OHIO DEPARTMENT OF TRANSPORTATION

STORM WATER BEST MANAGEMENT PRACTICES

BMP Inventory, Inspection, and Maintenance Guidelines

By Office of Hydraulic Engineering

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Ohio Department of Transportation
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I. Purpose of Guidelines

To meet environmental regulatory requirements, ODOT's permanent post construction storm water Best Management Practices (BMPs) must be inventoried, inspected, and maintained. These guidelines provide a systematic approach to aid in these inspections and to protect the public's investment through routine maintenance.

These guidelines focus on the following:

1. Describe the BMPs types.
2. Describe the acceptance process of BMPs from Construction to Maintenance responsibility.
3. Describe the process of conducting annual BMP inspections.
4. Describe the BMP performance criteria used for BMP inspections.

This manual is intended to be used as a supplement to the ODOT Collector Program. The BMP Collector Application (Collector App) was configured by the Office of Technical Services as part of the Collector Program.

II. Storm Water Best Management Practices (BMPs)

For purposes of these guidelines, a storm water BMP is a structural element designed to reduce pollution caused by precipitation runoff. BMPs reduce pollution by filtering, slowing, or infiltrating storm water runoff. During a construction project, there are many temporary erosion and sediment control BMPs incorporated to address construction activities. However, for the purposes of this guidance, the BMPs discussed are post-construction BMPs, meaning that they are the permanent structural controls left in place after construction has finished.

There are many types of storm water BMPs used on highway projects in Ohio. Examples include:

- Vegetated Biofilter
- Vegetated Filter Strip
- Manufactured System
- Detention Basin
- Retention Basin
- Infiltration Trench
- Bioretention Cell
- Constructed Wetland
- Underground Detention
- Infiltration Basin
- Stream Grade Control
- Exfiltration Trench (no longer used in Ohio)

The most common types of storm water BMPs constructed within ODOT right-of-way are the vegetated biofilters, vegetated filter strips, and manufactured systems.

Vegetated Biofilter

Vegetated biofilters (VBF) are grassed trapezoidal channels that filter storm water through vegetation and potential infiltration. A vegetated biofilter consists of the grassed portion of the graded shoulder, grassed foreslope, and flat grassed ditch. The purpose of a vegetated biofilter is to allow runoff to spread out and move slowly through a shallow, flat, grassed conveyance. Other vegetation (cattails, phragmites, brush, etc.) do not provide sufficient treatment compared to grass in a vegetated biofilter.

It can be difficult to tell the difference between vegetated biofilters and regular grass ditches. Generally, a vegetated biofilter has a flat bottom width that is 4 – 10 feet wide. Also, ditch erosion control mat (green or black netting) may be visible under the grass. Vegetated biofilters should be flat-bottomed with good grass coverage (as shown in the photos below). However, maintenance issues often occur that can lead to erosion or ponding. Erosion can cause a gully to form down the middle of the ditch bottom. A lack of positive drainage can lead to ponding, dead grass, cattails, or phragmites. When these maintenance issues occur, vegetated biofilters may have no distinguishing characteristics from regular roadside ditches.

The best way to identify a specific vegetated biofilter is by using the BMP Collector App. Each active and proposed BMP is input into Collector App by District Planning and Engineering staff and shows up as a line on a map. When using Collector App on a tablet out in the field, the location of the tablet is shown as a dot on a map that is GPS located. The inspector can verify the location of a vegetated biofilter by ensuring that the dot representing the tablet they are holding is near to the GIS-located vegetated biofilter shown in Collector App.

Vegetated Filter Strip

A vegetated filter strip (VFS) is a BMP that filters storm water through vegetation. The vegetated filter strip consists of the vegetated portion of the graded shoulder and the vegetated foreslope. The vegetated filter strip should be void of gullies, ditches, or concentrated flow. Storm water runoff sheet flows through the grass, filtering pollutants and enabling some infiltration.

It can be difficult to tell the difference between vegetated filter strips and regular grassed shoulders. Vegetated filter strips are efficient and effective because they make use of conditions that occur normally on many roadways to reduce pollution from storm water.

Vegetated filter strips should be sloped no steeper than 3:1, meaning that they are normally not located behind guard rail. They should have good, regularly mowed grass coverage throughout (minimum 70% grass coverage) and have sheet flow coming off the roadway. Vegetated filter strips should not be covered in woody brush. Also, slope erosion control mat (green or black netting) may be visible under the grass.

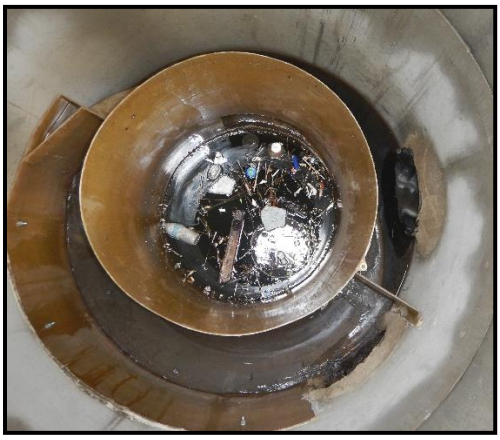
The best way to identify a specific vegetated filter strip is by using the BMP Collector App. Each active and proposed BMP is input into Collector App by District Planning and Engineering staff and shows up as a line on a map. When using Collector App on a tablet out in the field, the location of the tablet is shown as a dot on a map that is GPS located. The inspector can verify the location of a vegetated filter strip by ensuring that the dot representing the tablet they are holding is near to the GIS-located vegetated filter strip shown in Collector App.

Manufactured System

Manufactured systems consist of underground structures that treat storm water runoff by removing particulate matter through settlement or filtration. They are placed near a storm sewer in an off-line configuration, and they have access manholes for routine maintenance. A manhole may be placed along the storm sewer with a diversion weir that directs low flows to the manufactured system for water treatment. Then, the discharge from the manufactured system normally empties into the downstream side of the diversion weir along the storm sewer.

Several vendor-supplied products have been approved by ODOT and can be found on the Qualified Products List (QPL) under Supplemental Specification 995. Each product is either a round manhole or rectangular vault with internal filtering and flow direction equipment built into the structure. Manufactured systems are difficult to notice while driving by since they are located underground. Generally, there are one or two manholes located near each other that have the vendor's name printed on manhole covers. Normally, the manholes are located just off the road, but they are sometimes located in the road if the site was space-constrained. A diversion manhole will also be located nearby. This diversion manhole is between 84 and 108 inches in diameter, and has a weir directing upstream flows towards the manufactured system.

