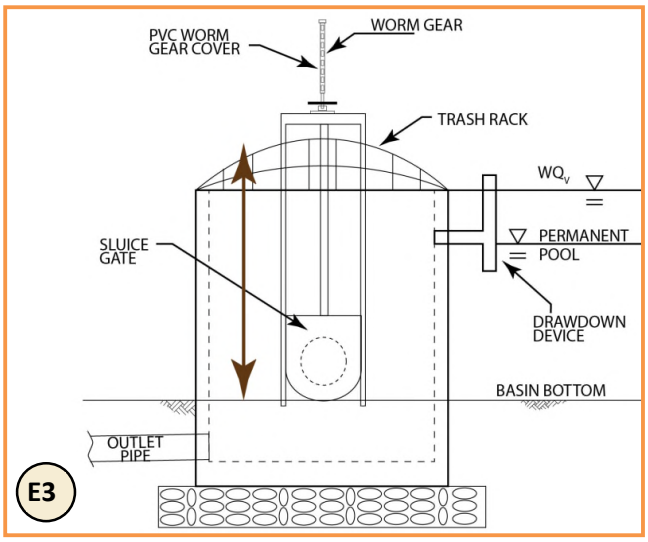
Outlet Control Structure

- **E1: Ensure that water is flowing freely through the outlet control structure; if standing water is present above the outlet/orifice opening, this indicates that the drawdown device is blocked:**
    - If the outlet appears to be clogged or blocked and standing water prevents access to the structure, use hip waders or a small boat to make the necessary repairs. Do not enter the standing water unless you have been trained to do so. Trained contractors can be hired to make needed repairs.
    - If the water level in the pool is above the outlet/orifice, follow proper safety precautions before opening the sluice gate or valve or pumping out the pool.
    - Remove sediment or debris around the drawdown device. After the deep pool has been drained, check the outlet pipe for blockage and remove debris as needed. Return the sluice gate to its original position.
- **E2: Inspect trash rack for trash, debris, damage, or corrosion:**
    - Remove trash and debris from trash rack.
    - Replace trash rack according to design specifications if it is corroded or damaged.

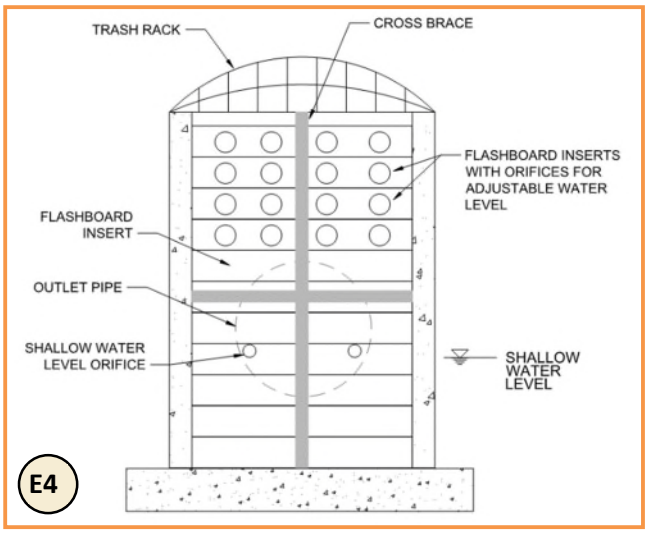




- **E3: Ensure movable components (i.e., sluice gates or valves) are operable through their full range of motion:**
  - Remove sediment or debris within and near the movable component.
  - If lubrication is necessary, lubricate with a marine-type grease.
  - If the components are damaged beyond repair, consult a design professional for guidance on replacement.



- **E4: Inspect flashboard riser (if present) for damage or blockage:**
  - Remove debris around the structure and orifices.
  - Inspect for missing or damaged flashboards. Replace or repair as appropriate, providing the same orifice sizes and configuration.
  - Check for leaks within the structure.
  - Remove or reconfigure flashboards if the wetland must be drained for maintenance or the water level requires adjustment.



5.9 Bioslopes

5.9.1 Description and Function of Structure

Bioslopes are filtration BMPs that are typically installed in roadway embankments. A special media allows sheet flow from the roadway to rapidly infiltrate and filter through the bioslope, where it is then collected and conveyed by an underdrain parallel to the roadway. Runoff in excess of the design flow rate bypasses the bioslope in the form of sheet flow that does not infiltrate. A filter strip is recommended, if space allows, and is typically placed directly upstream of the bioslope for pretreatment where it captures sediment and debris and prevents premature clogging of the bioslope. If a filter strip BMP cannot be implemented upstream of the bioslope, an ordinary grassed shoulder or gravel diaphragm may be used for pretreatment. Bioslopes combine the benefits of filter strips and dry enhanced swales, providing cost-effective treatment in areas where it is challenging to implement other BMPs. Figure 5.9-1 is a photograph of a roadside bioslope.

Figure 5.9-1
Bioslope with Gravel Diaphragm
(photo courtesy of Oregon DOT)

Figure 5.9-2 shows the typical configurations and components of a bioslope.

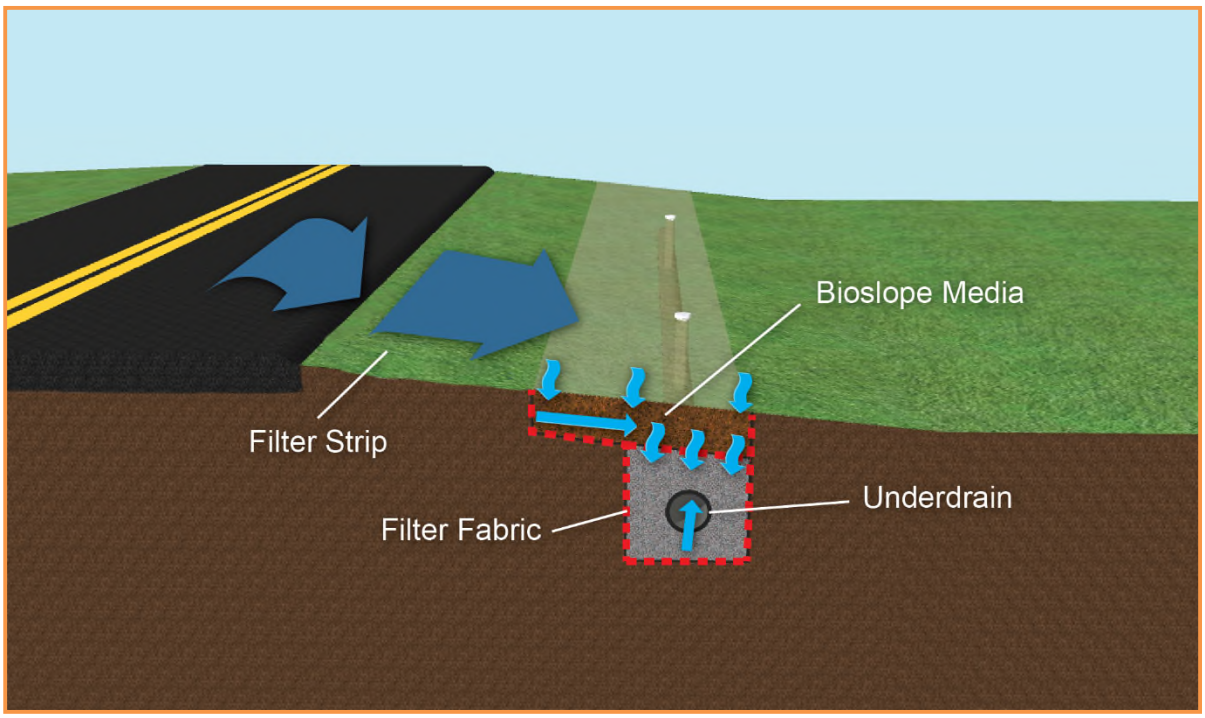


Figure 5.9-2
Typical Bioslope Configuration and Components

Key functional features of bioslopes include:

- Use filter strips or gravel diaphragms for pretreatment of stormwater runoff.
- Provide effective treatment along roadway embankments where runoff exits the pavement as sheet flow.
- Infiltrates and filters runoff through the bioslope media, where it is collected and conveyed by an underdrain.

The Section 5.9.2 recommends inspection and maintenance practices for maximizing bioslope performance.

5.9.2 Inspection and Maintenance

Bioslopes will typically be indistinguishable from the rest of the surrounding embankment unless staked out with markers or located using GPS. If the inspector cannot locate the bioslope, coordinates will be obtained and markers should be added to the site.

Inspections should be performed annually during periodic route inspections. The inspector documents observed conditions during compliance inspections using Form B-7 (Appendix B), determines appropriate actions to remedy functional impairments per this I&M Manual, and documents routine or as-needed maintenance performed.

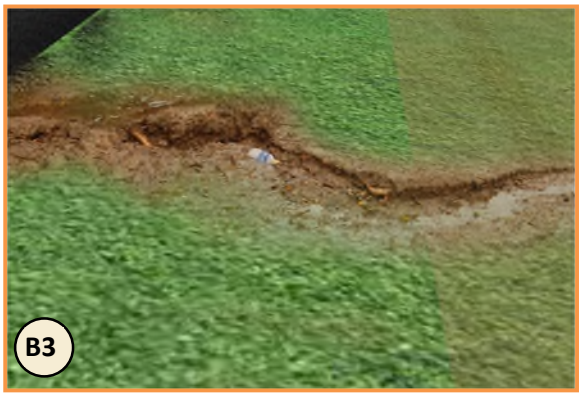
Filter Strip

- **A1: Inspect filter strip for trash and/or debris:**
  - Remove and properly dispose of trash and debris.
- **A2: Inspect for areas of unhealthy grass cover, bare areas, or dying grass:**
  - Inspect overall vegetative cover, which will be maintained at a coverage of 70 percent. Reseed and add topsoil to bare areas.
  - Provide lime and one-time fertilizer application if soil testing indicates that pH adjustment and fertilization are needed.
  - Install erosion control mat on eroded areas and steeper slopes as needed.
  - If due to unusually dry conditions, water where practical.
  - If compaction is a concern, aerate the soil using a core aerator that collects cores and dispose of the cores in an area that will not impact stormwater or receiving waters. Aerate only during times of the year when grass is actively growing.
  - If the problem persists, determine the source of the problem (e.g., soil, drainage). If needed, perform additional soil testing and carefully apply/add materials to improve soil conditions and re-establish vegetation.

- **A3: Inspect filter strip for areas of erosion or formation of gullies:**
  - Runoff must enter the strip as sheet flow.
  - Regrade the soil if necessary to remove the gully. Plant ground cover and water, if practical, until it is established.
  - Repair eroding areas by filling/regrading and re-establishing ground cover.
  - Use sod where possible and provide adequate erosion protection until repaired areas are well stabilized.
  - Provide lime and one-time fertilizer application if needed.
- **A4: Inspect filter strip area for woody vegetation:**
  - Remove woody vegetation that can cause flow to channelize.
  - Remove vegetation that threatens the function or integrity of the filter strip.
- **A5: Inspect for areas of standing water:**
  - Dewater and discharge to an approved location. Regrading may be required.
  - If a filter strip exhibits signs of poor drainage, determine cause of standing water (e.g., compacted soil, significant erosion) and regrade if necessary.

- **A6: Sediment is accumulating within filter strip:**
  - Remove sediment from the filter strip area when it reaches a depth of 1 to 3 inches. Re-establish vegetation and regrade if necessary.
- **A7: Inspect vegetation density:**
  - Mow grass according to the IRVM Straight Line Mowing Standards Manual within the filter strip at a height to maintain a dense vegetative cover.

- **B1: Inspect area for trash or debris:**
  - Remove and properly dispose of trash and debris.
- **B2: Inspect areas for unhealthy vegetative cover, bare areas, or dying vegetation:**
  - Monitor overall vegetative cover, which will be maintained at a coverage of 70 percent. Reseed and add topsoil to bare areas.
  - If needed, perform soil testing and carefully apply/add materials to improve soil conditions. Also, provide lime and one-time fertilizer application if soil testing indicates that pH adjustment and fertilization are needed.
  - If unusually dry conditions are the cause for unhealthy vegetation, water where practical.
  - If sod was used, check to see that it was not grown in clay or impermeable soil. Replace sod if necessary.
- **B3: Inspect areas for presence of erosion or formation of gullies in the bioslope:**
  - If erosion has occurred, re-establish turf grass (seed or sod). Use a rolled erosion control product on eroded areas and steeper slopes as needed.
  - If channelization has occurred, re-establish the design grade of the bioslope by removing sediment, filling in, and re-establishing vegetation. Provide lime and one-time fertilizer application if needed.



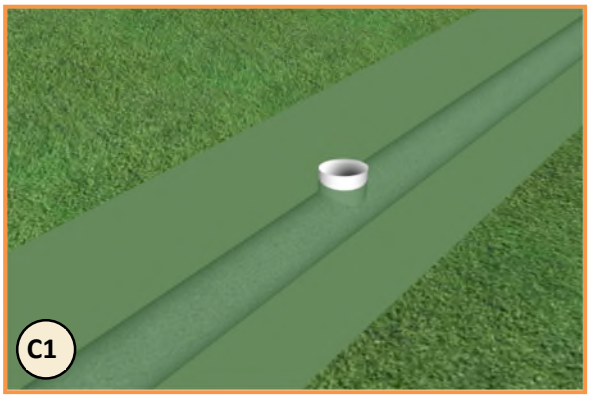
- **B4: Inspect bioslope area for woody vegetation:**
  - Remove woody vegetation that can cause flow to channelize.
  - Remove vegetation that threatens the function or integrity of the bioslope.

