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Developing a Stormwater BMP Maintenance Program

INAFSM— Sept 5, 2019

Heather Williams, LEED AP



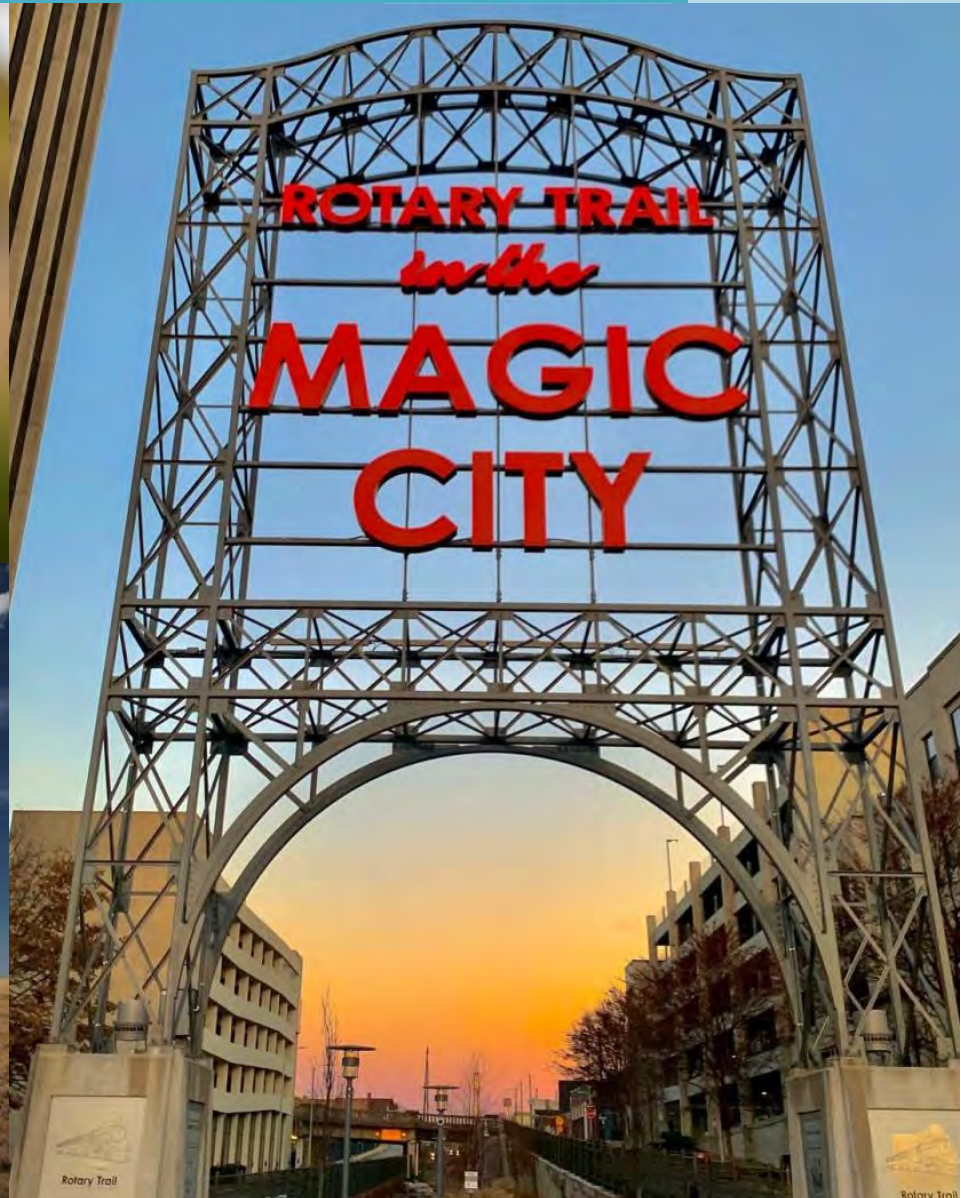
Birmingham, AL

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Birmingham, AL

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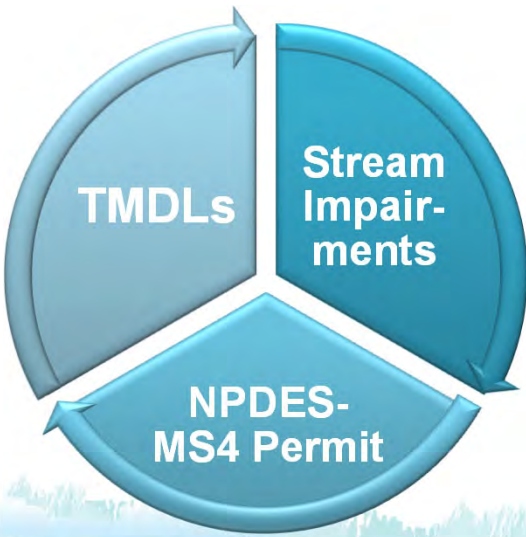
Developing a Post Construction Stormwater Program

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Stormwater in Birmingham