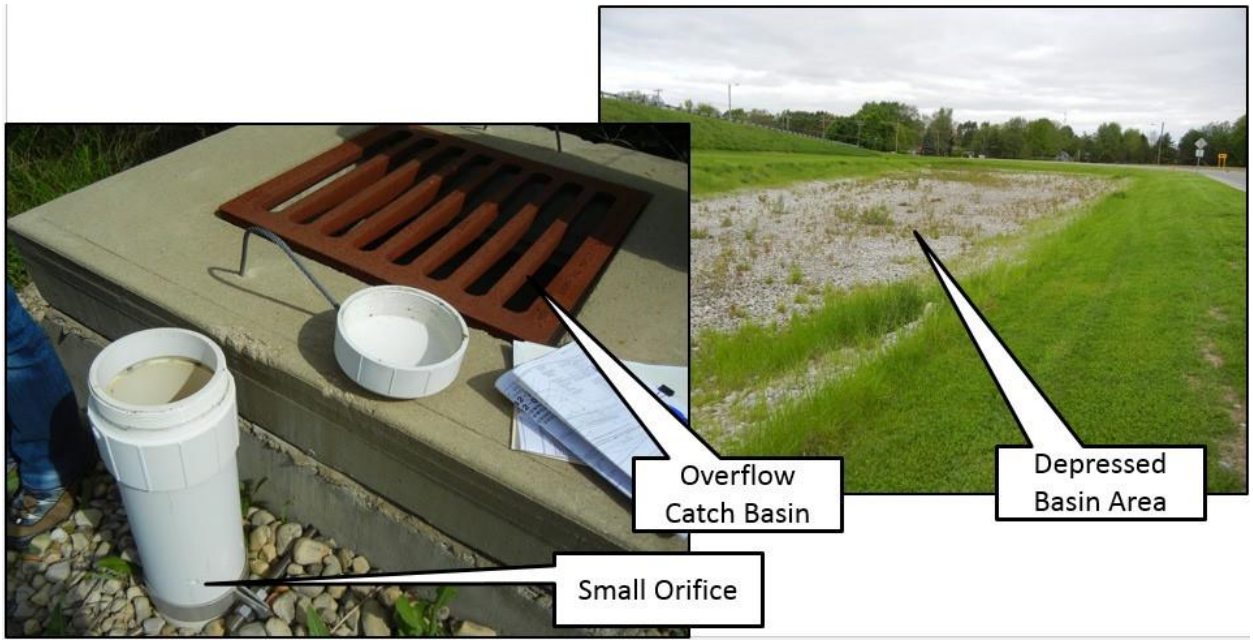
The easiest way to locate a specific manufactured system is by using BMP Collector App to identify the approximate location of the BMP on a map. Once relatively near to the BMP, the manhole covers with vendor names printed on them should be easy to find. After removing the maintenance manholes for the manufactured system, the diversion manhole can quickly be located by determining the direction of influent flows.



Detention Basin

Detention basins are partially dry ponds that hold water temporarily during rain events to allow pollutants to settle out of storm water runoff. Detention basins are designed to slowly discharge their volume over the course of 48 hours via an outlet structure that normally has a perforated standpipe attached to an elevated catch basin with some sort of overflow opening or wire to accommodate larger flow rates. (see standard construction drawing WQ-1.1)

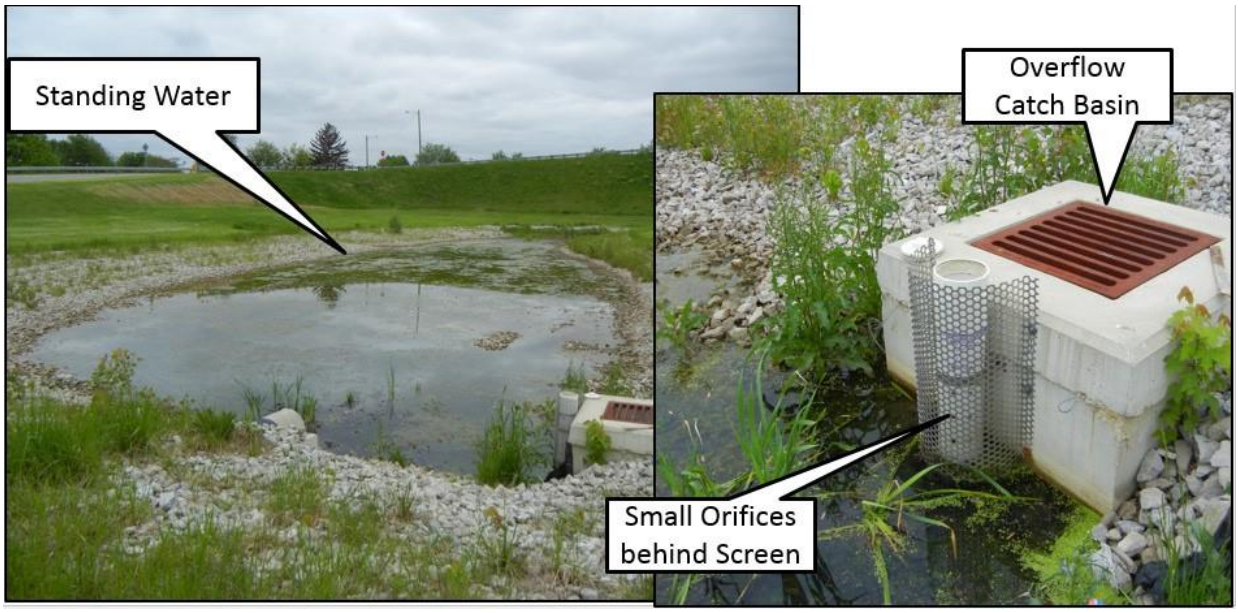
Most detention basin BMPs are designed with a small permanent pool of water at the inflow (forebay) and at the point of discharge (micropool). The rest of the detention basin is normally covered with grass or a layer of aggregate (#57s or #67s). Often, detention basin excavation can be too deep, or the outlet structure can be clogged, leading to a flooded detention basin that looks more like a wet pond. Cattails or phragmites are common in the forebays and micropools of detention basins.



Retention Basin

A retention basin is a wet pond that has a minimum water surface elevation between storms that is defined as the permanent pool. Above the permanent pool is a detention pool that provides for temporary storage (similar to a detention pond) that is released slowly over 24 hours or more through an outlet structure (see standard construction drawing WQ-1.1). An emergency outlet weir structure is provided for storm events greater than the design event so that damage will not occur to the retention basin.

Retention basins differ from detention basins as evident by standing water being present over the majority of the basin. Care should be taken to check the database or plans to ensure a detention basin isn't clogged making it appear to be a retention basin. There is an outlet structure with small orifices behind a screen or rock filter and a larger overflow (normally a catch basin). Cattails and phragmites may be present along the perimeter of the retention basin, depending on regular maintenance, vegetation plantings, or the presence of an aggregate layer.



Infiltration Trench

An infiltration trench is an excavated trench that has been lined with a geotextile fabric and backfilled with aggregate (see standard construction drawing WQ-1.2). The storm water is filtered through grass by sheet flowing off the roadway, and then it flows into the stone aggregate and is stored in the pore volume of the backfill material. The storm water percolates through the sides and bottom of the infiltration trench slowly over 48 hours.

A layer of 6 inches of Item 601 Infiltration Basin Aggregate is provided across the top of the trench to assist in pretreatment of the surface water. In addition to the aggregate, a vegetated filter strip or vegetated swale is used for pretreatment of the surface water.