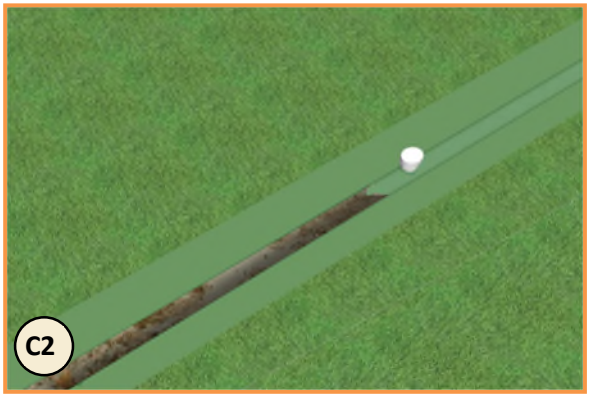
- **B5: Inspect bioslope for accumulation of sediment:**
  - Search for the source of the sediment and remedy the problem if possible.
  - Remove sediment if it is clogging the bioslope media or if it has reached a depth of 3 inches. Dispose of sediment in a location where it will not cause impacts to streams or the BMP. Revegetate disturbed areas immediately with sod (preferred) or seed, protected with a securely staked erosion mat.
  - Due to the sloped nature of this stormwater BMP, sediment may accumulate downslope. Inspect these areas as well.
  - Removal and replacement of the top 2 to 5 inches of media every 3 to 5 years for low sediment applications may be necessary. Media replacement may be needed more often for areas of high sediment yield or high oil and grease.

- **B6: Inspect vegetation:**
  - Mow grass according to the IRVM Straight Line Mowing Standards Manual within bioslope.

Underdrain

- **C1: Inspect for missing or damaged cleanout caps:**
  - Replace cleanout caps that are missing, cracked, or otherwise damaged. Damaged or missing caps will allow stormwater to bypass the bioslope untreated.
- **C2: Perform periodic flow testing of cleanouts to determine if underdrain system is clogged:**
  - Use a bucket or hose to pour water into cleanout and observe outlet control structure for flow.
  - If water does not exit freely, the underdrain is likely clogged. Use a high-pressure hose to flush out the underdrain system by spraying directly into the cleanouts.
  - Repair or replace underdrain system if flushing does not allow water to drain freely. Repair and replace in accordance with the original design specifications. Flush the underdrain system annually if it has a tendency to plug.
  - Rills or gullies downgradient may indicate that the underdrain is clogged.





Outlet

- **D1: Inspect outlet for signs of erosion:**
  - Repair eroded areas by resodding or reseeding. Restore compacted fill, filter fabric, and rock riprap (if present). If erosion is a recurring problem, consult a design professional.
  - Identify and control the source of erosion damage if soil is exposed or erosion is evident in the channel bottom or side slopes.
  - Check the upstream areas for bank stability and evidence of seeping water or scour holes.
- **D2: Inspect outlet pipes for damage or clogging:**
  - Repair or replace damaged piping if needed.
  - If clogged, remove material and identify and mitigate the source of sediment or debris.

Gravel Diaphragm (optional)

See Section 5.12 for guidance on inspection and maintenance of optional components.

5.10 Bioretention Basins

5.10.1 Description and Function of Structure

Bioretention basins are structural BMPs that serve to reduce stormwater pollution through filtration, biological uptake, and microbial activity using landscape vegetation, engineered soil media, and an underdrain. Bioretention basins are effective in reducing TSS, nutrients, heavy metals, pathogens, and temperature. After pretreatment, runoff is temporarily impounded in the bioretention basin to allow it to percolate through an engineered soil media. Vegetation is purposefully selected and planted to enhance pollutant removal and aesthetics. Stormwater that is not absorbed by vegetation or exfiltrated to surrounding soil is collected in an underdrain at the bottom of the media. The underdrain is typically routed to an outlet structure and discharged through the outlet pipe.

It should be noted that the current design of bioretention basins call for an underdrain system to be included in all bioretention basins. However, the underdrain system outlet may be capped to promote full infiltration of runoff into the soil, partial infiltration, or filtration depending on which outlet pipes are capped.

Figure 5.10-1 depicts two variations of bioretention basins.

Figure 5.10-1
Landscaped Bioretention Basin (left) and Newly Planted Bioretention Basin after Storm Event (right) (photos courtesy of NCDOT and GSMM)

Figure 5.10-2 shows the typical configuration and components of a bioretention basin.

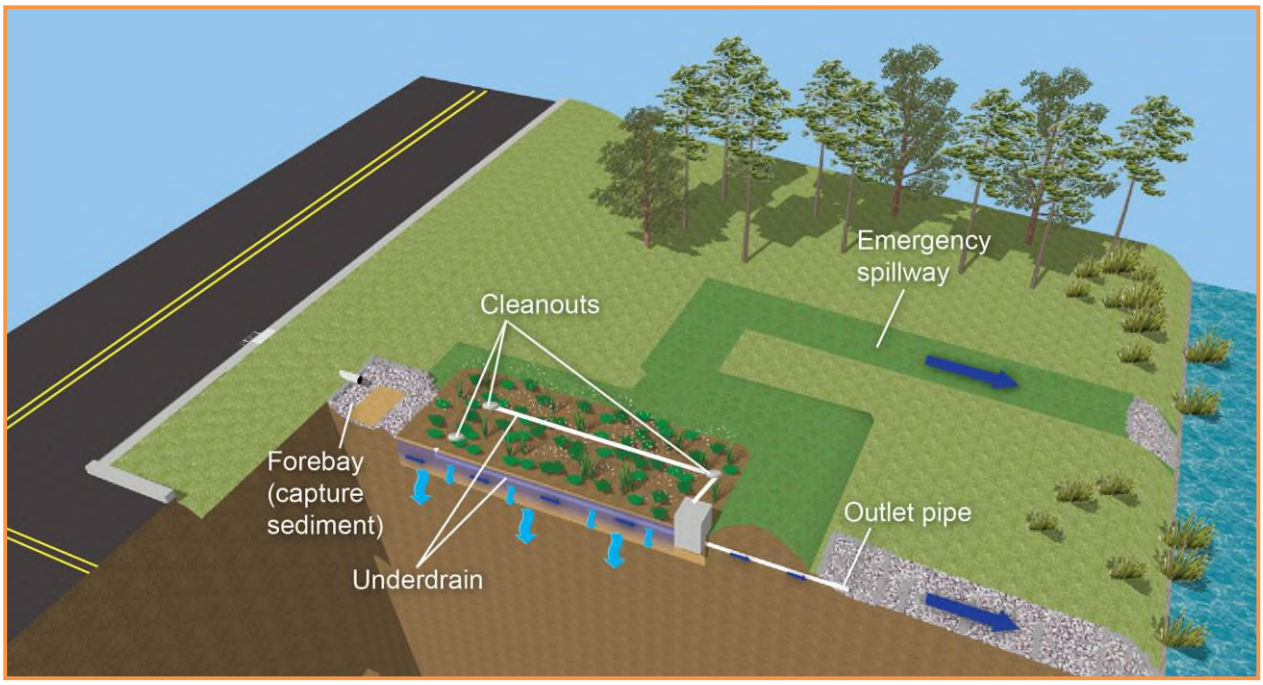


Figure 5.10-2
Typical Bioretention Basin Configuration and Components

Key functional features of bioretention basins include:

- Forebay designed to provide pretreatment by capturing debris and sediment and to reduce the velocity of runoff entering the bioretention basin.
- Healthy vegetation and a sufficient mulch layer essential to pollutant removal.
- Underdrain system to collect water after filtering through the bioretention basin.

Section 5.10.2 recommends inspection and maintenance practices for maximizing bioretention basin performance.

5.10.2 Inspection and Maintenance

Inspections of bioretention basins should be conducted at least annually during periodic route inspections. The inspector documents observed conditions during compliance inspections using Form B-8 (Appendix B), determines appropriate actions to remedy functional impairments per this I&M Manual, and documents routine or as-needed maintenance performed.

Inlet and Outlet Drainage Systems

- **A1: Inspect for trash, debris, and sediment:**
  - Remove trash and vegetative debris or sediment that has the potential to inhibit flow into the bioretention basin.
- **A2: Inspect these areas for signs of erosion:**
  - Repair eroded areas by resodding or reseeding. Restore compacted fill, filter fabric, and rock riprap (if present). If erosion is a recurring problem, consult a design professional.
  - Identify and control the cause of erosion damage if soil is exposed or erosion is evident.
  - Check upstream areas for bank stability and evidence of seeping water or scour holes.
- **A3: Inspect inlet and outlet pipes for damage or clogging:**
  - Repair or replace damaged piping if needed.
  - If clogged, remove material and identify and mitigate the source of sediment or debris.

Forebay

- **B1: Inspect for sediment accumulation in forebay:**
  - Remove sediment in forebay if sediment depth is greater than 6 inches.
  - Reseed any areas of bare soil if surrounding soil is disturbed during cleanout of the forebay.

- **B2: Inspect for woody vegetation in forebay:**
  - Remove vegetation that threatens the function or integrity of the forebay such as woody vegetation that may cause structural deterioration or make removal of sediment from the forebay difficult.

- **B3: Inspect condition of erosion protection materials:**
  - Replace materials as needed.
  - Repair or reshape the forebay, taking care to maintain the original design elevation and dimensions. Repair, supplement, or replace erosion protection materials as needed.

Basin

- **C1: Inspect area for trash or debris:**
  - Remove and properly dispose of trash and debris.
- **C2: Inspect for unhealthy or dying plants:**
  - Replace dead or unhealthy plants using the original design drawings or landscaping plan if necessary.
  - Determine the source of the problem (e.g., soil, hydrology, disease). Remedy the problem before replacing plants.
- **C3: Inspect areas for presence of erosion or formation of gullies in the basin:**
  - If erosion has occurred, re-establish mulch cover.
  - If channelization has occurred, re-establish the basin bottom by removing sediment, filling in, and re-mulching.

- **C4: Inspect mulch cover for uniformity and whether it is breaking down or has floated away:**
    - Replenish mulch in void areas.
    - Replace entire mulch layer if necessary according to design plan specifications.
    - Remove the remaining mulch and replace with triple-shredded hardwood mulch at a maximum depth of 3 inches.
    - Do not replace with pine bark mulch.

- **C5: Inspect basin for standing water; the basin must drain within 24 hours after a storm event:**
    - Check outlet structure for clogging. If clogging appears to be a design issue, consult a design professional. If cattails or other wetland vegetation emerge, water is likely remaining in the basin too long. Possible causes include a high groundwater table, clogged media or underdrain, clogged outlet, or localized low areas from heavy equipment or soil compaction.
    - If the outlet and underdrain are functioning properly and there is limited or no flow through them, the media is likely clogged and must be replaced.
    - Remove and replace the top 2 to 5 inches of media every 3 to 5 years for normal applications, more often for areas of high sediment yield or high oil and grease loading.

- **C6: Inspect basin for accumulation of sediment:**
    - Identify and control the source of the sediment if possible. Remove the sediment if it has reached a depth of 3 inches. Dispose of the sediment in a location where it will not cause impacts to streams or the BMP. Re-mulch disturbed areas immediately according

to planting plan.
    - Removal of accumulated sediment is extremely important. A significant accumulation of sediment will impair the pollutant removal capabilities of the basin by reducing the available storage for the water quality volume.

- **C7: Inspect vegetation for pruning or removal needs:**
    - Prune according to best professional practices.
    - Pruning is not needed often for native plantings.
    - Remove trees because their roots can damage the underdrain and inhibit inspection and maintenance.

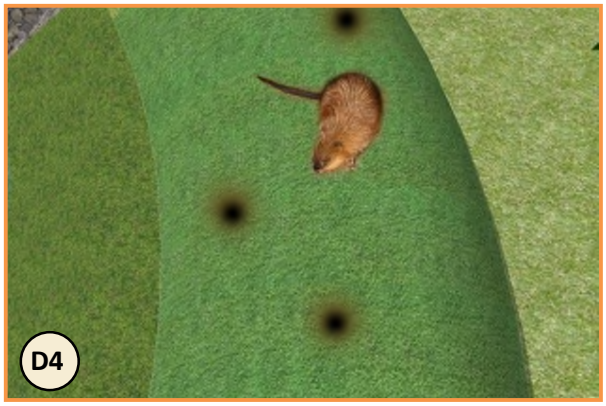
Embankment and Emergency Spillway

- **D1: Inspect for shrubs or trees growing on the embankment:**
    - Remove shrubs or trees immediately.
    - Fill/regrade and re-establish ground cover as necessary.

- **D2: Inspect grass cover for poor health and/or erosion:**
    - Repair eroding areas by filling/ regrading and re-establishing ground cover.
    - Use sod where possible and provide adequate erosion protection until repaired areas are well stabilized.
    - Provide lime and one-time fertilizer application if needed.
    - Consult a professional landscaper if needed.

- **D3: Inspect for signs of seepage on the downstream face:**
    - Consult a design professional. This could indicate a serious issue and cause the embankment to fail.

- **D4: Inspect for evidence of animal activity:**
  - Repair animal burrows.
- **D5: Inspect for signs of settling, scouring, cracking, or sloughing:**
  - Repair by adding soil and/or regrade where needed. Compact as indicated in the original design documents and re-establish vegetation. Consult a design professional if needed.
- **D6: Inspect for trash, debris, or woody vegetation in emergency spillway:**
  - Remove trash, debris, and vegetation that threatens the function or integrity of the spillway.
- **D7: Inspect grass height and condition of concrete or riprap:**
  - Grass height will be carefully maintained according to the IRVM Straight Line Mowing Standards Manual .
  - If emergency spillway is constructed of concrete or riprap, repair if in poor condition.



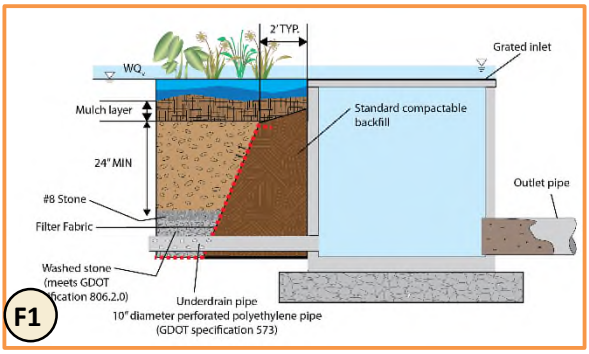
Underdrain

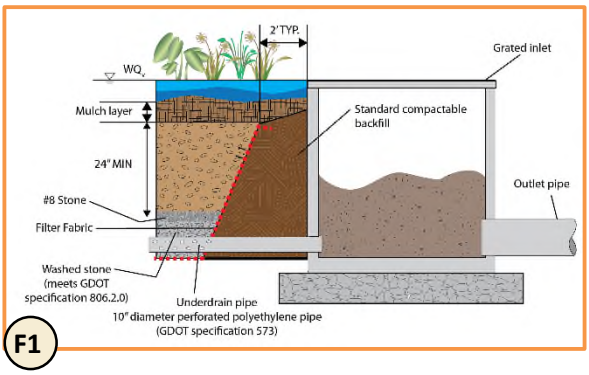
- **E1: Cleanout caps are missing or damaged:**
  - Replace cleanout caps that are missing, cracked, or otherwise damaged.
  - Damaged or missing caps may allow stormwater to exit the basin untreated.