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UAB Campus, Birmingham AL, June 27, 2016



Developing a Post Construction Stormwater Program



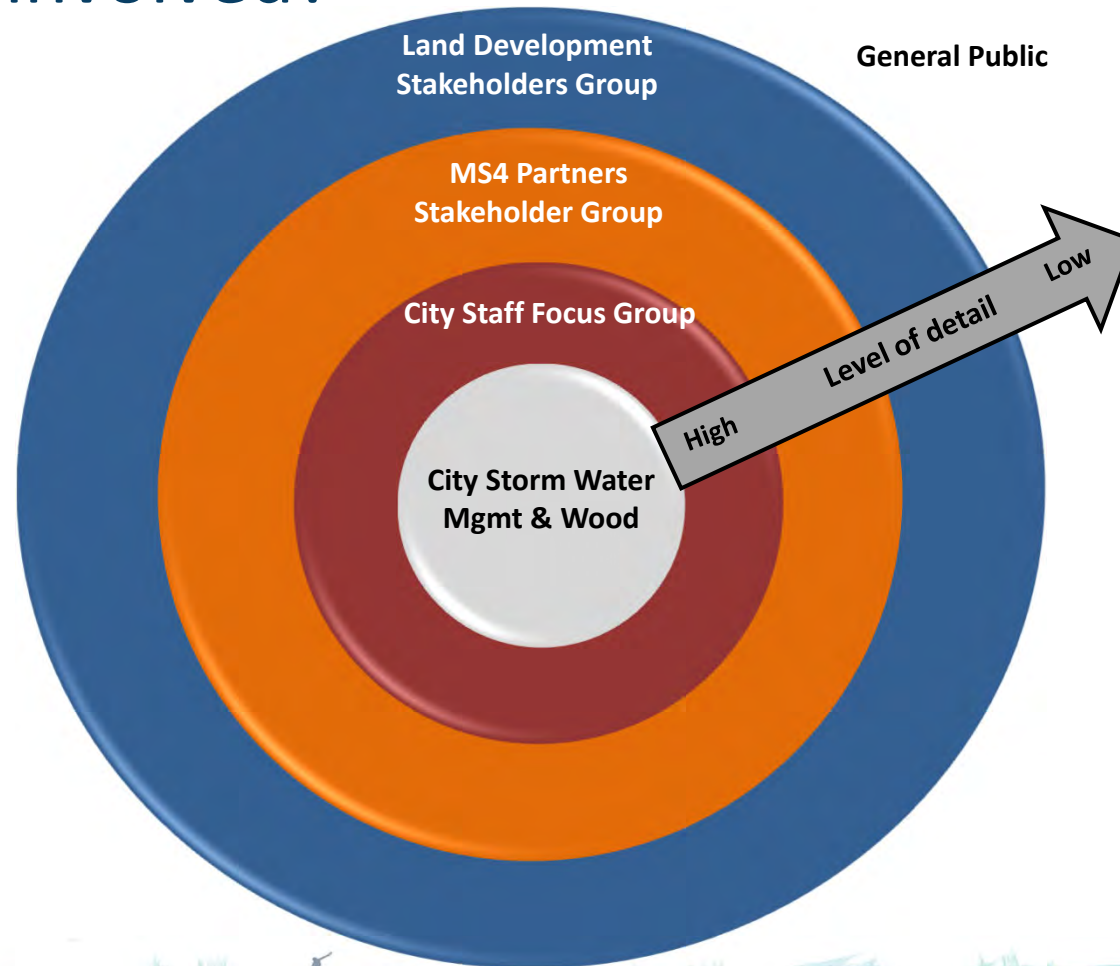
- How to set up the many pieces of a stormwater program?
- ADEM and the state of AL's post construction requirements.
 - No water quality requirements to very stringent volume requirements (green infrastructure)
 - Maintenance requirements
- Public and Private



Developing a Post Construction Stormwater Program



- Who was involved?
- Timeline?