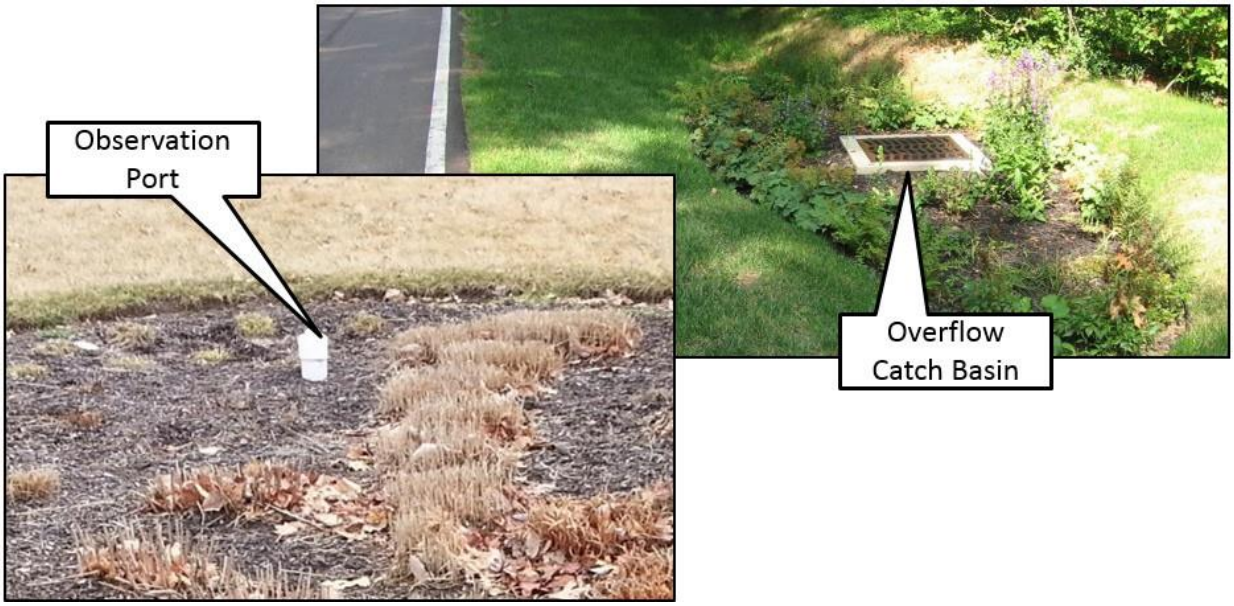
Infiltration trenches are distinguished from typical trenches by the aggregate placed along the ditch line which can sometimes clog with vegetation, an observation well, and overflow catch basin structure.

An observation well is provided at the center of the trench to allow for routine viewing of the water level within the trench.

Bioretention Cell

Bioretention cells consist of depressed low-lying areas that treat storm water through evapotranspiration and filtering through a planting soil. The storm water is filtered as it passes through the engineered soil. An underlying underdrain captures the treated storm water and carries it to an outlet. Vegetation assists in the filtration of the storm water prior to filtering through the soil. Vegetation should consist of shrubs or grasses.

Bioretention cells may look like a mulched flower bed with a defined edge, or they may have grass coverage similar to surrounding areas. The best way to identify a bioretention cell is by locating small observation ports and some sort of flow retention structure on the downstream end (i.e. weir, raised catch basin, dike, etc.). In order for bioretention cells to remain functional, the vegetation inside the cell and upstream of the cell (pretreatment) must remain alive, and the bioretention cell must not be compacted or filled in with sediment. A failing bioretention cell is one in which there is ponding water that does not filter down through the engineered soil within 24 hours of the last rainfall.



Constructed Wetland

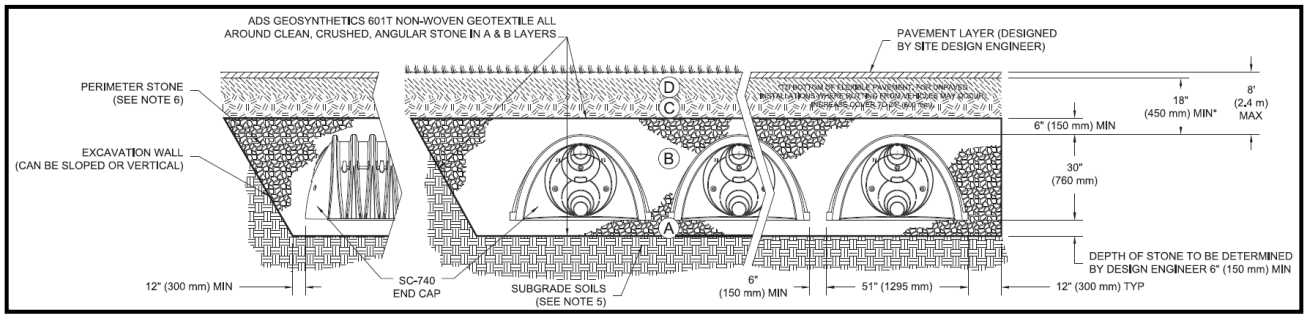
Constructed wetlands look like a cross between detention basins and retention basins, but with more vegetation. Constructed wetlands utilize the same treatment mechanisms as detention basins: giving sediment and pollutants a place to slow down, spread out, and settle out of storm water runoff. Constructed wetlands are different from other basin BMPs in that they have permanently ponded sections that range in depth between 0.5 to 2 feet to support different types of wetland vegetation. Constructed wetlands have outlet control structures (i.e. orifice, weirs, etc.) similar to detention basins and retention basins.

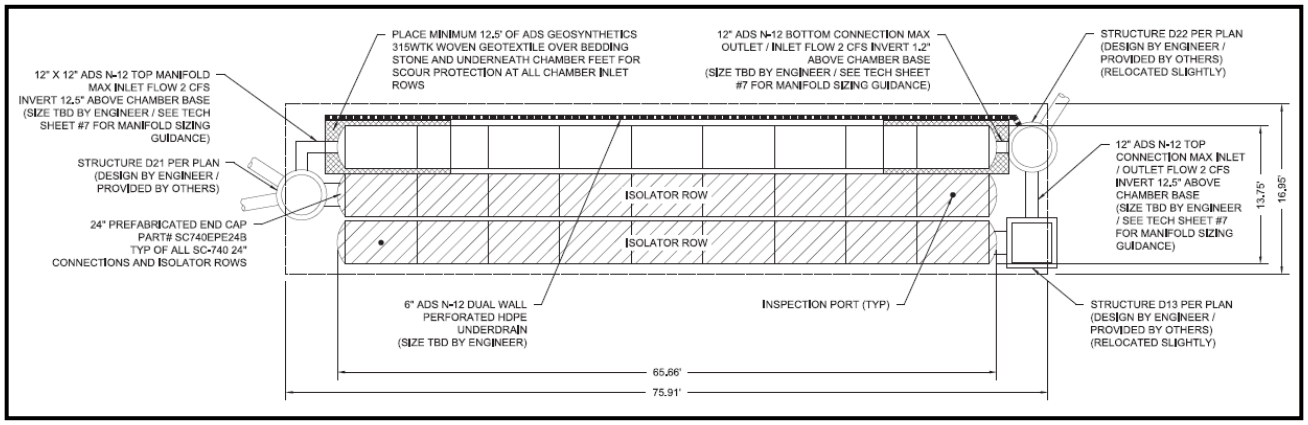
ODOT owns and maintains very few constructed wetlands because in most situations, detention basins are more cost effective and easier to maintain than constructed wetlands. Constructed wetlands are distinguished by ponding water with heavy vegetation surrounding the ponding and an outlet control structure at the downstream end. A single constructed wetland may be subdivided into multiple cells to separate those sections with shallow depths and those with slightly greater depths. There may also be signs showing areas that should not be mowed or sprayed.

Underground Detention

Underground detention BMPs provide storage underground to allow pollutants to settle out of storm water runoff. They range from a series of conduits that are specifically used for storm water detention to large concrete vaults. Most underground detention BMPs have a pretreatment section where runoff enters the unit. Pretreatment sections normally require more frequent maintenance than the rest of the underground storage units. These BMPs normally also have outlet control structures to slowly release discharges downstream.

Underground detention BMPs are not generally visible from the surface. BMP plans are needed to know where the different components of the BMP are located (i.e. pretreatment chamber and outlet structure). The plans are needed to determine which manhole covers must be removed to facilitate inspection and maintenance.