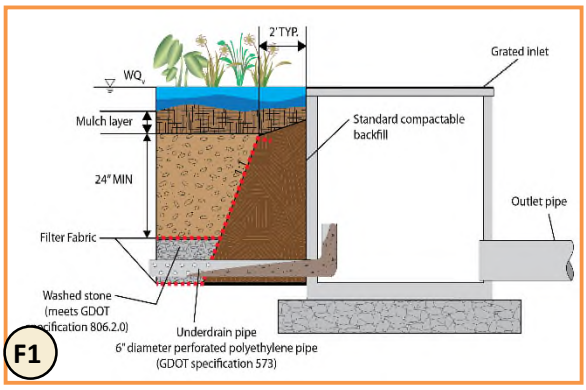
- **E2: Perform periodic flow testing of cleanouts to determine if underdrain system is clogged:**
  - Use a bucket or hose to pour water into the cleanout and observe outlet control structure for flow. If water does not exit freely, the underdrain is likely clogged. Use a high-pressure hose to flush out the underdrain system by spraying directly into the cleanouts.
  - Repair or replace underdrain systems if flushing does not allow water to drain freely. Repair and replace in accordance with the original design specifications.
  - Flush the underdrain system annually if it has a tendency to plug.

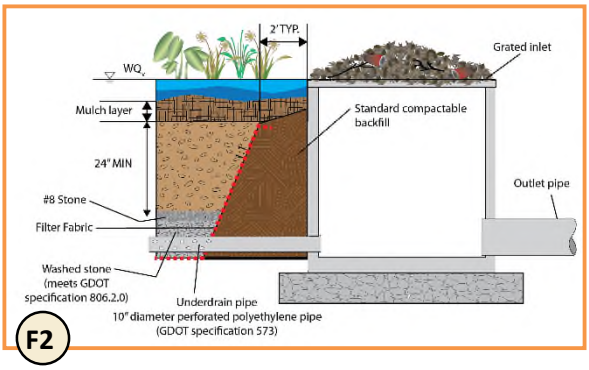
Outlet Control Structure

- **F1: Inspect for standing water around outlet control structure:**
  - If the outlet appears to be clogged or blocked, remove material blocking the outlet opening. Replace the outlet if there are signs of excessive corrosion or damage.
  - Inspect for leaks that may allow runoff to bypass the sand media untreated.
  - Check upturned elbow (if present) for clogging.
- **F2: Inspect trash rack/grate inlet for trash, debris, damage, or corrosion:**
  - Remove trash and debris from trash rack.
  - Replace trash rack according to design specifications if it is corroded or damaged.









5.11 Open-Graded Friction Course

5.11.1 Description and Function of Structure

Open-graded friction course (OGFC) is a thin, permeable layer of asphalt that encompasses a support structure consisting of a uniform coarse aggregate size with minimal fines, and serves as a final surface course or an overlay to conventional asphalt pavements. OGFC absorbs noise from vehicle traffic and has an increased resistance to surface friction. The permeability of OGFC allows for water to enter and flow through the aggregate matrix, and not directly off the pavement surface. As a result, OGFC increases the safety of motorists by decreasing splash and spray, reduces the potential for hydroplaning, improves the visibility of pavement markings, and benefits the environment. The large number of void spaces within the structure of OGFC provides a stormwater detaining effect, reduces TSS in stormwater runoff, and minimizes sediment impacts. This applies to all GDOT types of OGFC including conventional, modified, and porous European mix. Figure 5.11-1 illustrates a typical cross section of OGFC.

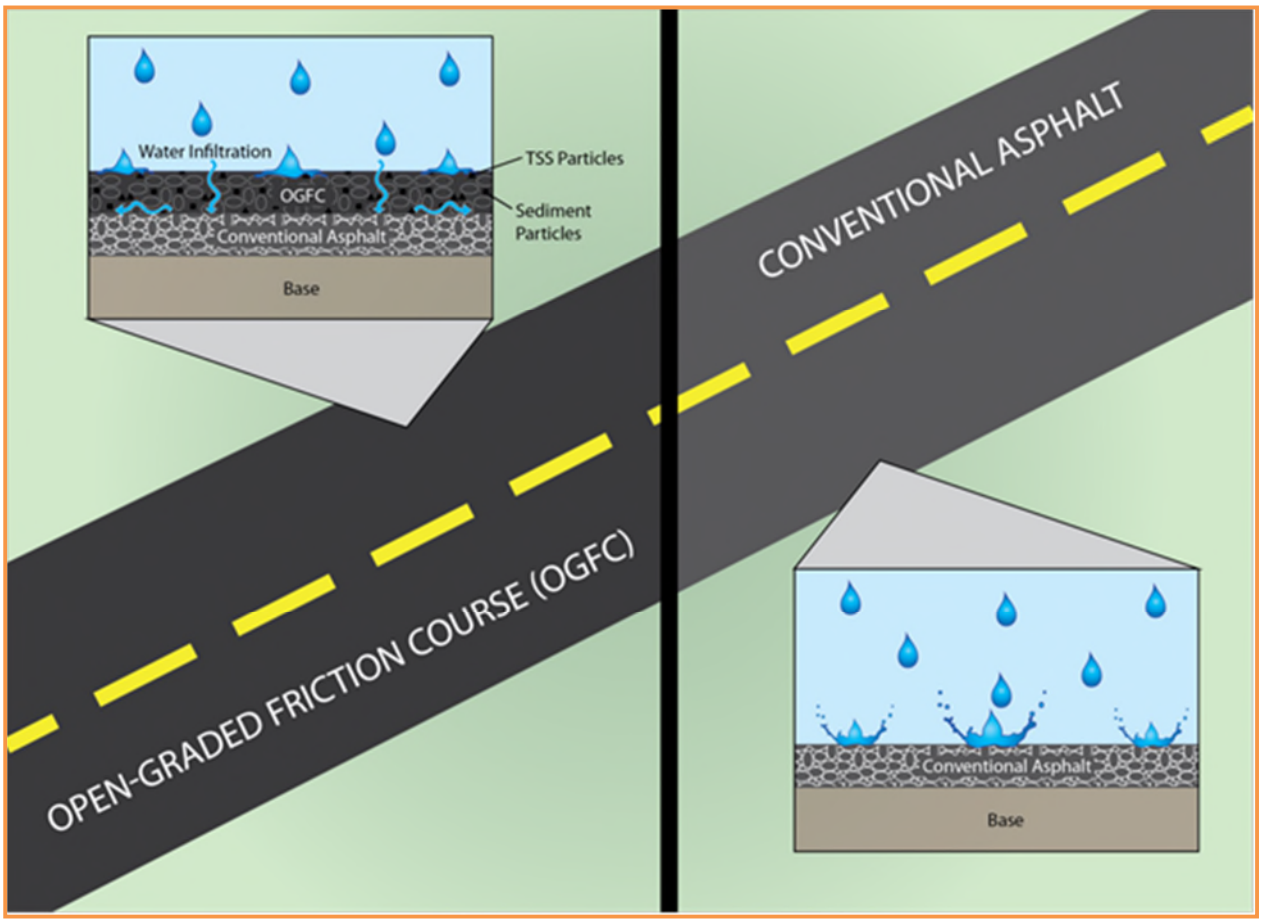


Figure 5.11-1
OGFC (left) and Conventional Asphalt (right) Cross Sections

Key functional features of OGFC that must be maintained include:

- Highways with rural shoulder sections (no curb and gutter) overlaid with OGFC and combined with filter strips provide low-cost treatment.
- Promote sheet flow along the pavement and shoulder. Some striping materials and sealing of longitudinal cracks can block lateral flow-through, decreasing OGFC effectiveness.

Figure 5.11-2 shows a typical configuration of an OGFC paired with a filter strip.

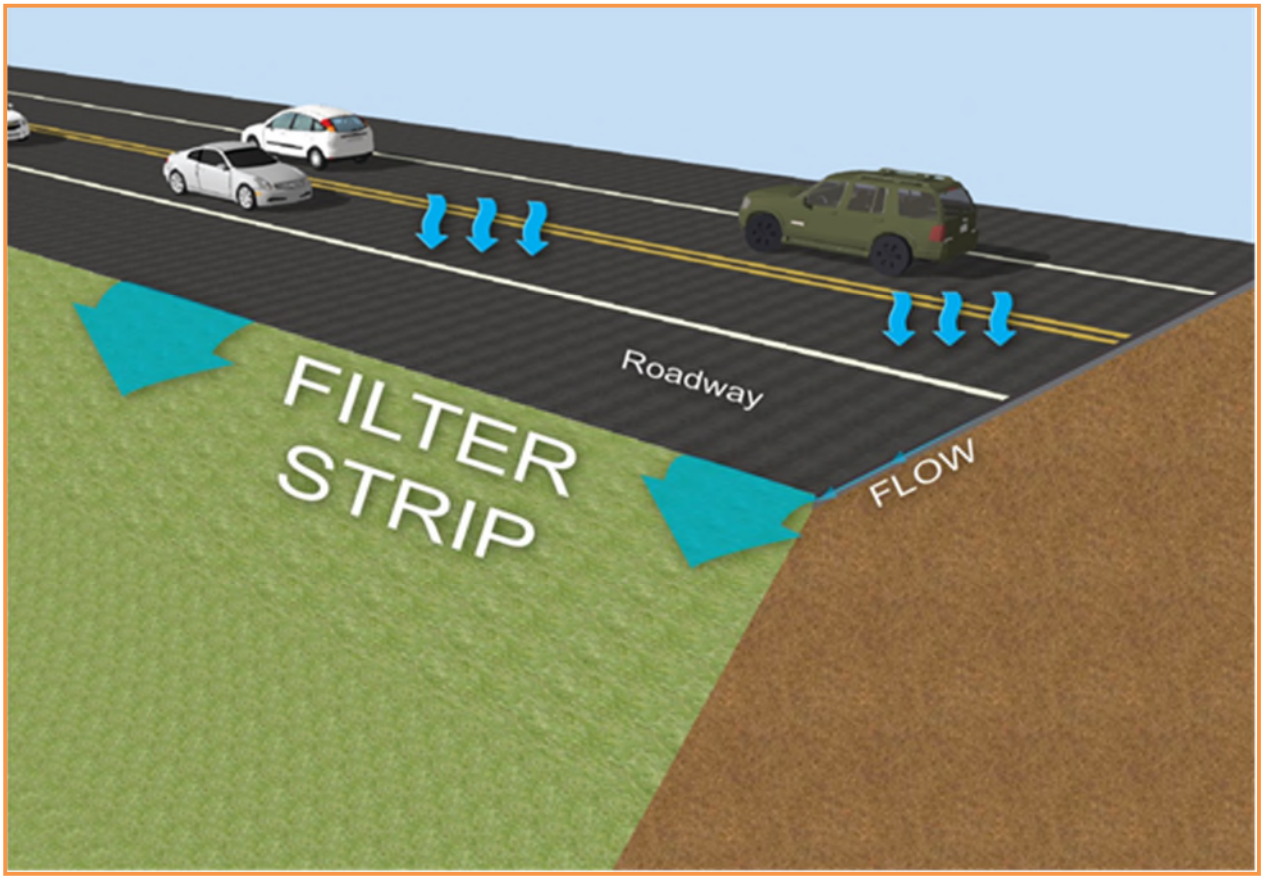


Figure 5.11-2
OGFC with a Filter Strip for Added Stormwater Treatment

Section 5.11.2 recommends inspection and maintenance practices for maximizing OGFC performance.

5.11.2 Inspection and Maintenance

Perform OGFC inspections annually following the process established in GDOT's pavement management system (PMS). The inspector documents observed conditions using PMS, determines appropriate actions to remedy functional impairments, and documents in MMS routine or as-

needed maintenance performed. Perform filter strip inspections following guidelines in section 5.1.

5.12 Other Components

This section includes inspection and maintenance guidance for the less prevalent components of post-construction stormwater BMPs including gravel diaphragms, underdrain systems (typical for specific stormwater types but not for others), underground perforated pipes used for additional stormwater storage, and stone check dams to trap sediment and slow velocity of stormwater (i.e., in ditch lines or channels).

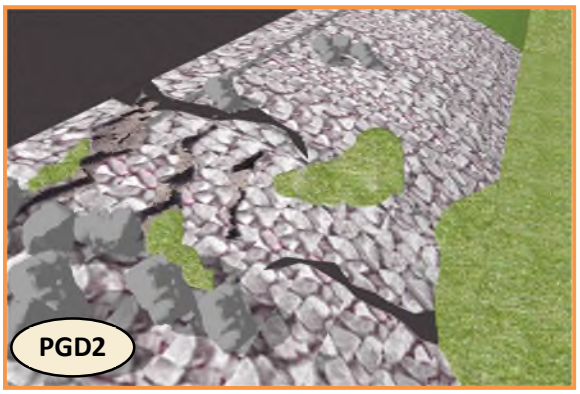
5.12.1 Inspection and Maintenance

Inspect optional components at the same time and with the same frequency as the post-construction stormwater BMP. The inspector documents observed conditions during compliance inspections of optional components using the forms provide in Appendix B for the post-construction stormwater BMP, determines appropriate actions to remedy functional impairments per this I&M Manual, and documents routine or as-needed maintenance performed.

Gravel Diaphragm

Gravel diaphragms (washed No. 8 or No. 89 stone or equivalent) may be used on the roadway shoulder as a level spreader to distribute stormwater flow. They are sometimes used in combination with filter strips, enhanced swales, bioslopes, grass channels, and other stormwater control structures.