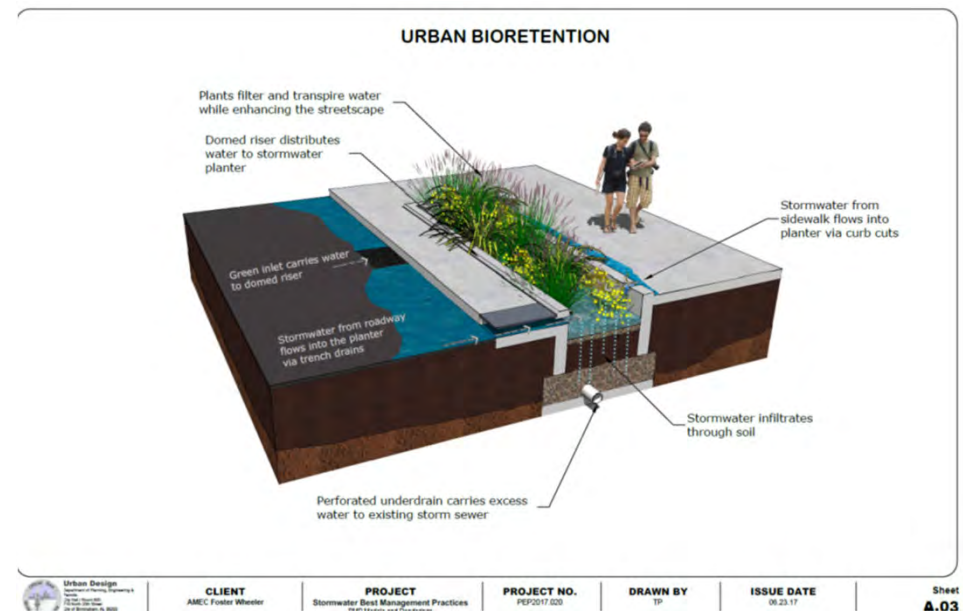


Program Content and Materials

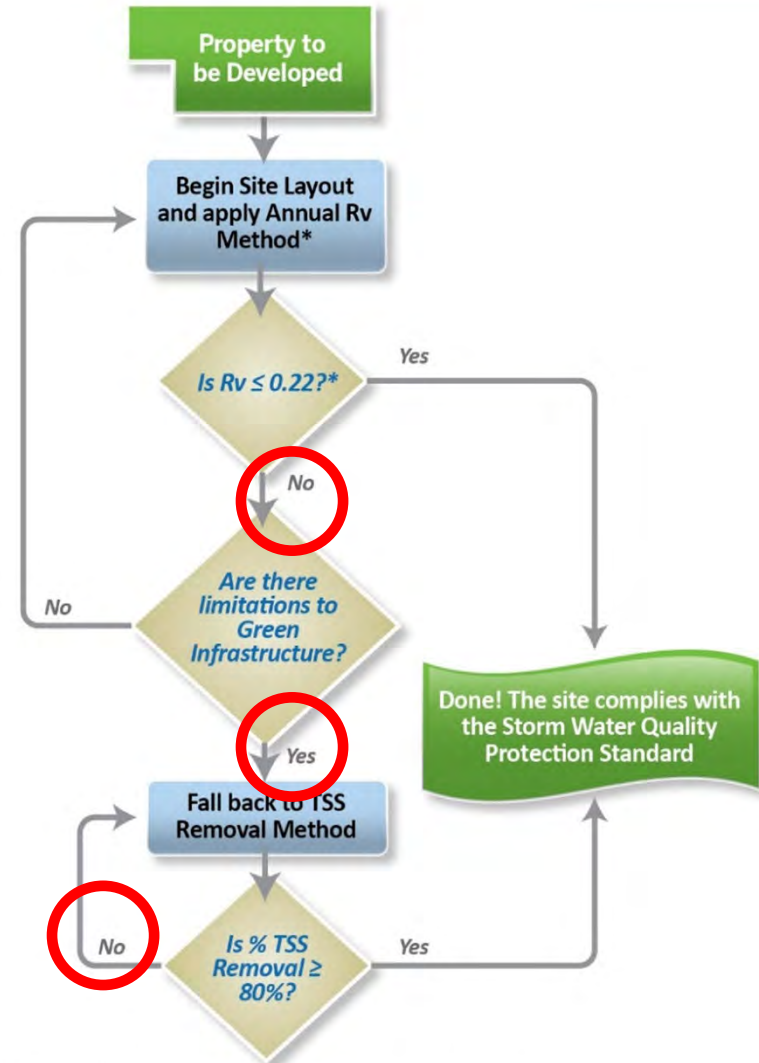
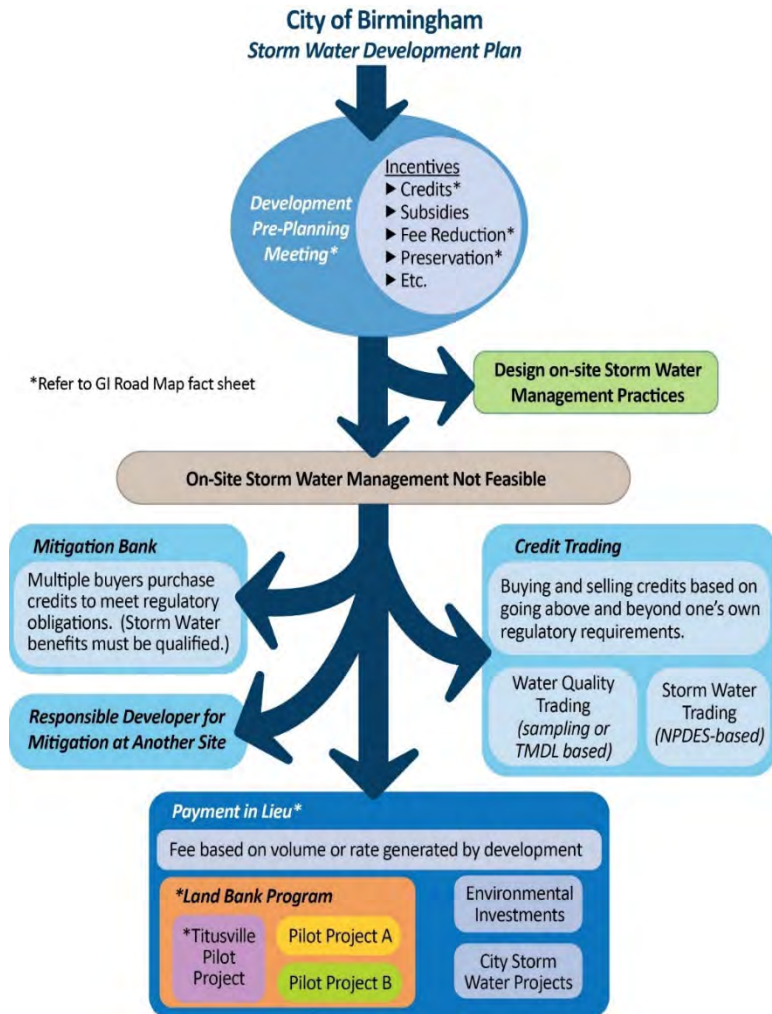


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- Stormwater Ordinance
- Stormwater Manual
- Typical Details
- Owner's Guide to Maintenance
- Training
- Web Resource Center
- Off Site Mitigation Program



Developing a Post Construction Stormwater Program



* The use of Credits and Incentives is not included in this graphic.



BMPs Fails

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How to prevent BMP fails....



- Set up a **STRONG** and **ENFORCABLE** ordinance
- Link Maintenance Agreement to property deed
- Have funding and staff dedicated to **ENFORCEMENT**
- Provide **TRAINING, OUTREACH, and ASSISTANCE**
- Develop checklists and material **TARGETED** toward the **OWNER** not the Engineer.
- Determine who is responsible for inspection and maintenance.