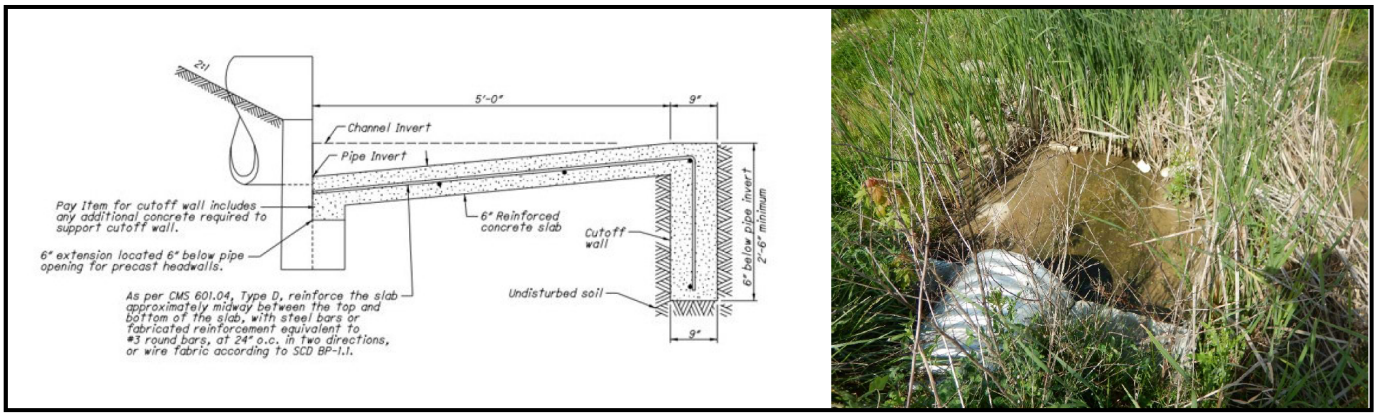
Infiltration Basin

An infiltration basin is an open-air depressed area that uses infiltration into the ground as the primary outlet for most storm water flows. A bypass outlet structure and/or a weir structure may be used for storm events larger than the design storm. Infiltration basins are designed to discharge their volume into the ground utilizing in-situ permeability rates over the course of 24 hours. An observation well(s) will be provided for routine inspection of the water level.

Infiltration basins have a vegetated filter strip or vegetated biofilter for pretreatment of the surface water. Most soils in Ohio do not have permeability rates sufficient to support infiltration practices. Also, infiltration basins can be difficult to maintain and can require footprints similar to detention basins.

Stream Grade Control

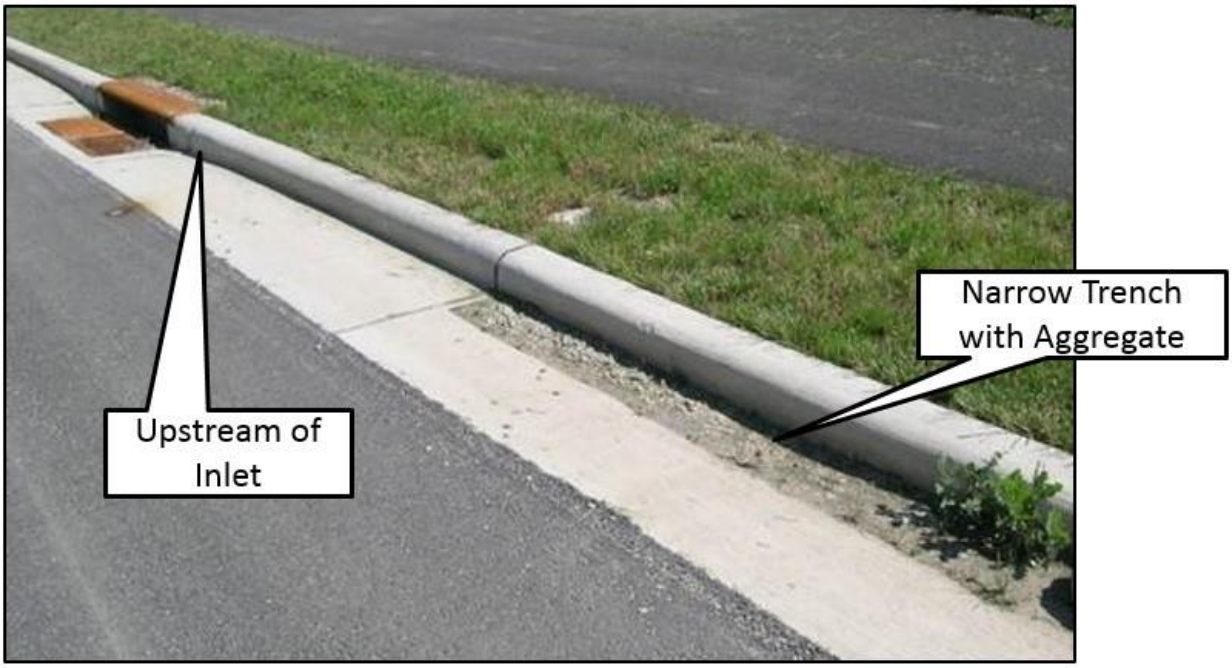
Stream grade control BMPs are concrete pads on the upstream and downstream side of some culverts. These concrete pads are commonly used for other purposes such as invert depression or to prevent piping of water under and around culverts and are detailed in SCD DM-1.1. Use of concrete pads as BMPs are not common on ODOT roadways. Also, these BMPs do not require specific maintenance or annual inspections. Stream grade control BMPs are included in the BMP database within Collector App, but only for tracking purposes.



Exfiltration Trenches

Exfiltration trenches do not need to be inventoried or maintained. They are only mentioned because over 3,000 were constructed across Ohio during the years of 2009 to 2013. These devices were determined to be too labor-intensive to maintain. No new exfiltration trenches are being constructed.

An Exfiltration Trench is a narrow trench filled with aggregate along the curb, sometimes clogged with vegetation. They are normally just upstream of an inlet into the storm sewer system.



III. Process for Accepting New BMPs

New post construction BMPs are added to projects in the design stage to meet environmental regulatory requirements. Project designers and District Planning and Engineering staff determine which types of BMPs are appropriate for each specific project and input BMP data from the construction plans into the BMP Database that is within Collector App. Each BMP has a status associated with it. When District P&E staff input BMPs into Collector, the status is listed as "Proposed" until the project is finished with construction and the status can be switched to "Active." Proposed BMPs are shown as squares or dotted lines in the Collector website and are shown as red in the Field Maps app (also called Collector App) on the iPad to signify that they have not been built and therefore do not yet require regular inspections.

Once the project is near the end of construction, Construction personnel must notify Maintenance personnel that a project with a BMP is nearly finished. A Maintenance representative must be invited to attend the final inspection to ensure that every BMP meets the minimum performance criteria for that specific BMP. This inspection will constitute the transfer of the BMP from Construction responsibility to Maintenance responsibility.

During the final construction walk through, a Maintenance representative confirms that the BMP location in Collector App is consistent with the actual location of the BMP in the field. Then, the Maintenance representative performs a BMP inspection using Collector App. If any maintenance issues are identified, the Contractor is notified so that the issue can be resolved before Maintenance takes responsibility for the BMP. After a Maintenance representative confirms that a BMP meets all performance criteria, the Maintenance representative switches the BMP status from "Proposed" to "Active."

For example, a vegetated biofilter is a grass ditch that has a flat bottom, free of ruts, gullies, or erosion, and at least 70% grass coverage. If Maintenance staff perform a BMP inspection during the final Construction walk through and identify that the contractor did not complete final grading of the ditch, and there are ruts with standing water and poor grass coverage, then the Contractor has responsibility for fixing the BMP before Maintenance takes responsibility.