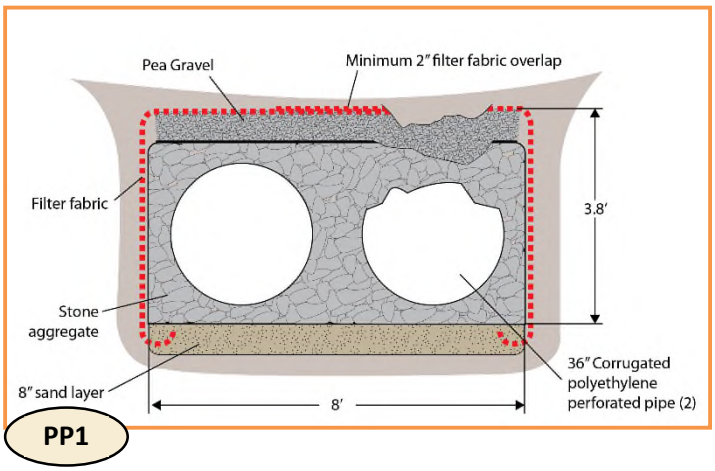
- **PGD1: Inspect for sediment accumulation on gravel diaphragm:**
  - Remove sediment and replace lost gravel with new, clean gravel.
- **PGD2: Inspect gravel diaphragm for damage:**
  - Repair damaged gravel diaphragm to original design specifications.
  - Supplement gravel if needed.

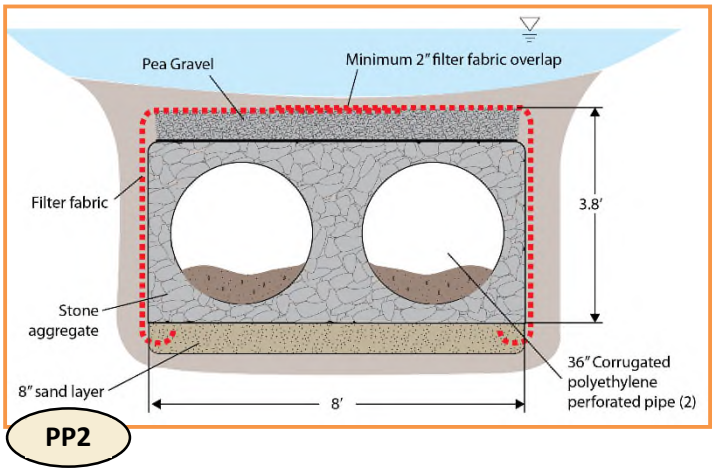


Perforated Pipe for Additional Storage

Perforated piping may be used for additional stormwater storage for infiltration trenches. Provide access for maintenance.

- **PP1: Inspect the ground surface above the perforated pipe for depressions that may indicate pipe breakage or damage:**
  - Check condition of pipes if access is provided for maintenance.
  - Remove and replace damaged pipes.
- **PP2: Inspect for water ponding that remains on surface of infiltration trench for 72 hours or more:**
  - Standing water could indicate that the infiltration trench aggregate or the perforated pipe is clogged.
  - Use closed-circuit television or lamps to check pipes for blockage. Clean out accumulated sediment and dispose of the sediment properly in an area that will not impact the infiltration trench.
  - Refer to Section 5.4 for guidance on handling clogged trenches.





Underdrain

Underdrains are perforated piping used to drain and discharge the treated stormwater from filtration BMPs. Underdrains are typically used in enhanced dry swales and sand filters but may be used with other BMPs as needed.

- **U1: Inspect for missing or damaged cleanout caps:**
  - Replace cleanout caps that are missing, cracked, or otherwise damaged. Damaged or missing caps may allow untreated stormwater to exit the stormwater control.
- **U2: Flushing of cleanouts indicates underdrain system is clogged:**
  - Use a bucket or hose to pour water into cleanout and observe outlet control structure for flow.
  - If water does not exit freely, the underdrain is likely clogged. Use a high-pressure hose to flush out the underdrain system by spraying directly into the cleanouts.
  - Repair or replace underdrain system if flushing does not allow water to drain freely. Repair and replace in accordance with the original design specifications.
  - Flush the underdrain system annually if it has a tendency to plug.

Stone Check Dam

Stone check dams are constructed of rock and washed aggregate and are placed across a natural or man-made ditch or channel. They reduce scour and channel erosion by reducing flow velocity and trapping sediment.

- **SCD1: Inspect for trash, debris, vegetation or excessive sediment:**
  - Remove and properly dispose of trash, debris, woody vegetation that threatens the function or integrity of the check dam, and sediment.
  - String trim or carefully mow around check dams to avoid damaging the check dam's structure.

- **SCD2: Inspect for evidence of erosion around the sides of the stone check dam:**
  - Replace or install riprap and stone as needed and repair erosion; rebuild or reshape check dams according to original design dimensions if necessary.

6 Implementation

GDOT implements this I&M Manual by performing periodic route inspections and compliance inspections to achieve the following MS4 Permit requirements within designated MS4 areas:

- *Drainage structures*. Inspect accessible structures within 10 percent of roadway miles annually.
- *Post-construction stormwater BMPs*. Inspect 20 percent of the identified structures annually, with 100% of post-construction stormwater BMP inspections in five years.

6.1 Key Staff, Roles, and Responsibilities

GDOT staff involved in the implementation of the I&M Manual includes the MS4 Program Manager and, principally, the State Maintenance Liaisons at the state level; the District and Assistant Maintenance Engineers and the Environmental Compliance Specialists at the District level; the Area and Assistant Area Engineers; and the respective site supervisors at the facility level (Figure 6.1-1).

The MS4 Program Manager resides within GDOT's Office of Design Policy and Support (ODPS) at the General Office and coordinates with other various divisions and offices within the Department to provide overall implementation of the GDOT Stormwater Management program (SWMP) and its various components, one of which is this manual. The District Environmental Compliance Specialists (under the authorization of the District Maintenance Manager), working with the State and District Maintenance offices, Area offices, and site supervisors, are responsible for permit compliance for GDOT facilities and operations within the respective Districts. District Maintenance for each Field District is responsible for regular maintenance, routine inspections, and completing corrective actions for compliance with the permit.

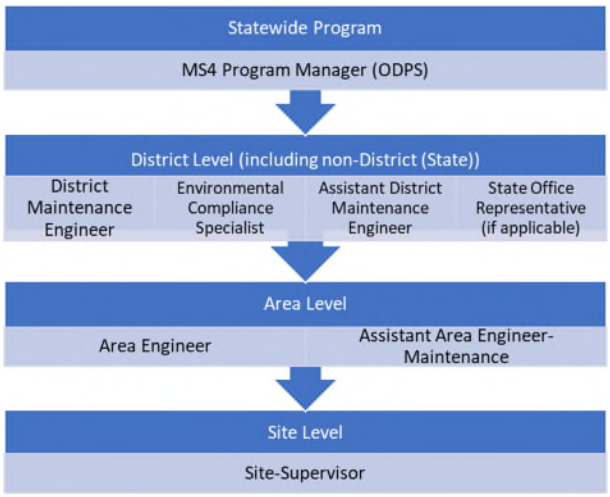


Figure 6.1-1
Key GDOT Staff for I&M Manual Implementation

6.2 Training

Training is a critical component of the GDOT MS4 Permit and implementation of this I&M Manual. Details of the training program related to the MS4 Permit can be obtained from Electronic Learning Management System (ELMS), the Training Office, GDOTs stormwater pollution prevention website (http://www.dot.ga.gov/BS/Programs/Stormwater), or the MS4 Program Manager (Office of Design Policy & Support).

6.3 Compliance Inspection Schedule

Each year, GDOT conducts compliance inspections of accessible drainage structures along 10 percent of the roadway miles. Roadway segments are added or removed from GDOT's MS4 area for many reasons including new roadway construction or updated GIS data. The total roadway miles requiring inspection is calculated using the total roadway miles within the MS4 permit area reported in the previous year's annual report.

Twenty percent of the total identified post-construction stormwater BMPs require inspection annually. The total number of identified post-construction stormwater BMPs changes yearly with continued inventory of existing BMPs and the addition of newly constructed post-construction stormwater BMPs. Compliance inspection goals representing 20-percent of the total inventory will be adjusted at the beginning of each reporting year based on the total number identified in the annual report of the previous reporting year.

Recommended follow-up or corrective actions required as a result of the inspections will be scheduled with other maintenance activities and prioritized by each district. The MS4 Structure Inventory and Inspection Summary, Estimated MS4 Structures Maintenance Summary, and Summary of Post-Construction Stormwater BMPs Inspections (Appendix C) are completed annually.

7 Recordkeeping and Reporting

The I&M Manual will be provided to each GDOT facility and District Office by posting on GDOTs electronic document management system ProjectWise. The ODPS is responsible for updating the manual as needed and communicating the updates to the District Offices. For the District Office, the District ECS oversees implementation of the I&M Manual at each district.

7.1 Recordkeeping

The MS4 Permit requires GDOT to maintain records of activities related to drainage structure and post-construction stormwater BMP inspection and maintenance. Route inspections are recorded as Activity 540 Litter Patrol in GAMS. Compliance inspections for drainage structures are recorded in GDOTs drainage asset database. Records of maintenance performed for drainage inventory are stored in GAMS using applicable activity codes.

Records of post-construction stormwater BMP inspections are stored in GDOTs BMP database. Records of the activity performed and date of completion are kept by the ECSs and reported to ODPS.

The MS4 Permit requires GDOT to develop procedures for receiving and investigating complaints related to drainage structures. These complaints and follow-up actions will be compiled and maintained in the Central Office. The information recorded includes REMEDY Inquiry ID, date, route / location, district, county, description, action, status, type, and completion date for each complaint. If the actual completion date is unknown, the confirmation date that the complaint was resolved will be included in the Annual Report. All records will be compiled during annual reporting. As required by the permit, GDOT will maintain records for at least 3 years after the expiration date of the permit.

7.2 Reporting

Records are reported to Georgia EPD in each MS4 Annual Report in accordance with permit requirements. The Annual Report summarizes drainage structure and post-construction stormwater BMP inspection, maintenance activities completed, and complaints related to drainage structures. Records are gathered by the District Offices under the supervision of the District ECS and forwarded to the Central Office on a quarterly basis, unless otherwise specified in this I&M Manual. The ODPS reviews and summarizes the reports and submit copies of the appropriate information to Georgia EPD with the MS4 Annual Report, unless more immediate notification is required.

Tables

Table 1 Inspection Attributes from GDOT's Drainage Structure Inventory and Inspection Database

GDOT's State Maintenance Office identified the yellow highlighted criteria and condition values as needing maintenance. Structures with inspection results with these values will be prioritized for maintenance by each district.

All Structure Types (Inlet, Outlet, Headwall, Endwall, End Section, Catch Basin, Junction, Manhole, Spillway, Flume, other)

Criteria	Value
BLOCKAGE	0%
BLOCKAGE	1 - 25%
BLOCKAGE	26 - 50%
BLOCKAGE	51 - 75%
BLOCKAGE	76 - 100%
BLOCKAGE	UNKNOWN
CORRECTIVE_ACTION	NO ACTION
CORRECTIVE_ACTION	CLEAN PIPE OF DEBRIS/SEDIMENT
CORRECTIVE_ACTION	REMOVE AND REPLACE PIPE
CORRECTIVE_ACTION	REPAIR STRUCTURAL DEFECTS
CORRECTIVE_ACTION	RE-GRADE DITCH
CORRECTIVE_ACTION	REMOVE SEDIMENT/TRASH/DEBRIS FROM DITCH
CORRECTIVE_ACTION	DIG-OUT DEPOSITS AROUND END SECTIONS/HWS
CORRECTIVE_ACTION	RE-INFORCE
CORRECTIVE_ACTION	INSTALL
CORRECTIVE_ACTION	UNKNOWN
EROSION_TYPE	NO INDICATION

Table 1 cont. Inspection Attributes from GDOT's Drainage Structure Inventory and Inspection Database

Criteria	Value
EROSION_TYPE	SYPHON HOLES
EROSION_TYPE	SETTLING
EROSION_TYPE	EXPOSED PIPE
EROSION_TYPE	SCOURING/UNDERMINING
EROSION_TYPE	UNKNOWN
EROSION_TYPE	CREEP
EROSION_TYPE	OTHER
STRUCTURE_DEFECT	NO VISIBLE DEFECT
STRUCTURE_DEFECT	STRUCTURAL DAMAGE
STRUCTURE_DEFECT	CRACKS/JOINT SEPARATION
STRUCTURE_DEFECT	TOP/COVER BROKEN OR MISSING
STRUCTURE_DEFECT	LEAKING
STRUCTURE_DEFECT	ROOT INTRUSION
STRUCTURE_DEFECT	UNKNOWN
STRUCTURE_DEFECT	MODERATE EROSION
STRUCTURE_DEFECT	SEVERE EROSION
STRUCTURE_DEFECT	CORROSION

Table 1 cont. Inspection Attributes from GDOT's Drainage Structure Inventory and Inspection Database

All Conveyance Types (Box Culvert, Circular Pipe, Ditch, Elliptical Pipe, Pipe Culvert, Swale, Trench Drain, Sanitary Storm Combo, Stream, Overland flow connector)

Criteria	Value
BLOCKAGE	0%
BLOCKAGE	1 - 25%
BLOCKAGE	26 - 50%
BLOCKAGE	51 - 75%
BLOCKAGE	76 - 100%
BLOCKAGE	UNKNOWN
CONDITION	NEW
CONDITION	GOOD
CONDITION	FAIR
CONDITION	POOR
CONDITION	INOPERABLE
CONDITION	UKNOWN
EROSION TYPE	NO INDICATION
EROSION TYPE	SYPHON HOLES
EROSION TYPE	SETTLING
EROSION TYPE	EXPOSED PIPE
EROSION TYPE	SCOURING/UNDERMINING
EROSION TYPE	UNKNOWN
EROSION TYPE	CREEP

Table 1 cont. **Inspection Attributes from GDOT's Drainage Structure Inventory and Inspection Database**

EROSION TYPE	OTHER
EROSION TYPE	SYPHON HOLES
CORRECTIVE_ACTION	NO ACTION
CORRECTIVE_ACTION	CLEAN PIPE OF DEBRIS/SEDIMENT
CORRECTIVE_ACTION	REMOVE AND REPLACE PIPE
CORRECTIVE_ACTION	REPAIR STRUCTURAL DEFECTS
CORRECTIVE_ACTION	RE-GRADE DITCH
CORRECTIVE_ACTION	REMOVE SEDIMENT/TRASH/DEBRIS FROM DITCH
CORRECTIVE_ACTION	DIG-OUT DEPOSITS AROUND END SECTIONS/HWS
CORRECTIVE_ACTION	RE-INFORCE
CORRECTIVE_ACTION	INSTALL
CORRECTIVE_ACTION	UNKNOWN
CONVEYANCE_DEFECT	NO VISIBLE DEFECT
CONVEYANCE_DEFECT	JOINT SEPARATION
CONVEYANCE_DEFECT	PIPE COLLAPSED
CONVEYANCE_DEFECT	PIPE CORROSION
CONVEYANCE_DEFECT	ROOT INTRUSION
CONVEYANCE_DEFECT	LACK OF STABILIZATION
CONVEYANCE_DEFECT	LINER DAMAGE
CONVEYANCE_DEFECT	SURCHARGED FLOW
CONVEYANCE_DEFECT	BENT/CHIPPED

Table 1 cont. **Inspection Attributes from GDOT's Drainage Structure Inventory and Inspection Database**

CONVEYANCE_DEFECT	CRACKS/CRACKING
CONVEYANCE_DEFECT	UNKNOWN
CONVEYANCE_DEFECT	MODERATE EROSION
CONVEYANCE_DEFECT	SEVERE EROSION
CONVEYANCE_DEFECT	LEAKING

Table 2 – Routine Maintenance and Frequency for Post-Construction Stormwater BMPs

Category	Routine Maintenance	Frequency	Dry and Wet Detention Basins, Stormwater Wetlands and Bioretention Basins	Infiltration Trench	Filter Strips, Bioslopes and Sand Filters	Grass Channel and Enhanced Swales
Trash and Debris	Remove trash, leaves, and debris from trash racks, spillways, and other areas	Annual or more frequently if needed	o	o	o	o
	Remove blockages from inlet and outlet structures	Annual or more frequently, if needed	o	o	o	o
Erosion and Sediment	Reseed or replant bare soil	Annual or more frequently, if needed	o	o	o	o
	Remove deposited sediment	Annual	o	o	o	o
Mowing	Mow vegetation	Refer to GDOT's IRVM Straight Line Mowing Standards Manual, "Cleanup Mowing and Trimming" section	o	o	o	o
Vegetation	Remove overgrown vegetation	Annual	o	o	o	o
	Spot weeding and invasive plant removal, minor herbicide treatment	Annual	o	o	o	o
	Seed sparsely vegetated areas and install matting, if necessary	Annual	o	o	o	o
	Remove and replace dead or diseased vegetation, if necessary	Annual			o	
Animal Activity	Fill animal burrows along embankment and basin	Annual	o	o	o	o
Mulch	Replenish mulch, if present	Annual or more frequently, if needed			o	

Note: IRVM = Integrated Roadside Vegetation Management (IRVM)

Appendix A

Drainage Structure
Inspection Checklists

GDOT Pipe Systems
Inspection Checklist Form A-1

This checklist is for the inspection of pipe systems NOT including the pipe inlets and outlets. For inspection of pipe inlets and outlets refer to GDOT Manholes, Junction Boxes, Catch Basins, Inlets and Outlets Inspection Checklist Form A-3.

Contractor:	Inspector:	Inspection Date:
Inspection Notes:		

Conveyance ID:	Install Date:	Liner: ☐ Yes ☐ No
Conveyance Type: ☐ Box Culvert ☐ Circular Pipe ☐ Elliptical Pipe ☐ Pipe Culvert ☐ Trench Drain ☐ Sanitary Storm Combo	Conveyance Material: ☐ Aluminized steel ☐ Concrete ☐ Corrugated Metal Pipe – Coated ☐ Corrugated Metal Pipe - Plain ☐ Corrugated Plastic Pipe ☐ Iron ☐ PVC ☐ Vitrified clay ☐ Other ☐ Unknown ☐ High-density polyethylene	Number of barrels: Rise (vertical diameter feet): Span (horizontal diameter feet):

Structure ID #:	Date:

GDOT Pipe Systems
Inspection Checklist Form A-1

Complete the form below by indicating the condition for each inspection item. Refer to Section 4.1 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on pipe systems inspection items and maintenance activities.

Criteria	Check if present	VALUE
BLOCKAGE	☐	0%
	☐	1 - 25%
	☐	26 - 50%
	☐	51 - 75%
	☐	76 - 100%
	☐	UNKNOWN
CORRECTIVE ACTION	☐	NO ACTION
	☐	CLEAN PIPE OF DEBRIS/SEDIMENT
	☐	REMOVE AND REPLACE PIPE
	☐	REPAIR STRUCTURAL DEFECTS
	☐	RE-GRADE DITCH
	☐	REMOVE SEDIMENT/TRASH/DEBRIS FROM DITCH
	☐	DIG-OUT DEPOSITS AROUND END SECTIONS/HWS
	☐	RE-INFORCE
	☐	INSTALL
	☐	UNKNOWN
EROSION TYPE	☐	NO INDICATION
	☐	SYPHON HOLES
	☐	SETTLING
	☐	EXPOSED PIPE
	☐	SCOURING/UNDERMINING
	☐	UNKNOWN
	☐	CREEP
	☐	OTHER

Structure ID #:	Date:

Criteria	Check if present	VALUE
CONDITION	☐	NEW
	☐	GOOD
	☐	FAIR
	☐	POOR
	☐	INOPERABLE
	☐	UKNOWN
CONVEYANCE DEFECT	☐	NO VISIBLE DEFECT
	☐	JOINT SEPARATION
	☐	PIPE COLLAPSED
	☐	PIPE CORROSION
	☐	ROOT INTRUSION
	☐	LACK OF STABILIZATION
	☐	LINER DAMAGE
	☐	SURCHARGED FLOW
	☐	BENT/CHIPPED
	☐	CRACKS/CRACKING
	☐	UNKNOWN
	☐	MODERATE EROSION
	☐	SEVERE EROSION
	☐	LEAKING

Item Number	**Corrective Actions Required/Comments:**

Media Name:	**Media Type**	**Media Aspect:**
	Photo	Overview
	Video	Side
	Document	Inside
	As Built	Behind
	Other	Other

GDOT Ditches and Swales
Inspection Checklist Form A-2

Contractor:	Inspector:	Inspection Date:
Inspection Notes:		

Conveyance ID:	Install Date:	Liner: ☐ Yes ☐ No
Conveyance Type: ☐ Ditch ☐ Swale ☐ Stream ☐ Overland flow connector	Conveyance Material: ☐ Earthen ☐ Concrete ☐ Armored ☐ Other ☐ Unknown	

Structure ID #:	Date:

GDOT Ditches and Swales
Inspection Checklist Form A-2

Complete the form below by indicating the performance condition for each inspection item. Refer to Section 4.2 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on ditch and swale inspection items and maintenance activities.

Criteria	Check if present	VALUE
BLOCKAGE	☐	0%
	☐	1 - 25%
	☐	26 - 50%
	☐	51 - 75%
	☐	76 - 100%
	☐	UNKNOWN
CORRECTIVE ACTION	☐	CLEAN PIPE OF DEBRIS/SEDIMENT
	☐	REMOVE AND REPLACE PIPE
	☐	NO ACTION
	☐	REPAIR STRUCTURAL DEFECTS
	☐	RE-GRADE DITCH
	☐	REMOVE SEDIMENT/TRASH/DEBRIS FROM DITCH
	☐	DIG-OUT DEPOSITS AROUND END SECTIONS/HWS
	☐	RE-INFORCE
	☐	INSTALL
	☐	UNKNOWN
EROSION TYPE	☐	NO INDICATION
	☐	SYPHON HOLES
	☐	SETTLING
	☐	EXPOSED PIPE
	☐	SCOURING/UNDERMINING
	☐	OTHER
	☐	UNKNOWN
	☐	CREEP

Structure ID #:	Date:

Criteria	Check if present	VALUE
CONDITION	☐	NEW
	☐	GOOD
	☐	FAIR
	☐	POOR
	☐	INOPERABLE
	☐	UKNOWN
CONVEYANCE DEFECT	☐	NO VISIBLE DEFECT
	☐	JOINT SEPARATION
	☐	PIPE COLLAPSED
	☐	PIPE CORROSION
	☐	ROOT INTRUSION
	☐	LACK OF STABILIZATION
	☐	LINER DAMAGE
	☐	SURCHARGED FLOW
	☐	BENT/CHIPPED
	☐	CRACKS/CRACKING
	☐	UNKNOWN
	☐	MODERATE EROSION
	☐	SEVERE EROSION
	☐	LEAKING

Item Number	**Corrective Actions Required/Comments:**

Media Name:	**Media Type**	**Media Aspect:**
	Photo	Overview
	Video	Side
	Document	Inside
	As Built	Behind
	Other	Other

GDOT Manholes, Junction Boxes, Catch Basins, Inlets, and Outlets Inspection Checklist Form A-3

Contractor:	Inspector:	Inspection Date:
Inspection Notes:		

Structure ID:	Install Date:		Invert Depth (feet):
Structure Type: ☐ Inlet ☐ Pipe Outlet ☐ Headwall ☐ Endwall ☐ Catch Basin ☐ Box Culvert End ☐ Junction Box ☐ Manhole ☐ End Section ☐ Spillway ☐ Intersection ☐ Stand Pipe ☐ Flume ☐ Misc ☐ Control Structure	Structure Shape: ☐ Buried ☐ Combination ☐ Breached ☐ Trapezoid ☐ Broadcrested ☐ V-notched ☐ Double Wing ☐ Manhole ☐ Left Wing ☐ Right Wing ☐ Flared End ☐ Plain End ☐ Grated Inlet ☐ Hooded grate ☐ Raised ☐ L-Shaped ☐ U-Shaped ☐ Round ☐ Rectangular ☐ Straight ☐ Winged ☐ Orifice ☐ Other ☐ Unknown	Material: ☐ Block ☐ Brick ☐ Concrete ☐ Corrugated Metal Pipe - Coated ☐ Corrugated Metal Pipe - Plain ☐ Iron ☐ Plastic ☐ Vitrified Clay ☐ Wood ☐ Other ☐ Unknown ☐ Paved ☐ Earthen	Throat Depth (feet): Anti-Theft Device: Yes / No Surface Area: ☐ RipRap ☐ Paved ☐ Other ☐ Unknown ☐ Heavy Vegetation ☐ Concrete apron ☐ Sod/Grass/Earthen
If the structure type is inlet, headwall, endwall catch basin, junction box, manhole, end section, spillway, flume, miscellaneous, or control structure please select the type of structure on the structure subtype page.			

Structure ID #:	Date:

GDOT Manholes, Junction Boxes, Catch Basins, and Inlets Inspection Checklist Form A-3

Complete the form below by indicating the performance condition for each inspection item. Refer to Section 4.3 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on manhole, junction box, catch basin, and inlet inspection items and maintenance activities.

Criteria	Check if present	VALUE
BLOCKAGE	☐	0%
	☐	1 - 25%
	☐	26 - 50%
	☐	51 - 75%
	☐	76 - 100%
	☐	UNKNOWN
CORRECTIVE ACTION	☐	NO ACTION
	☐	REINFORCE/PLACE RIPRAP
	☐	REPAIR STRUCTURAL DAMAGE
	☐	REMOVE DEBRIS
	☐	REPLACE
	☐	UNKNOWN
	☐	CLEAR OUT HEAVY VEGETATION
EROSION TYPE	☐	SYPHON HOLES
	☐	SETTLING
	☐	EXPOSED PIPE
	☐	SCOURING/UNDERMINING
	☐	OTHER
	☐	NO INDICATION
	☐	UNKNOWN
	☐	CREEP
CONDITION	☐	NEW
	☐	GOOD
	☐	FAIR
	☐	POOR
	☐	INOPERABLE
	☐	UNKNOWN

Structure ID #:	Date:

Criteria	Check if present	VALUE
STRUCTURE DEFECT	☐	NO VISIBLE DEFECT
	☐	STRUCTURAL DAMAGE
	☐	CRACKS/JOINT SEPARATION
	☐	TOP/COVER BROKEN OR MISSING
	☐	LEAKING
	☐	ROOT INTRUSION
	☐	UNKNOWN
	☐	MODERATE EROSION
	☐	SEVERE EROSION
	☐	CORROSION

Potential Illicit Discharge: Yes/No
Active Water: Yes/No
Outside Connection: Incoming pipe Outgoing pipe Incoming pipe and outgoing pipe None

Item Number	**Corrective Actions Required/Comments:**

Media Name:	**Media Type** Photo Video Document As Built Other	**Media Aspect:** Overview Side Inside Behind Other

Structure ID #:	Date:

Structure Subtypes

Inlet	
1019A	Standard Drop
1019AP	Standard Precast Drop
1019B	Standard Drop Types V-1 and V-2
1035	Drain Inlet
5001M	Standard Drop Types M-1 and M-2
9031S	Standard Median Drop
D-3	Special Design Median Drop
D-33	Type "V"
D-36	Modified Standard 5001-M Drop
D-4	Ditch Drop
D-5	Safety Inlet with Grate
Unk	Unknown