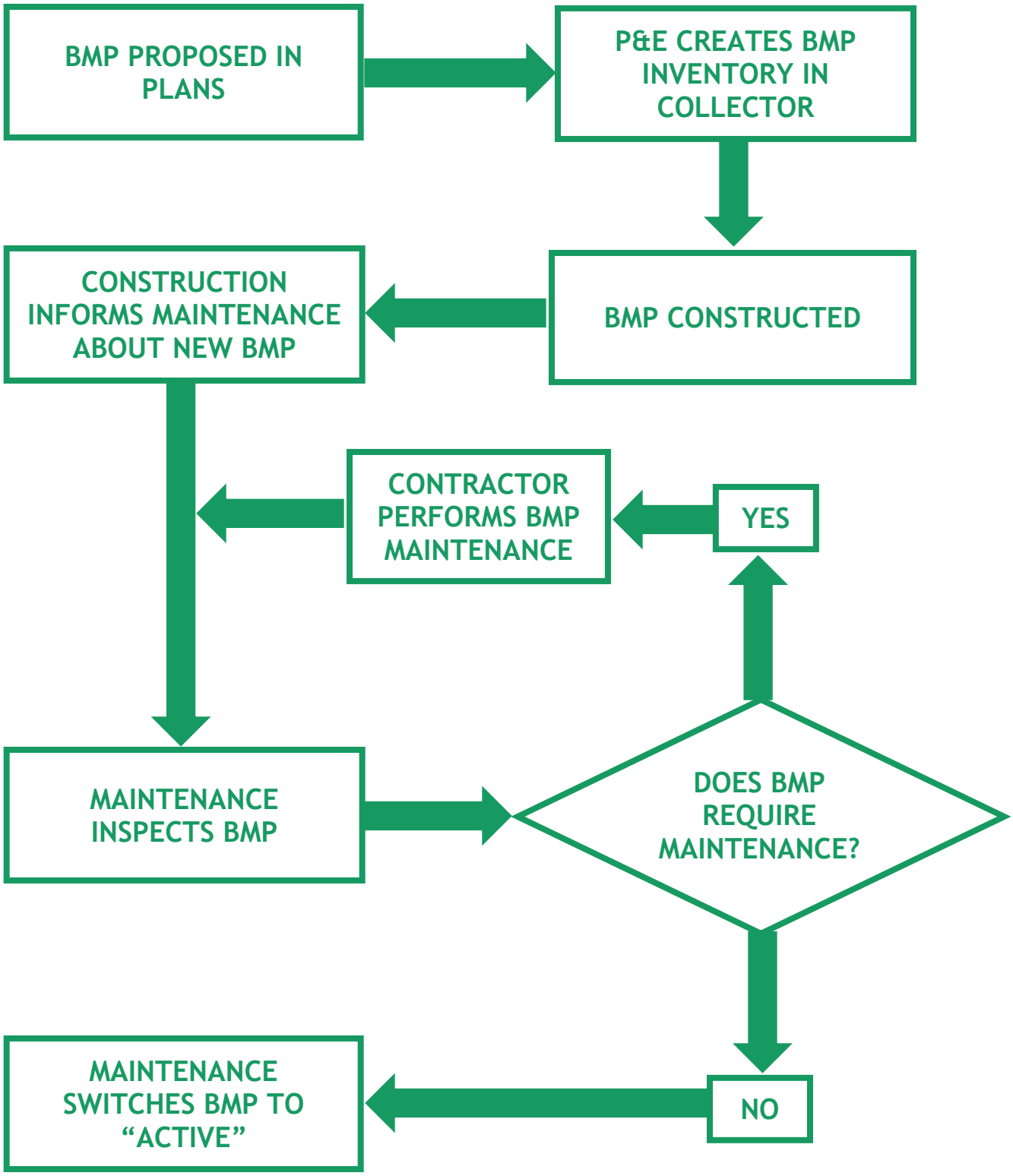
If a project has finished construction, and the Contractor is no longer on the project, but maintenance has not performed BMP inspections, then Maintenance assumes any initial BMP maintenance responsibilities to ensure the BMP is functioning as intended. Hence the importance for Maintenance to perform the initial inspection before the Contractor is released from the project.

When conducting an initial BMP inspection, attach at least one photograph of the active BMP to the BMP inventory. In Collector App, information is either attached to the BMP inventory (the BMP design details) or the BMP inspection (details about the BMP's current performance). For each BMP, there is one inventory, but there may be multiple inspections depending on how many times a BMP inspection has occurred. Ensure that at least one overall photograph is attached to the BMP inventory. Only photographs of maintenance issues need to be attached to each individual BMP inspection.

Normally, BMP inspectors will not need to add new BMPs using Collector App in the field. If a BMP is identified in the field that was not included in the BMP database within Collector, discuss and confirm the BMP details with the District Hydraulic Engineer.

Charge all labor, equipment, and material time to M100-010 Asset Inventory and Inspection with "BMPs" listed as the subactivity.

New BMP Acceptance Flowchart



IV. Process for Inspecting Existing BMPs

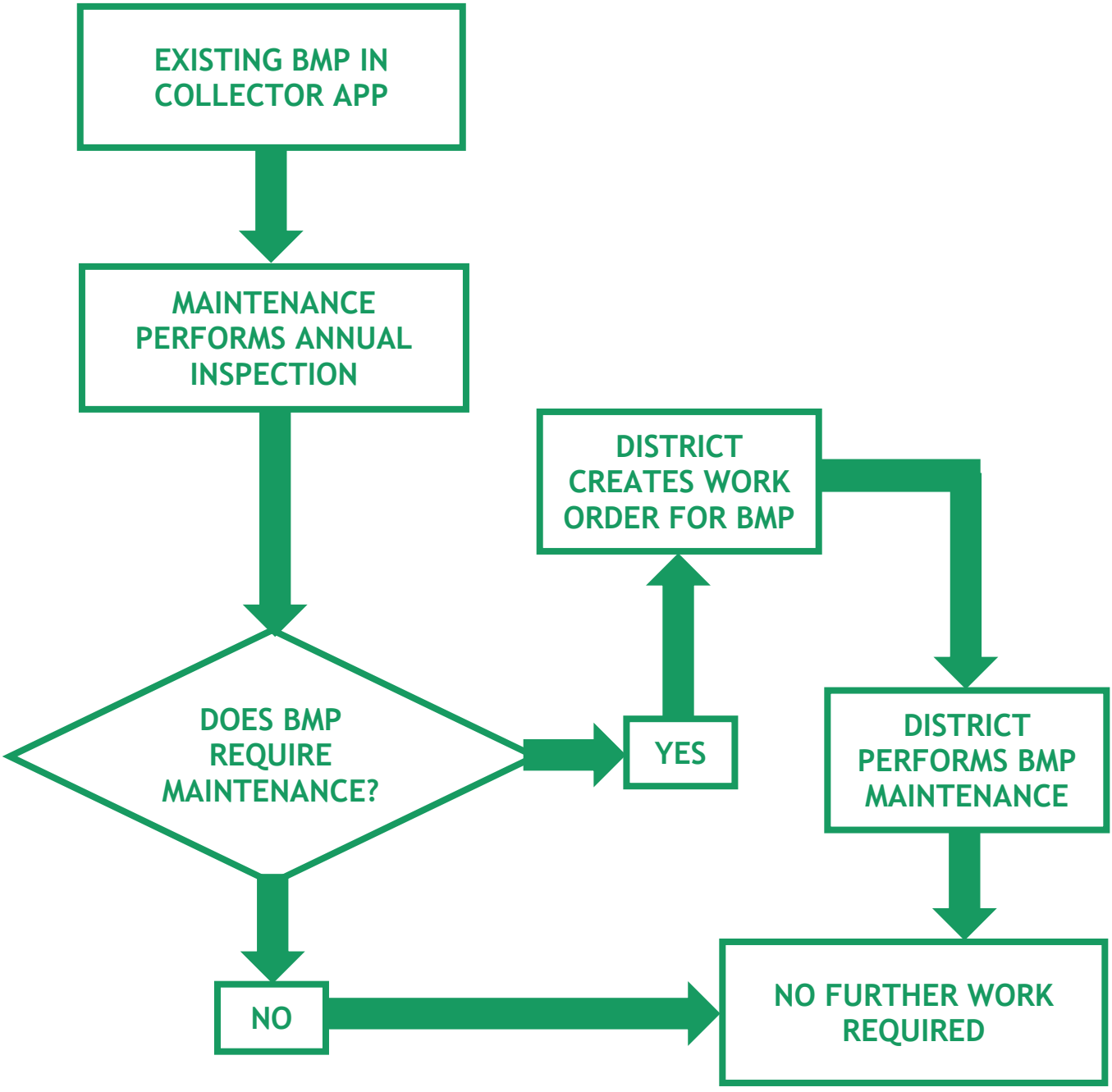
Each active BMP must be inspected once per year to ensure that it is functioning appropriately. BMPs are inspected for key performance criteria specific to the type of BMP as listed in the following section. Most existing BMPs were inspected at the end of construction, and therefore the location has already been verified. In this case, locating a BMP for inspection is straightforward using the Collector App's GIS capabilities as a guide. Sometimes maintenance staff are not able to perform an inspection before construction was complete. In these instances, BMPs are switched from "proposed" to "active" by district P&E staff or TAM coordinators. If an initial inspection was not completed, it is important to verify that the location of the BMPs in Collector App is consistent with the actual location in the field.