Outlet Type	
Weir	Weir
Ofce	Orifice
Unk	Unknown

Catch Basin	
1010	Cast Iron Grate Inlets
1013	Type A with C.I. Inlet
1033B	Type 1 and Type 2
1033D	For 6" or 8" Curb and Gutter
1033DP	Precast for 6" or 8" Curb and Gutter
1033E	For 4" Curb and Guttter
1033EP	Precast for 4" Curb and Guttter
1033F	For Header or 4", 6", 8", and 10" Integral Curbs
1033FP	Precast for Header or 4", 6", 8", and 10" Integral Curbs
1033G	For 6" Mountable Curb and Gutter
1033GP	Precast for 6" Mountable Curb and Gutter
1034D	For 6" or 8" Curb and Gutter in Sags or Low Points
1034DP	Precast for 6" or 8" Curb and Gutter in Sags or Low Points
1034E	For 4" Curb and Gutter in Sags or Low Points
1034EP	Precast for 4" Curb and Gutter in Sags or Low Points
1034F	For Header or 4", 6", 8", and 10" Integral Curbs in Sags or Low Points
1034FP	Precast for Header or 4", 6", 8", and 10" Integral Curbs in Sags or Low Points

Structure ID #:	Date:

1034G	For 6" Mountable Curb and Gutter in Sags or Low Points
1034GP	Precast for 6" Mountable Curb and Gutter in Sags or Low Points
9017C	Adjacent to Approach Slab
Unk	Unknown

Junction Box	
9031U	Pipe Collars, Pipe Elbow and Pipe Curve Alignment

Manhole	
1011A	Standard Brick
1011AP	Standard Precast Reinforced Concrete
Unk	Unknown

Flume	
D-9	Concrete
Asphalt	Asphalt
Unk	Unknown

Spillway	
9013	Standard Concrete
9017J	Standard Concrete Adjacent to Approach Slabs
9031G	Grouted Rubble Spillways or Aprons
D-26	Asphaltic Concrete
Unk	Unknown

Misc Type	
1031	Standard Sand Cement Bag Ditch Check
1040	Standard Circular Base Units and Riser
D-7	Berm, Side or Surface Ditch
D-14	Drop Tapered Inlet Section
D-19	Temp Pipe Slope Drain with Drain Inlet
D-27	Special Grate Inlet
D-28	Circular Corrugated Metal Base
D-32	Longitudinal Edge Drains with Lateral
D-8	Inlet Drainage Structure at Surface Ditch
9029B	Standard Perforated Underdrain
Unk	Unknown

Appendix B

Post-Construction Stormwater BMP
Inspection Checklists

GDOT Enhanced Swale
Inspection Checklist Form B-1

Structure ID #:	Date:
Inspector:	Precipitation within last 72 hours: Yes No

Stormwater system within:

☐ Right-of-Way (Highway, Adjacent Park and Ride Lot)
☐ Easement
☐ GDOT Facility Property

Further location description (i.e. address, milepost, and/or intersection):

Swale Type:

☐ Dry swale
☐ Wet swale
☐ Other: _____

Vegetation:

☐ Grass turf
☐ Meadow Grass
☐ Wetland Vegetation
☐ Landscaped
☐ Other: _____

General dimensions:

width (top) _____'

length _____'

depth _____'

Structure protection:

☐ Fence
☐ Guard rail
☐ Bollards
☐ Signage
☐ Other: _____

Discharges to:

☐ GDOT drainage system
☐ GDOT post-construction stormwater BMP Structure Type_____
☐ Off R/W
☐ Adjacent MS4 jurisdiction structure
☐ Live stream/lake/pond
☐ Wetlands
☐ Other: _____

Additional components:

☐ Check dams
☐ Forebay
☐ Pea gravel diaphragm
☐ Flow spreaders
☐ Weir
☐ Splash blocks
☐ Infiltration berms
☐ None
☐ Other: _____

Structure ID #:	Date:

GDOT Enhanced Swale Inspection Checklist Form B-1

Complete the form below by indicating the performance condition for each inspection item.
Performance Condition Key:

☐ N/A: Not applicable, the condition of the inspection item could not be determined or the component is not present.

Level 1: Good condition. No corrective action required.

Level 2: Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).

Level 3: Fair condition. Needing non-critical repairs (see corrective action for further details).

Level 4: Poor condition. Maintenance, repair, and/or replace (see corrective action for further details).

Refer to Section 5.3 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on enhanced swale inspection items and maintenance activities. Refer to Section 5.12 for additional information on optional components.

Enhanced Swale Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Inlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Damaged or plugged inlet pipe?

Notes:

Outlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Damaged or plugged outlet pipe?

Notes:

Structure ID #:	Date:

Enhanced Swale Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Forebay	B1.	☐ ■ ■ ■ ■		Sediment accumulation greater than 50% of storage capacity present?
	B2.	☐ ■ ■ ■ ■		Is there vegetation that threatens the function or integrity of the forebay?
	B3.	☐ ■ ■ ■ ■		Do erosion protection materials need replacement or repair?
Notes:				
Swale	C1.	☐ ■ ■ ■ ■		Trash or debris present?
	C2.	☐ ■ ■ ■ ■		Unhealthy vegetative cover, bare areas, or dying vegetation present over 30% or more of the surface area?
	C3.	☐ ■ ■ ■ ■		Evidence of erosion or gullies?
	C4.	☐ ■ ■ ■ ■		Is there vegetation that threatens the function or integrity of the swale?
	C5.	☐ ■ ■ ■ ■		For dry swales, is ponded water present 24 – 48 hours after storm event?
	C6.	☐ ■ ■ ■ ■		Sediment accumulation depth greater than 3 inches present in grass swale?
	C7.	☐ ■ ■ ■ ■		Vegetation height according to IRVM Straight Line Mowing Manual?
Notes:				
Side Slopes	D1.	☐ ■ ■ ■ ■		Evidence of erosion, rills, or gullies forming on side slopes?
Check Dam	E1.	☐ ■ ■ ■ ■		Trash, debris, undesirable vegetation or excessive sediment present?
	E2.	☐ ■ ■ ■ ■		Evidence of erosion around the sides of the check dam?
Wetland Vegetation (for Wet Swales)	F1.	☐ ■ ■ ■ ■		Is there vegetation that threatens the function or integrity of the swale?
	F2.	☐ ■ ■ ■ ■		Unhealthy or dead plants present?
Underdrain (for Dry Swales)	G1.	☐ ■ ■ ■ ■		Are cleanout caps missing or damaged?
	G2.	☐ ■ ■ ■ ■		Does flow testing of cleanouts indicate underdrain system is clogged?
Discharge Weir or Berm	H1.	☐ ■ ■ ■ ■		Is trash, debris, undesirable vegetation or sediment obstructing flow through weir?

Structure ID #:	Date:

	H2.	☐ ☐ ☐ ☐ ☐		Is weir or berm damaged?
Pea Gravel Diaphragm (optional)	PGD1.	☐ ☐ ☐ ☐ ☐		Sediment accumulation present on pea gravel diaphragm?
	PGD2.	☐ ☐ ☐ ☐ ☐		Is pea gravel diaphragm damaged?

Notes:

Item Number	Corrective Actions Required/Comments:	Entered into MMS?

GDOT Infiltration Trench Inspection Checklist Form B-2

Structure ID #:	Date:
Inspector:	Precipitation within last 72 hours: Yes No

Stormwater system within:

- ☐ Right-of-Way (Highway, Adjacent Park and Ride Lot)
- ☐ Easement
- ☐ GDOT Facility Property

Further location description (i.e. address, milepost, and/or intersection):

General dimensions:

_____' width _____' length

Design features:

- ☐ Observation well
- ☐ Aggregate surface
- ☐ Grass surface
- ☐ Underdrain
- ☐ Other: _____

Discharges to:

- ☐ GDOT drainage system
- ☐ GDOT post-construction stormwater BMP Structure Type_____
- ☐ Off R/W
- ☐ Adjacent MS4 jurisdiction structure
- ☐ Live stream/lake/pond
- ☐ Wetlands
- ☐ Other: _____

Structure protection:

- ☐ Fence
- ☐ Guard rail
- ☐ Bollards
- ☐ Signage
- ☐ Other: _____

Additional components:

- ☐ Level spreader
- ☐ Filter strip
- ☐ Diversion structure
- ☐ Other pretreatment structure
- ☐ Overflow control structure
- ☐ Underdrain
- ☐ None
- ☐ Other: _____

Structure ID #:	Date:

GDOT Infiltration Trench Inspection Checklist Form B-2

Complete the form below by indicating the performance condition for each inspection item.
Performance Condition Key:

☐ N/A: Not applicable, the condition of the inspection item could not be determined or the component is not present.

Level 1: Good condition. No corrective action required.

Level 2: Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).

Level 3: Fair condition. Needing non-critical repairs (see corrective action for further details).

Level 4: Poor condition. Maintenance, repair, and/or replace (see corrective action for further details).

Refer to Section 5.4 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on infiltration trench inspection items and maintenance activities. Refer to Section 5.12 for additional information on optional components.

Infiltration Trench Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Inlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Damaged or plugged inlet pipe?
Notes:				
Forebay	B1.	☐		Sediment accumulation greater than 50% of storage capacity present?
	B2.	☐		Is there vegetation that threatens the function or integrity of the forebay?
	B3.	☐		Do erosion protection materials need replacement or repair?
Notes:				

Structure ID #:	Date:

Infiltration Trench Component		Performance Condition (N/A, Level 1, 2, or 3)	Photo Ref #	Inspection Item
Filter Strip	C1.	☐ ■ ■ ■ ■		Trash or debris present?
	C2.	☐ ■ ■ ■ ■		Unhealthy grass cover, bare areas, or dying grass cover over 30% or more of the surface area?
	C3.	☐ ■ ■ ■ ■		Evidence of erosion or gullies?
	C4.	☐ ■ ■ ■ ■		Is there vegetation that threatens the function or integrity of the filter strip?
	C5.	☐ ■ ■ ■ ■		Standing water present?
	C6.	☐ ■ ■ ■ ■		Sediment accumulation depth greater than 3 inches present?
	C7.	☐ ■ ■ ■ ■		Vegetation height according to IRVM Straight Line Mowing Manual?
Notes:				
Berm and Emergency Spillway	D1.	☐ ■ ■ ■ ■		Evidence of erosion?
	D2.	☐ ■ ■ ■ ■		Sediment accumulation present at base of berm?
	D3.	☐ ■ ■ ■ ■		Is there trash, debris, or vegetation that threatens the function or integrity of the spillway?
	D4.	☐ ■ ■ ■ ■		Vegetation height according to IRVM Straight Line Mowing Manual? Is the concrete or riprap in poor condition?
Notes:				
Infiltration Trench	E1.	☐ ■ ■ ■ ■		Evidence of ponding water on infiltration trench surface 72 hours or more after a storm event?
	E2.	☐ ■ ■ ■ ■		Undesirable vegetation growing on trench surface?
Pea Gravel Diaphragm (optional)	PGD1.	☐ ■ ■ ■ ■		Sediment accumulation on pea gravel diaphragm?
	PGD2.	☐ ■ ■ ■ ■		Is pea gravel diaphragm damaged?
Perforated Pipe for Additional Storage (optional)	PP1.	☐ ■ ■ ■ ■		Evidence of depressions on ground surface above perforated pipes?
	PP2.	☐ ■ ■ ■ ■		Standing water on ground surface above perforated pipes for 72 hours or longer?

Structure ID #:	Date:

Infiltration Trench Component		Performance Condition (N/A, Level 1, 2, or 3)	Photo Ref #	Inspection Item
Underdrain (optional)	U1.	☐ ■ ■ ■ ■		Are cleanout caps missing or damaged?
	U2.	☐ ■ ■ ■ ■		Does flow testing of cleanouts indicate underdrain system is clogged?

Notes:

Item Number	Corrective Actions Required/Comments:	Entered into MMS?

GDOT Sand Filter
Inspection Checklist Form B-3

Structure ID #:	Date:
Inspector:	Precipitation within last 72 hours: Yes No

Stormwater system within:

- ☐ Right-of-Way (Highway, Adjacent Park and Ride Lot)
- ☐ Easement
- ☐ GDOT Facility Property

Further location description (i.e. address, milepost, and/or intersection):

Sand Filter Type:

- ☐ Surface
- ☐ Perimeter
- ☐ Other: _____

Design Components:

- ☐ Trash/debris rack
- ☐ Forebay
- ☐ Sedimentation chamber
- ☐ Overflow structure
- ☐ Other: _____

Contributing runoff area:

- ☐ Grass/vegetated
- ☐ Paved

Approximate size: _____ac.

Structure/Access protection:

- ☐ Fence
- ☐ Guard rail
- ☐ Bollards
- ☐ Signage
- ☐ Access covers
- ☐ Other: _____

Discharges to:

- ☐ GDOT drainage system
- ☐ GDOT post-construction stormwater BMP Structure Type_____
- ☐ Off R/W
- ☐ Adjacent MS4 jurisdiction structure
- ☐ Live stream/lake/pond
- ☐ Wetlands
- ☐ Other: _____

Additional components:

- ☐ Inlet/inflow control
- ☐ Outlet/discharge control
- ☐ Energy dissipation structures
- ☐ Underdrain
- ☐ Oil/grease traps
- ☐ None
- ☐ Other: _____

Structure ID #:	Date:

GDOT Sand Filter Inspection Checklist Form B-3

Complete the form below by indicating the performance condition for each inspection item.
Performance Condition Key:

☐ N/A: Not applicable, the condition of the inspection item could not be determined or the component is not present.

Level 1: Good condition. No corrective action required.

Level 2: Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).

Level 3: Fair condition. Needing non-critical repairs (see corrective action for further details).

Level 4: Poor condition. Maintenance, repair, and/or replace (see corrective action for further details).

Refer to Section 5.5 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on sand filter inspection items and maintenance activities.

Sand Filter Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Inlet Drainage System	A1.	☐ 1 2 3 4		Trash, debris, and sediment present?
	A2.	☐ 1 2 3 4		Are there signs of erosion?
	A3.	☐ 1 2 3 4		Damaged or plugged inlet pipes and grates?
Notes:				
Outlet Drainage System	A1.	☐ 1 2 3 4		Trash, debris, and sediment present?
	A2.	☐ 1 2 3 4		Are there signs of erosion?
	A3.	☐ 1 2 3 4		Damaged or plugged outlet pipes?
Notes:				
Forebay/ Sedimentation Chamber	B1.	☐ 1 2 3 4		Sediment accumulation greater than 6 inches present in forebay/ or sedimentation chamber?
	B2.	☐ 1 2 3 4		Is there vegetation that threatens the function or integrity of the forebay?
	B3.	☐ 1 2 3 4		Are erosion protection materials in poor condition?
	B4.	☐ 1 2 3 4		Trash, debris, sediment, overgrown vegetation, damage, or corrosion on perforated stand-pipe?

Structure ID #:	Date:

Notes:

Sand Filter Component		Performance Condition (N/A, Level 1, 2, or 3)	Photo Ref #	Inspection Item
Filter Bed	C1.	☐ 🟩 🟨 🟧 🟥		Trash or debris present?
	C2.	☐ 🟩 🟨 🟧 🟥		Unhealthy grass cover, bare areas, or dying grass present over 30% or more of the surface area in surface type filter bed?
	C3.	☐ 🟩 🟨 🟧 🟥		Evidence of erosion or gullies?
	C4.	☐ 🟩 🟨 🟧 🟥		Is there vegetation that threatens the function or integrity of the filter bed?
	C5.	☐ 🟩 🟨 🟧 🟥		Water ponding more than 72 hours after storm event in surface filter bed?
	C6.	☐ 🟩 🟨 🟧 🟥		Sediment accumulation depth greater than 3 inches?
	C7.	☐ 🟩 🟨 🟧 🟥		Vegetation height according to IRVM Straight Line Mowing Manual?

Notes:

Side Slopes (Surface Sand Filter)/Vault (Perimeter Sand Filter)	D1.	☐ 🟩 🟨 🟧 🟥		Evidence of erosion, rills, or gullies forming on side slopes?
	D2.	☐ 🟩 🟨 🟧 🟥		Evidence of degrading structural components on perimeter sand filter or leaks at the joints in the concrete structure or other components allowing groundwater to enter or discharge runoff untreated?

Notes:

Embankment and Emergency Spillway	E1.	☐ 🟩 🟨 🟧 🟥		Are shrubs or trees present on embankment?
	E2.	☐ 🟩 🟨 🟧 🟥		Evidence of erosion and/or unhealthy grass cover?
	E3.	☐ 🟩 🟨 🟧 🟥		Evidence of seepage on downstream face?
	E4.	☐ 🟩 🟨 🟧 🟥		Evidence of animal activity?
	E5.	☐ 🟩 🟨 🟧 🟥		Evidence of settling, scouring, cracking, or sloughing?
	E6.	☐ 🟩 🟨 🟧 🟥		Is there trash, debris, or vegetation that threatens the function or integrity of the spillway?
	E7.	☐ 🟩 🟨 🟧 🟥		Vegetation height according to IRVM Straight Line Mowing Manual?

Structure ID #:	Date:

Notes:

Sand Filter Component		Performance Condition (N/A, Level 1, 2, or 3)	Photo Ref #	Inspection Item
Underdrain	F1.	☐		Are cleanout caps missing or damaged?
	F2.	☐		Does flow testing of cleanouts indicate underdrain system is clogged?
Outlet Control Structure	G1.	☐		Standing water present around above the outlet control structure?
	G2.	☐		Trash, debris, damage, or corrosion on trash rack?
	G3.	☐		Are all movable components operational through their full range of motion?

Item Number	Corrective Actions Required/Comments:	Entered into MMS?

GDOT Dry Detention Basin Inspection Checklist Form B-4

Structure ID #:	Date:
Inspector:	Precipitation within last 72 hours: Yes No

Stormwater system within:

- ☐ Right-of-Way (Highway, Adjacent Park and Ride Lot)
- ☐ Easement
- ☐ GDOT Facility Property

Further location description (i.e. address, milepost, and/or intersection):

General dimensions:

_____' width _____' length _____' depth

Vegetation:

- ☐ Grass turf
- ☐ Meadow Grass
- ☐ Wetland Vegetation
- ☐ Landscaped
- ☐ Other: _____

Discharges to:

- ☐ GDOT drainage system
- ☐ GDOT post-construction stormwater BMP Structure Type_____
- ☐ Off R/W
- ☐ Adjacent MS4 jurisdiction structure
- ☐ Live stream/lake/pond
- ☐ Wetlands
- ☐ Other: _____

Structure/Access protection:

- ☐ Fence
- ☐ Guard rail
- ☐ Bollards
- ☐ Signage
- ☐ Access covers
- ☐ Other: _____

Additional components:

- ☐ Forebay
- ☐ Energy dissipation structures
- ☐ Emergency spillway control structure
- ☐ Inlet trash/debris capture structure
- ☐ Outlet/drawdown control structure
- ☐ Trash rack
- ☐ None
- ☐ Other: _____

Structure ID #:	Date:

GDOT Dry Detention Basin Inspection Checklist Form B-4

Complete the form below by indicating the performance condition for each inspection item.
Performance Condition Key:

☐ N/A: Not applicable, the condition of the inspection item could not be determined or the component is not present.

Level 1: Good condition. No corrective action required.

Level 2: Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).

Level 3: Fair condition. Needing non-critical repairs (see corrective action for further details).

Level 4: Poor condition. Maintenance, repair, and/or replace (see corrective action for further details).

Refer to Section 5.6 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on dry detention basin inspection items and maintenance activities.

Dry Detention Basin Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Inlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Damaged or plugged inlet pipes?
Notes:				
Outlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Damaged or plugged outlet pipes?
Notes:				
Forebay	B1.	☐		Sediment accumulation greater than 50% of storage capacity present?
	B2.	☐		Undesirable vegetation present?
	B3.	☐		Are erosion protection materials in good condition?

Structure ID #:	Date:

Notes:

Dry Detention Basin Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Low Flow Channel (if present)	C1.	☐ ☐ ☐ ☐ ☐		Sediment accumulation greater than 3 inches present?
	C2.	☐ ☐ ☐ ☐ ☐		Evidence of erosion, formation of gullies, or problems with turf reinforcement mat (TRM)?
	C3.	☐ ☐ ☐ ☐ ☐		Undesirable vegetation present?

Notes:

Basin	D1.	☐ ☐ ☐ ☐ ☐		Trash or debris present?
	D2.	☐ ☐ ☐ ☐ ☐		Unhealthy grass cover, bare areas, or dead grass cover over 30% or more of the surface area?
	D3.	☐ ☐ ☐ ☐ ☐		Evidence of erosion or gullies?
	D4.	☐ ☐ ☐ ☐ ☐		Undesirable vegetation threatening the function or integrity of the basin?
	D5.	☐ ☐ ☐ ☐ ☐		Evidence of water ponding more than 5 days after storm event?
	D6.	☐ ☐ ☐ ☐ ☐		Sediment accumulation greater than 3 inches present?

Structure ID #:	Date:

Notes:

Embankment and Emergency Spillway	E1.	☐ 🟩 🟨 🟧 🟥		Are shrubs or trees present on embankment?
	E2.	☐ 🟩 🟨 🟧 🟥		Evidence of erosion and/or unhealthy vegetation cover?
	E3.	☐ 🟩 🟨 🟧 🟥		Evidence of seepage on downstream face?
	E4.	☐ 🟩 🟨 🟧 🟥		Evidence of animal activity?
	E5.	☐ 🟩 🟨 🟧 🟥		Evidence of settling, scouring, cracking, or sloughing?
	E6.	☐ 🟩 🟨 🟧 🟥		Trash, debris, or undesirable vegetation present in emergency spillway?
	E7.	☐ 🟩 🟨 🟧 🟥		Vegetation height according to IRVM Straight Line Mowing Manual? Is concrete, and/or riprap in the emergency spillway damaged?

Notes:

Outlet Control Structure	F1.	☐ 🟩 🟨 🟧 🟥		Is standing water above the outlet/orifice more than 5 days after storm event?
	F2.	☐ 🟩 🟨 🟧 🟥		Trash, debris, damage, or corrosion on trash rack?
	F3.	☐ 🟩 🟨 🟧 🟥		Are all moveable components operable through their full range of motion?

Notes:

Structure ID #:	Date:

Item Number	Corrective Actions Required	Entered into MMS?

GDOT Wet Detention Pond Inspection Checklist Form B-5

Structure ID #:	Date:
Inspector:	Precipitation within last 72 hours: Yes No

Stormwater system within:

- ☐ Right-of-Way (Highway, Adjacent Park and Ride Lot)
- ☐ Easement
- ☐ GDOT Facility Property

Further location description (i.e. address, milepost, and/or intersection):

Wet Detention Type:

- ☐ Off-line
- ☐ In-line
- ☐ In Channel

Vegetation:

- ☐ Grass turf
- ☐ Meadow Grass
- ☐ Wetland Vegetation
- ☐ Landscaped
- ☐ Other: _____

General dimensions:

_____' width _____' length _____' depth

Structure/Access protection:

- ☐ Fence
- ☐ Guard rail
- ☐ Bollards
- ☐ Signage
- ☐ Access covers
- ☐ Other: _____

Discharges to:

- ☐ GDOT drainage system
- ☐ GDOT post-construction stormwater BMP Structure Type_____
- ☐ Off R/W
- ☐ Adjacent MS4 jurisdiction structure
- ☐ Live stream/lake/pond
- ☐ Wetlands
- ☐ Other: _____

Additional components:

- ☐ Forebay
- ☐ Energy dissipation structures
- ☐ Emergency spillway control structure
- ☐ Inlet trash/debris capture structure
- ☐ Outlet/drawdown control structure
- ☐ Trash rack
- ☐ None
- ☐ Other: _____

Structure ID #:	Date:

GDOT Wet Detention Pond Inspection Checklist Form B-5

Complete the form below by indicating the performance condition for each inspection item.
Performance Condition Key:

☐ N/A: Not applicable, the condition of the inspection item could not be determined or the component is not present.

Level 1: Good condition. No corrective action required.

Level 2: Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).

Level 3: Fair condition. Needing non-critical repairs (see corrective action for further details).

Level 4: Poor condition. Maintenance, repair, and/or replace (see corrective action for further details).

Refer to Section 5.7 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on wet detention pond inspection items and maintenance activities.

Wet Detention Pond Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Inlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Is there vegetation that threatens the function or integrity of the inlet channel or ditch?
	A4.	☐		Damaged or plugged inlet pipes?

Notes:

Outlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Is there vegetation that threatens the function or integrity of the outlet?
	A4.	☐		Damaged or plugged outlet pipes?

Notes:

Forebay	B1.	☐		Sediment accumulation greater than 6 inches present?
	B2.	☐		Is there vegetation that threatens the function or integrity of the forebay?
	B3.	☐		Are erosion protection materials in good condition?

Structure ID #:	Date:

Notes:

Wet Detention Pond Component		Performance Condition (N/A, Level 1, 2, or 3)	Photo Ref #	Inspection Item
Pond	C1.	☐ ■ ■ ■ ■		Is the water level at or near the design normal water level?
	C2.	☐ ■ ■ ■ ■		Sediment accumulation greater than 12 inches present?
	C3.	☐ ■ ■ ■ ■		Is there vegetation that threatens the function or integrity of the pond?
	C4.	☐ ■ ■ ■ ■		Trash or debris present?
	C5.	☐ ■ ■ ■ ■		Algal growth covering greater than 50% of pond?
	C6.	☐ ■ ■ ■ ■		Evidence of erosion on safety bench?
	C7.	☐ ■ ■ ■ ■		Is there vegetation that threatens the function or integrity of the aquatic or safety bench?

Notes:

Embankment and Emergency Spillway	D1.	☐ ■ ■ ■ ■		Are shrubs or trees present on embankment and emergency spillway?
	D2.	☐ ■ ■ ■ ■		Evidence of erosion and/or unhealthy vegetation cover?
	D3.	☐ ■ ■ ■ ■		Evidence of seepage on downstream face?
	D4.	☐ ■ ■ ■ ■		Evidence of animal activity?
	D5.	☐ ■ ■ ■ ■		Evidence of settling, scouring, cracking, or sloughing?
	D6.	☐ ■ ■ ■ ■		Is there trash, debris, or vegetation that threatens the function or integrity of the embankment or spillway?
	D7.	☐ ■ ■ ■ ■		Vegetation height according to IRVM Straight Line Mowing Manual? Is concrete, and/or riprap in the emergency spillway in poor condition?

Structure ID #:	Date:

Notes:

Wet Detention Pond Component		Performance Condition (N/A, Level 1, 2, or 3)	Photo Ref #	Inspection Item
Outlet Control Structure	E1.	☐ ■ ■ ■ ■		Is the water level above the outlet/orifice opening?
	E2.	☐ ■ ■ ■ ■		Trash, debris, damage, or corrosion on trash rack?
	E3.	☐ ■ ■ ■ ■		Are all moveable components operable through their full range of motion?

Notes:

Item Number	Corrective Actions Required/Comments:	Entered into MMS?

GDOT Stormwater Wetland Inspection Checklist Form B-6

Structure ID #:	Date:
Inspector:	Precipitation within last 72 hours: Yes No

Stormwater system within:

- ☐ Right-of-Way (Highway, Adjacent Park and Ride Lot)
- ☐ Easement
- ☐ GDOT Facility Property

Further location description (i.e. address, milepost, and/or intersection):

Wetland Type:

- ☐ Shallow
- ☐ Pocket
- ☐ Permanent Pool

Vegetation:

- ☐ Grassy
- ☐ Woody
- ☐ Wetland Vegetation
- ☐ Landscaped
- ☐ Other: _____

General dimensions:

_____' width _____' length _____' depth

Structure/Access protection:

- ☐ Fence
- ☐ Guard rail
- ☐ Bollards
- ☐ Signage
- ☐ Access covers
- ☐ Other: _____

Discharges to:

- ☐ GDOT drainage system
- ☐ GDOT post-construction stormwater BMP Structure Type_____
- ☐ Off R/W
- ☐ Adjacent MS4 jurisdiction structure
- ☐ Live stream/lake/pond
- ☐ Wetlands
- ☐ Other: _____

Additional components:

- ☐ Forebay
- ☐ Energy dissipation structures
- ☐ Emergency spillway control structure
- ☐ Inlet trash/debris capture structure
- ☐ Outlet/drawdown control structure
- ☐ Trash rack
- ☐ None
- ☐ Other: _____

Structure ID #:	Date:

GDOT Stormwater Wetland Inspection Checklist Form B-6

Complete the form below by indicating the performance condition for each inspection item.
Performance Condition Key:

☐ N/A: Not applicable, the condition of the inspection item could not be determined or the component is not present.