If the BMP cannot be located in the field, or the BMP type does not look like the BMP identified in the field, the BMP inspector should inform the District Hydraulic Engineer of the issue. The BMP inspector may also confirm BMP location details with the District Hydraulic Engineer if a BMP appears to be shown in Collector on the wrong side of the road, or in a different location than identified in the field. A second site visit with the District Hydraulic Engineer may be required.

When conducting an inspection on an existing BMP, check to make sure that a BMP photograph has already been attached to the BMP inventory. If no photograph is attached to the BMP inventory, use Collector App to edit that BMP inventory to add a photograph that shows the BMP.

Charge labor, equipment, and material time to M100-010 Asset Inventory and Inspection with "BMPs" listed as the subactivity.

Existing BMP Inspection Flowchart



V. BMP Inspection Criteria

The BMP inspection criteria in this section are used for all inspections (both for new BMPs and regular annual inspections). There are specific performance criteria for each type of BMP; however, many BMPs have similar approaches as follows:

- Use BMP Collector App to ensure that you've located the BMP.
- Ensure that there is at least one photograph of the BMP attached to the BMP inventory.
- Check for erosion or structural deficiencies in the BMP.
- Ensure that appropriate vegetation or grass is surviving.
- Ensure that storm water runoff is able to flow towards the outlet and that the BMP outlet is not clogged.
- Remove buildup of sediment, trash, and/or debris.
- Use Collector App to take a photograph of any identified maintenance issues and attach it to the BMP inspection

The BMP types have between 1 and 9 performance criteria to check for each inspection. For each BMP, every criterion must be given a value of either "No Maintenance Needed" or "Maintenance Needed." Leaving a performance indicator with no value does not mean that no maintenance is needed. Instead, leaving the cell blank indicates that the BMP was not inspected for that specific criteria and is therefore incomplete. If any issues were identified that will require maintenance, "Inspection Comments" input is required to describe the nature, extent, or specific location of the maintenance issue. Also, the inspector must fill out the "Inspector Initials" and "Inspection Date" cells for every inspection that they complete.

Collector App enables BMP inspectors to quickly attach photographs of specific maintenance issues to a BMP inspection. Attach as many photographs as are necessary to support the development of a work order to address those issues. For example, if a vegetated biofilter has tire ruts along the bottom of the ditch and erosion in one spot along the foreslope, attach one photograph showing the tire ruts and an additional photograph showing the eroding slope.

Some BMP inspections may identify uncommon issues, such as a BMP being removed, paved over, or replaced with a different feature. For inspections that show issues not addressed by the standard inputs in Collector App, it is best to input "Maintenance Needed" for at least one of the cells and then describe the issue in the "Comments" section. If comments are added, but "Maintenance Needed" is not input, then the BMP will not get added to the overall list of BMPs to maintain and no notice will be sent about the BMP issue.

The following pages show the specific performance criteria for individual BMP types. BMP Collector App lists the shortened version of the performance criteria. This document provides detailed explanations for each of those shortened versions.

Vegetated Biofilter

- Confirm or correct the location (start/stop Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	Maintenance Activity
Check Erosion/Ruts/Gullies	Level out ruts, gullies, or anything causing concentrated flow. Don't create ruts with equipment. Reseed and replace Item 670, Ditch Erosion Protection after any earthwork to achieve 70% grass coverage.
Remove Sediment/Trash/Debris	Pick up any trash that accumulates and dispose according to C&MS 105.16.
Remove Woody Vegetation	Inspect the vegetation. Ensure the grass is well established along the bottom and foreslope of the swale. The backslope may be covered with grass or brush. Grass should cover at least 70% of the surface area of the vegetated biofilter in all areas.
Maintain Ditch Bottom	Maintain ditch bottom to original width. Maintain a flat ditch bottom, without ruts. Reseed and replace Item 670, Ditch Erosion Protection after any earthwork to achieve 70% grass coverage.
Grass Coverage 70%	Reseed and replace Item 670, Ditch Erosion Protection after any earthwork to achieve 70% grass coverage. Don't expose bare soil without re-establishing vegetation. Grass should cover at least 70% of the surface area of the vegetated biofilter in all areas. Cattails and phragmites are not considered grass and should not be in vegetated biofilters.

Vegetated Filter Strip

- Confirm or correct the location (start/stop Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	Maintenance Activity
Check Erosion/Ruts/Gullies	Ensure the slope is void of any ruts, gullies, or concentrated flow damage. Level out ruts, gullies, or anything causing concentrated flow. Don't create ruts with equipment. Reseed and replace Item 670, Slope Erosion Protection after any earthwork to achieve 70% grass coverage.
Remove Sediment/Trash/Debris	Pick up any trash that accumulates and dispose according to C&MS 105.16.
Remove Woody Vegetation	Inspect the vegetation. Ensure the grass is well established along the width of the strip. Grass should cover at least 70% of the surface area of the vegetated filter strip in all areas.
Grass Coverage 70%	Ensure the grass is well established along the width of the strip. Reseed and replace Item 670, Ditch Erosion Protection after any earthwork to achieve 70% grass coverage. Don't expose bare soil without re-establishing vegetation.

Manufactured System

- Confirm or correct the location (Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	Maintenance Activity
Remove Sediment/Trash/Debris	Remove accumulated material with a vacuum truck which may require jetting the sediment to loosen it before being able to vacuum it out. Inspect and clean the diversion weir structure (manhole placed along the storm sewer trunk line). When removing accumulated material, sample the removed material and test as hazardous/non-hazardous (same as done for catch basins). Do not flush the system and wash polluted material downstream. Dispose of it according to C&MS 105.16. Do not perform maintenance during a rain event.

Manufactured systems should be maintained a minimum of once per year. If collected sediment is left in manufactured systems too long, it can harden to the bottom of the unit such that jetting and vacuuming with a vacuum truck is no longer sufficient. When this happens, the hardened sediment must be chipped out of the unit. Also, too much sediment collected in manufactured systems can lead to complete bypass of flows and failure to provide water treatment. The Office of Hydraulic Engineering recommends that manufactured systems are maintained at the same time as their annual inspection to reduce required trips to BMPs. This is especially true for manufactured systems sited such that shoulder or lane closures are required to inspect or maintain.

Directly following construction, or when there is an especially dirty land use upstream, the pollutant load draining to a manufactured system can be greater than normal. Therefore, the Office of Hydraulic Engineering requires that manufactured systems are maintained every 4 months after installation (3 times in the first year). After that point, if the manufactured system has not filled in 4 months, the District may maintain the BMP annually. If a manufactured system has completely filled with sediment since that last annual inspection, the District must maintain the BMP more frequently than annually (i.e. every 6 months).

Detention Basin

- Confirm or correct the location (Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	Maintenance Activity
Check Erosion/Ruts/Gullies	Repair any erosion, ruts, or gullies around the perimeter of the detention basin that may lead to excess sediment deposited into the basin.
Remove Sediment/Trash/Debris	Remove litter and debris and dispose of it according to C&MS 105.16.
Remove Woody Vegetation	Check for excessive vegetation growing on the bottom of the basin that will diminish the capacity of the basin or clog the invert. Remove woody vegetation on embankment slopes or areas that could reduce the structural integrity of the basin.
Check Ponding	Check for ponding 72 hours after a significant rain event of at least 0.5 inches falling in 24 hours. If ponding exists, verify with P&E that it should be dry and check outlet structure for clogging.
Inspect Bank & Overflow Weir	Inspect embankments and emergency overflow weir. Ensure they are intact and structurally sound.
Inspect Outlet	Inspect the outlet structure. Ensure the orifice holes are not clogged and the catch basin is free from any debris.
Remove Sediment in Forebay & Regrade	Check for erosion or sediment deposition in pretreatment areas. Clean out and repair damaged areas and dispose of it according to C&MS 105.16.

Retention Basin

- Confirm or correct the location (Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	Maintenance Activity
Check Erosion/Ruts/Gullies	Check for erosion or sediment deposition in pretreatment areas. Clean out and repair damaged areas. Dispose of removed material according to C&MS 105.16.
Remove Sediment/Trash/Debris	Remove litter and debris and dispose of it according to C&MS 105.16.
Remove Woody Vegetation	Ensure basin does not fill with vegetation. Remove woody vegetation on embankment slopes or areas that could reduce the structural integrity of the basin.
Check Ponding	Check for excessive ponding above the permanent volume level 72 hours after a significant rain event (0.5 inches of rain falling in 24 hours). Consult original plans for normal pond elevation and check outlet structure for proper function.
Inspect Bank & Overflow Weir	Inspect embankments and emergency overflow weir. Ensure they are intact and structurally sound.
Inspect Outlet	Inspect the outlet structure. Ensure the orifice holes are not clogged and the catch basin is free from any debris.

Infiltration Trench

- Confirm or correct the location (Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	**Maintenance Activity**
Check Erosion/Ruts/Gullies	Ensure pretreatment of runoff is maintained to extend the life of the infiltration trench. Ensure that the pretreatment vegetated strip or swale are in good condition with at least 70% grass coverage and with no ruts or gullies causing concentrated flow.
Remove Sediment/Trash/Debris	Remove any sediment or debris within the pretreatment strip, swale, or infiltration trench aggregate. Dispose of it according to C&MS 105.16.
Remove Woody Vegetation	Ensure woody vegetation is not present at or immediately near the infiltration trench. Trim adjacent trees to assure that drip-line does not extend over the surface of the infiltration trench. Do not allow grass clipping or leaves to cover the trench.
Check Observation Wells	Check observation wells 72 hours after an event of at least 0.5 inches falling in 24 hours. If water is found after 72 hours, then the infiltration trench is considered clogged. Perform the following: • Remove the infiltration trench aggregate and scarify the soil by a tilling method to a depth of at least 8 inches (12 inches preferred). • Regrade the trench after scarifying the soil (take care to not compact the soil). Add a new 6" layer of Item 601 Infiltration Basin Aggregate after regrading the trench.
Check for Compaction	Ensure trench is dry prior to cleaning to reduce soil compaction. Ensure the trench does not get compacted by equipment.

Bioretention Cell

- Confirm or correct the location (Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	Maintenance Activity
Check Erosion/Ruts/Gullies	Check for erosion or deposition in pretreatment areas; Clean out and repair damaged areas. Dispose of this according to C&MS 105.16.
Remove Sediment/Trash/Debris	Remove litter and debris. Dispose of this according to C&MS 105.16.
Add Mulch	Add additional mulch if bioretention cell is planted with shrubs.
Check Ponding	Check bioretention cells for excessive ponding 48 – 72 hours following rain event of at least 0.5 inches falling in 24 hours. If excessive ponding exists, the planting soil may be clogged. If the planting soil is clogged, remove the top layer and replace with new engineered planting soil. After unclogged planting soil is replaced, vegetation must be reestablished.
Check for Compaction	To prevent compaction of planting soil, avoid vehicle traffic, including riding mower traffic, on bioretention cell area.
Inspect Outlet	Inspect outlet structure. Ensure the catch basin or underdrain is not clogged. Some bioretention cells do not have catch basin or orifice structures.
Inspect/Replace Diseased Plants	Inspect & replace poorly suited or diseased plants if bioretention cell is planted with shrubs.

Inspection Item/Maintenance Issue	Maintenance Activity
Mow Grass	If bioretention cell is planted with grass, mow the bioretention cell area in order to maintain healthy grass coverage. To prevent compaction of planting soil, avoid vehicle traffic, including riding mower traffic, on bioretention cell area. Grassed bioretention cells may be mowed with hand operated equipment or with an extended mower that allows tire traffic to remain outside of the cell area.
Prune/Weed/Water Plants	Water plants. Prune and weed plants for appearance if bioretention cell is planted with shrubs.

Constructed Wetland

- Confirm or correct the location (Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	Maintenance Activity
Check Erosion/Ruts/Gullies	Check for erosion or sediment deposition in pretreatment areas. Clean out and repair damaged areas. Dispose of removed material according to C&MS 105.16.
Remove Sediment/Trash/Debris	Remove litter and debris and dispose of it according to C&MS 105.16.
Inspect Bank & Overflow Weir	Inspect embankments and emergency overflow weir. Ensure they are intact and structurally sound.
Inspect Outlet	Inspect the outlet structure. Ensure the orifice holes are not clogged and the catch basin is free from any debris.
Remove Sediment in Forebay & Regrade	Check for erosion or sediment deposition in pretreatment areas. Clean out and repair damaged areas and dispose of it according to C&MS 105.16.

Underground Detention

- Confirm or correct the location (Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	Maintenance Activity
Remove Sediment/Trash/Debris	Remove sediment, litter, and debris from any access point and dispose of it according to C&MS 105.16.
Check Ponding	Check for ponding 72 hours after a significant rain event of at least 0.5 inches falling in 24 hours. If ponding exists, verify with P&E that it should be dry and check outlet structure for clogging.
Inspect Bank & Overflow Weir	Inspect discharge structure(s). Ensure they are intact and structurally sound.
Inspect Outlet	Inspect the outlet structure. Ensure the orifice holes are not clogged and the structure is free from any debris.
Remove Sediment in Forebay & Regrade	Remove accumulated material in pretreatment area with a vacuum truck which may require jetting the sediment to loosen it before being able to vacuum it out. Inspect and clean any flow routing structures that may collect sediment and trash. When removing accumulated material, sample the removed material and test as hazardous/non-hazardous (same as done for catch basins). Do not flush the system and wash polluted material downstream. Dispose of it according to C&MS 105.16. Do not perform maintenance during a rain event.