Level 1: Good condition. No corrective action required.

Level 2: Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).

Level 3: Fair condition. Needing non-critical repairs (see corrective action for further details).

Level 4: Poor condition. Maintenance, repair, and/or replace (see corrective action for further details).

Refer to Section 5.8 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on stormwater wetland inspection items and maintenance activities.

Stormwater Wetland Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Inlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Is there vegetation that threatens the function or integrity of the inlet channel, or ditch?
	A4.	☐		Damaged or plugged inlet pipes?
Notes:				
Outlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Is there vegetation that threatens the function or integrity of the outlet?
	A4.	☐		Damaged or plugged outlet pipes?

Structure ID #:	Date:

Notes:

Stormwater Wetland Component		Performance Condition (N/A, 1, 2, 3, 4	Photo Ref #	Inspection Item
Forebay	B1.	☐ ☐ ☐ ☐ ☐		Sediment accumulation greater than 50% of storage capacity?
	B2.	☐ ☐ ☐ ☐ ☐		Is there vegetation that threatens the function or integrity of the forebay?
	B3.	☐ ☐ ☐ ☐ ☐		Are erosion protection materials in good condition?

Notes:

Wetland Zones/ Pools	C1.	☐ ☐ ☐ ☐ ☐		Is aquatic plant density less than design density (refer to final approved planting plan)?
	C2.	☐ ☐ ☐ ☐ ☐		Sediment accumulation such that original design depth is reduced by 75% or more?
	C3.	☐ ☐ ☐ ☐ ☐		Is there vegetation that threatens the function or integrity of the wetland?
	C4.	☐ ☐ ☐ ☐ ☐		Trash or debris present?
	C5.	☐ ☐ ☐ ☐ ☐		Algal growth present over greater than 50% of wetland pool?
	C6.	☐ ☐ ☐ ☐ ☐		Are unhealthy or dead plants present?

Notes:

Embankment and Emergency Spillway	D1.	☐ ☐ ☐ ☐ ☐		Are shrubs or trees present on the embankment and emergency spillway?
	D2.	☐ ☐ ☐ ☐ ☐		Evidence of erosion and/or unhealthy vegetation cover?
	D3.	☐ ☐ ☐ ☐ ☐		Evidence of seepage on downstream face?
	D4.	☐ ☐ ☐ ☐ ☐		Evidence of animal activity?
	D5.	☐ ☐ ☐ ☐ ☐		Evidence of settling, scouring, cracking, or sloughing?
	D6.	☐ ☐ ☐ ☐ ☐		Is there trash, debris, and undesirable vegetation that threatens the function or integrity of the

Structure ID #:	Date:

				spillway?
	D7.	☐ 🟩 🟨 🟧 🟥		Vegetation height according to IRVM Straight Line Mowing Manual? Is concrete, and/or riprap in the emergency spillway maintained?

Notes:

Stormwater Wetland Component		Performance Condition (N/A, 1, 2, 3, 4	Photo Ref #	Inspection Item
Outlet Control Structure	E1.	☐ 🟩 🟨 🟧 🟥		Is the water level above the outlet/orifice opening?
	E2.	☐ 🟩 🟨 🟧 🟥		Trash, debris, damage, or corrosion on trash rack?
	E3.	☐ 🟩 🟨 🟧 🟥		Are all movable components operable through their full range of motion?
	E4.	☐ 🟩 🟨 🟧 🟥		If present, is flashboard riser damaged or plugged?

Notes:

Item Number	Corrective Actions Required/Comments:	Entered into MMS?

GDOT Bioslope
Inspection Checklist Form B-7

Structure ID #:	Date:
Inspector:	Precipitation within last 72 hours: Yes No

Stormwater system within:

- ☐ Right-of-Way (Highway, Adjacent Park and Ride Lot)
- ☐ Easement
- ☐ GDOT Facility Property

Further location description (i.e. address, milepost, and/or intersection):

Bioslope dimensions:

Filter Strip:

_____' width _____' length

Treatment Zone:

_____' width _____' length

Vegetation:

- ☐ Grass turf
- ☐ Meadow Grass
- ☐ Landscaped
- ☐ Other: _____

Discharges to:

- ☐ GDOT drainage system
- ☐ GDOT post-construction stormwater BMP Structure Type_____
- ☐ Off R/W
- ☐ Adjacent MS4 jurisdiction structure
- ☐ Live stream/lake/pond
- ☐ Wetlands
- ☐ Other: _____

Structure protection:

- ☐ Fence
- ☐ Guard rail
- ☐ Bollards
- ☐ Signage
- ☐ Other: _____

Additional components:

- ☐ Level spreader
- ☐ Pea gravel diaphragm
- ☐ Vegetated filter strip
- ☐ Treatment zone
- ☐ Underdrain
- ☐ None
- ☐ Other: _____

Structure ID #:	Date:

GDOT Bioslope Inspection Checklist Form B-7

Complete the form below by indicating the performance condition for each inspection item.
Performance Condition Key:

☐ N/A: Not applicable, the condition of the inspection item could not be determined or the component is not present.

Level 1: Good condition. No corrective action required.

Level 2: Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).

Level 3: Fair condition. Needing non-critical repairs (see corrective action for further details).

Level 4: Poor condition. Maintenance, repair, and/or replace (see corrective action for further details).

Refer to Section 5.9 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on bioslope inspection items and maintenance activities. Refer to Section 5.12 for additional information on optional components.

Bioslope Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Filter Strip	A1.	☐		Trash and/or debris present?
	A2.	☐		Unhealthy grass cover, bare areas, or dying grass present or 30% or more of surface area?
	A3.	☐		Evidence of erosion or gullies?
	A4.	☐		Is there vegetation that threatens the function or integrity of the filter strip?
	A5.	☐		Standing water present?
	A6.	☐		Sediment accumulation depth greater than 3 inch present in filter strip?
	A7.	☐		Vegetation height according to IRVM Straight Line Mowing Manual?

Notes:

Structure ID #:	Date:

Bioslope Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item (include comments in corrective actions/comments table below)
Bioslope	B1.	☐ ☐ ☐ ☐ ☐		Trash or debris present?
	B2.	☐ ☐ ☐ ☐ ☐		Unhealthy vegetative cover, bare areas, or dying vegetation present?
	B3.	☐ ☐ ☐ ☐ ☐		Evidence of erosion or gullies?
	B4.	☐ ☐ ☐ ☐ ☐		Is there vegetation that threatens the function or integrity of the bioslope?
	B5.	☐ ☐ ☐ ☐ ☐		Sediment accumulation greater than 3 inches present?
	B6.	☐ ☐ ☐ ☐ ☐		Vegetation height according to IRVM Straight Line Mowing Manual?
Notes:				
Underdrain	C1.	☐ ☐ ☐ ☐ ☐		Are cleanout caps missing or damaged?
	C2.	☐ ☐ ☐ ☐ ☐		Does flow testing of cleanouts indicate underdrain system is clogged?
Outlet	D1.	☐ ☐ ☐ ☐ ☐		Evidence of erosion?
	D2.	☐ ☐ ☐ ☐ ☐		Damaged or plugged outlet pipes?
Pea Gravel Diaphragm (optional)	PGD1.	☐ ☐ ☐ ☐ ☐		Sediment accumulation present on pea gravel diaphragm?
	PGD2.	☐ ☐ ☐ ☐ ☐		Is pea gravel diaphragm damaged?
Notes:				

Item	Corrective Actions Required/Comments:	Entered

Structure ID #:	Date:

Number		into MMS?

GDOT Bioretention Basin Inspection Checklist Form B-8

Structure ID #:	Date:
Inspector:	Precipitation within last 72 hours: Yes No

Stormwater system within:

- ☐ Right-of-Way (Highway, Adjacent Park and Ride Lot)
- ☐ Easement
- ☐ GDOT Facility Property

Further location description (i.e. address, milepost, and/or intersection):

General dimensions:

_____' width _____' length _____' depth

Vegetation:

- ☐ Grass turf
- ☐ Meadow Grass
- ☐ Wetland Vegetation
- ☐ Landscaped
- ☐ Other: _____

Discharges to:

- ☐ GDOT drainage system
- ☐ GDOT post-construction stormwater BMP Structure Type_____
- ☐ Off R/W
- ☐ Adjacent MS4 jurisdiction structure
- ☐ Live stream/lake/pond
- ☐ Wetlands
- ☐ Other: _____

Structure/Access protection:

- ☐ Fence
- ☐ Guard rail
- ☐ Bollards
- ☐ Signage
- ☐ Access covers
- ☐ Other: _____

Additional components:

- ☐ Forebay
- ☐ Energy dissipation structures
- ☐ Emergency spillway control structure
- ☐ Inlet trash/debris capture structure
- ☐ Outlet/drawdown control structure
- ☐ Underdrain
- ☐ Trash rack/Grate Inlet
- ☐ None
- ☐ Other: _____

Structure ID #:	Date:

GDOT Bioretention Basin Inspection Checklist Form B-8

Complete the form below by indicating the performance condition for each inspection item.
Performance Condition Key:

☐ N/A: Not applicable, the condition of the inspection item could not be determined or the component is not present.

Level 1: Good condition. No corrective action required.

Level 2: Good to fair condition. Monitor periodically for potential maintenance or repair needs. (see corrective action for further details).

Level 3: Fair condition. Needing non-critical repairs (see corrective action for further details).

Level 4: Poor condition. Maintenance, repair, and/or replace (see corrective action for further details).

Refer to Section 5.10 in the GDOT Stormwater System Inspection and Maintenance Manual for additional information on bioretention basin inspection items and maintenance activities.

Bioretention Basin Component		Performance Condition (N/A, 1, 2, 3, 4)	Photo Ref #	Inspection Item
Inlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Damaged or plugged inlet pipes?
Notes:				
Outlet Drainage System	A1.	☐		Trash, debris, and sediment present?
	A2.	☐		Are there signs of erosion?
	A3.	☐		Damaged or plugged outlet pipes?
Notes:				
Forebay	B1.	☐		Sediment accumulation greater than 6 inches?
	B2.	☐		Is there vegetation that threatens the function or integrity of the forebay?
	B3.	☐		Are erosion protection materials in good condition?
Notes:				

Structure ID #:	Date:

Bioretention Basin Component		Performance Condition (N/A, Level 1, 2, or 3)	Photo Ref #	Inspection Item
Basin	C1.	☐ ☐ ☐ ☐ ☐		Trash or debris present?
	C2.	☐ ☐ ☐ ☐ ☐		Are unhealthy or dying plants present?
	C3.	☐ ☐ ☐ ☐ ☐		Evidence of erosion or gullies?
	C4.	☐ ☐ ☐ ☐ ☐		Is mulch cover non-uniform, breaking down, or missing?
	C5.	☐ ☐ ☐ ☐ ☐		Evidence of standing water more than 12 hours after storm event?
	C6.	☐ ☐ ☐ ☐ ☐		Sediment accumulation of depth greater than 3 inches?
	C7.	☐ ☐ ☐ ☐ ☐		Vegetation in need of pruning or removing?

Notes:

Embankment and Emergency Spillway	D1.	☐ ☐ ☐ ☐ ☐		Are shrubs or trees present on embankment?
	D2.	☐ ☐ ☐ ☐ ☐		Evidence of erosion and/or unhealthy grass coverage?
	D3.	☐ ☐ ☐ ☐ ☐		Evidence of seepage on downstream face?
	D4.	☐ ☐ ☐ ☐ ☐		Evidence of animal activity?
	D5.	☐ ☐ ☐ ☐ ☐		Evidence of settling, scouring, cracking, or sloughing?
	D6.	☐ ☐ ☐ ☐ ☐		Is there trash, debris, and undesirable vegetation that threatens the function or integrity of the spillway?
	D7.	☐ ☐ ☐ ☐ ☐		Vegetation height according to IRVM Straight Line Mowing Manual? Is concrete, and/or riprap in the emergency spillway maintained?

Notes:

Structure ID #:	Date:

Bioretention Basin Component		Performance Condition (N/A, Level 1, 2, or 3)	Photo Ref #	Inspection Item (include comments in corrective actions/comments table below)
Underdrain	E1.	☐ ■ ■ ■ ■		Are cleanout caps missing or damaged?
	E2.	☐ ■ ■ ■ ■		Does flow testing of cleanouts indicate underdrain system is clogged?
Outlet Control Structure	F1.	☐ ■ ■ ■ ■		Standing water present around the outlet control structure?
	F2.	☐ ■ ■ ■ ■		Trash, debris, damage, or corrosion on trash rack/grate inlet?

Notes:

Item Number	Corrective Actions Required/Comments:	Entered into MMS?

Appendix C

The MS4 Structure Inventory and Inspection Summary, Estimated MS4 Structures Maintenance Summary, and Summary of Post-Construction Stormwater BMPs Inspections

MS4 Structure Inventory and Inspection Summary

Reporting Year	Goal/Actual	% of Total Roadway Miles in MS4/miles[1]	Existing Structure Type[2]													Total MS4 Structures
			Box Culvert End	Catch Basin	Control Structure	End Section	Endwall	Flume	Headwall	Inlet	Junction Box	Manhole	Pipe Outlet	Spillway	Other	
	Inventory and Inspection															
	Goal (Estimated)	10% X miles														
	Actual	X% X miles														

[1]Total roadway miles in GDOT MS4 was estimated at X miles.
[2]Goal is for total number of structures based on estimates along GDOT roadway miles, not by individual structure type.

Post-Construction Stormwater BMPs Inspections Summary

Object ID	Inventory Date	PCS ID	PCS Type	Easting	Northing

Estimated MS4 Structures Maintenance Summary

	Drainage Structures Manual/ Mechanical Cleaning (each)	Ditches Clean/Restore (linear feet)	Pipe Install (linear feet)	Concrete Structures Build/Repair (person hours)	Culvert Repair (square feet)
District 1					
District 2					
District 3					
District 4					
District 5					
District 6					
District 7					
Total					

Data Sources:

1.
2.
3.