Underground detention pretreatment should be maintained a minimum of once per year. If collected sediment is left in pretreatment section too long, it can harden such that jetting and vacuuming with a vacuum truck is no longer sufficient. When this happens, the hardened sediment must be chipped out of the unit. Also, too much sediment collected in pretreatment section can lead to bypass of flows and failure to provide water treatment. The Office of Hydraulic Engineering recommends that underground detention BMPs are maintained at the same time as their annual inspection to reduce required trips to BMPs.

Infiltration Basin

- Confirm or correct the location (Latitude/Longitude coordinates).
- Ensure that there is at least one photograph attached to the BMP inventory that shows the overall BMP in context with the roadway, or some feature that helps with identification from the road.
- Perform the inspection as follows, filling out every cell.
- Take a photograph of any maintenance issue identified and describe in the "Inspection Comments" cell. Attach maintenance issue photographs to the inspection.

Inspection Item/Maintenance Issue	**Maintenance Activity**
Check Erosion/Ruts/Gullies	Ensure pretreatment of runoff is maintained to extend the life of the infiltration basin. Ensure that the pretreatment vegetated strip or swale are in good condition with at least 70% grass coverage and with no ruts or gullies causing concentrated flow.
Remove Sediment/Trash/Debris	Remove any sediment or debris within the pretreatment strip, swale, or infiltration basin Aggregate. Dispose of it according to C&MS 105.16.
Check Ponding	Check for ponding 72 hours after a significant rain event of at least 0.5 inches falling in 24 hours. If ponding exists, verify with P&E that it should be dry and check any outlet structure for clogging.
Check Observation Wells	Check observation wells 72 hours after a significant rain event. If water is found after 72 hours then the infiltration basin is considered clogged. Perform the following: • Remove the Infiltration Basin Aggregate and scarify the soil by a tilling method to a depth of at least 8 inches (12 inches preferred). • Regrade the basin after scarifying the soil (take care to not compact the soil). Add a new 6" layer of Item 601 Infiltration Basin Aggregate after regrading the trench.
Check for Compaction	Ensure basin is dry prior to cleaning to reduce soil compaction. Ensure the basin does not get compacted by equipment.

VI. BMP Maintenance

ODOT has a regulatory requirement to ensure that all active BMPs in the BMP Database within Collector App are maintained and functioning appropriately. To that end, ODOT is required to address any maintenance issue identified on a BMP within 1 year of the inspection.

Most of ODOT's BMPs are vegetated biofilters and vegetated filter strips. The major maintenance issues with these BMPs are associated with maintaining a minimum of 70% overall grass coverage, and avoiding erosion, ruts, or gullies. Therefore, significant portions of expected maintenance efforts will be associated with re-establishing grass coverage, and possible re-grading to fix erosion, ruts, or gullies. Generally, the best times to plant grass are during the spring (March 15 – May 15) and during the fall (September 15 – November 1). Districts may want to attempt regrading and reseeding maintenance work during these time frames to decrease the likelihood that additional maintenance will be needed later.

Since good grass establishment is critical to performance of many BMPs and to avoiding erosion, grass re-establishment will likely be a common BMP maintenance activity. Especially for vegetated biofilters, it is important to ensure that the grass ditch has positive drainage throughout the length of the ditch before attempting to re-establish grass. In general, grass will not grow in permanently ponded sections of a ditch. Therefore, regrading to achieve positive drainage or eliminate deep, water-holding ruts, may be a necessary first step before attempting to plant grass.

BMPs that are designed to temporarily hold back larger volumes of water are generally low maintenance compared to vegetated biofilers and vegetated filter strips. These BMPs include:

- Detention Basins
- Retention Basins
- Constructed Wetlands

These BMPs normally have an outlet structure with small orifices that may become clogged with vegetation, especially after mowing. A clogged orifice can sometimes cause water to pond 2 – 3 feet for weeks, killing any vegetation growing in the lower parts of the basin. Normally, unclogging these orifices may only take 5 – 10 minutes at the site to get the BMP functioning appropriately again.

Underground BMPs (manufactured systems and underground detention) can be easy to forget about since maintenance issues are not readily identifiable from the surface. However, these BMPs concentrate pollutants in a specific location underground. Since long-term buildup of those pollutants can lead to costly future maintenance issues, underground BMPs should be maintained with a vacuum truck at least once per year. For underground detention BMPs, plan drawings of the installed unit are critical to determine appropriate maintenance, observation, and outlet points.

If there are uncertainties about the best approach to maintain a specific BMP, contact the District Hydraulic Engineer or Central Office, Office of Hydraulic Engineering for help developing a maintenance plan. If maintenance of a specific BMP is not feasible for site-specific constraints, contact the Office of Hydraulic Engineering to discuss mitigation solutions. ODOT may not abandon active BMPs without providing mitigation. Sometimes, that mitigation must be 1.5 times as much as the abandoned BMP and provided within the same watershed.

BMP maintenance is tracked in Collector App. When a BMP inspection identifies maintenance needed, that BMP is flagged and added to the list of BMPs that must be maintained. ODOT is then responsible for maintaining that BMP within one year. After completing the necessary maintenance for a BMP, perform the following steps:

1. Open the most recent BMP inspection for that specific BMP.
2. Edit the most recent inspection and change the "Maintenance Completed" field from "No" to "Yes."
3. Once "Yes" is input into the "Maintenance Completed" field, notice a new field called "Maintenance Completed Date" will appear at the bottom of the inspection form.
4. Input the last date that maintenance was performed into that field.
5. Click the "Submit" button at the top of the screen to update the inspection.
6. Charge labor, equipment, and material time to M100-009, Storm Water BMP Maintenance.

VII. BMP Representatives

The following groups have key roles associated with post-construction BMPs:

District Hydraulic Engineer: District representative responsible for overseeing appropriate BMP design, normally in District Planning and Engineering.

District TAM Coordinator: District representative responsible for overall assistance associated with Collector App. Also responsible for facilitating communication between Collector App users and key asset decision makers.

District MS4 Liaison: District representative responsible for tracking and reporting District activities associated with Ohio EPA's MS4 permit (public outreach, illicit discharge, construction erosion and sediment controls, post-construction BMPs, and facility storm water management).

Central Office, Office of Hydraulic Engineering: Responsible for post-construction BMP design guidance in ODOT's Location and Design Manual, Volume 2. Also responsible for coordination with Ohio EPA on compliance issues associated with post-construction BMPs.

VIII. Appendix A – Inspection Items/ Maintenance Issues

The photographs in this section show examples of specific ODOT BMP maintenance issues.

Check Erosion/Ruts/Gullies – Vegetated Biofilter and Vegetated Filter Strip

Remove Sediment/Trash/Debris


Remove Woody Vegetation - Vegetated Biofilter and Vegetated Filter Strip


Maintain Ditch Bottom - Vegetated Biofilter


Grass Coverage 70% - Vegetated Biofilter and Vegetated Filter Strip

Examples of 70% to 100% grass coverage where maintenance is not required.


Examples of less than 70% grass coverage where maintenance is required.




Remove Sediment/Trash/Debris – Manufactured System


Check Ponding and Inspect Outlet – Detention, Retention, and Wetland

Clogged outlet leads to ponding.


Unclogging outlet leads to flowing water which eliminates the permanent ponding.


Remove Woody Vegetation – Detention and Retention Basins

Check Erosion or Inspect Bank & Overflow Weir – Detention, Retention, and Wetland

Remove Sediment/Trash/Debris or Check for Compaction – Infiltration Trench

Check Erosion/Ruts/Gullies – Infiltration Trench


Add Mulch – Bioretention Cell

Check Ponding – Bioretention Cell

Inspect/Replace Diseased Plants

Mow Grass – Bioretention Cell

Prune/Weed/Water Plants – Bioretention Cell