BMP Maintenance Program Tools **wood.**



■ **DRAFT BMP Owner's Manual**

- Provides general education on BMPs and explains Owner responsibilities
- Establishes maintenance “performance standards”
- Provides inspection and maintenance guidance and checklists
- Provides additional resource information

■ **City Stormwater Web Resources**

- Provides Owner's Manual in engaging “storybook” format
- Provides Compliance Inspection Checklist templates





- Section 1:** Introduction and Storm Water BMPs 101
- Section 2:** BMP Operational and Success Criteria
- Section 3:** BMP Inspection
- Section 4:** BMP Maintenance
- Section 5:** Individual BMP Inspection Requirements
- Section 6:** Helpful Resources

Target Audience:

NOT written for engineer or designer

IS written for **property owners**

Messaging:

- ✓ Simple
- ✓ Educational
- ✓ Visual
- ✓ Themed



Introduction and Storm Water BMPs



Property Owner's Guide to BMP Maintenance:

Best Management Practices (BMPs) = Regulated Storm Water Management Practices

- What is Storm Water?
- What are Storm Water BMPs?
- Why do we have Storm Water BMPs?
- How do I know if I have a Stormwater BMP on my property?



Introduction and Storm Water BMPs

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Storm water can cause
flooding



Storm water can cause
erosion



Storm water can cause
pollution



BMPs can look like
typical landscaping...



... but they are
working to manage
stormwater

Introduction and Storm Water BMPs

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OWNER RESPONSIBILITIES

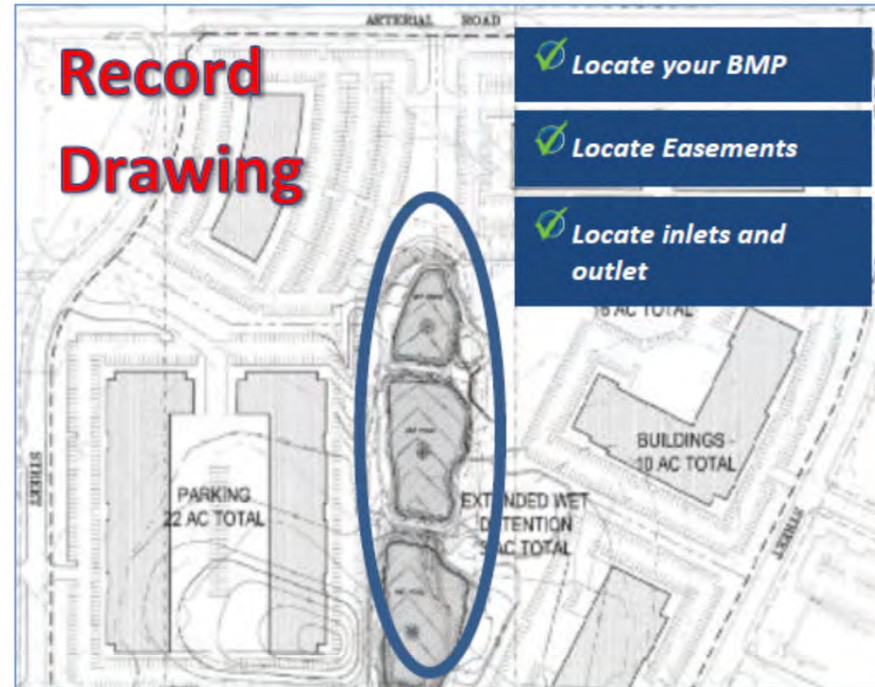
- ✓ Protection of the BMP, related components and access routes from a public roadway from development, encroachment, and damage
- ✓ Conduct and document inspections and maintenance
- ✓ Submit required information to the City
- ✓ Provide for the perpetual and proper operation of the BMP

CITY RESPONSIBILITIES

- ✓ Enforce the provisions for inspection and maintenance.

We are here to help! The City of Birmingham's Storm Water Management Department can answer questions about your BMP!

Record Drawing



Once you have your as-built, locate your specific BMPs. They may be called by other names, such as:

- ✓ Rain Garden
- ✓ Swale
- ✓ Downspout Disconnection
- ✓ Green Roof
- ✓ Sheet Flow
- ✓ Reforestation
- ✓ Permeable Pavement
- ✓ Infiltration Trench
- ✓ Rain Barrel
- ✓ Pond
- ✓ Underground Detention
- ✓ Oil/Grit Separator
- ✓ Manufactured Treatment Device

2.0 BMP Operational Success Factors

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Property Owner's Guide to Maintenance:

Keeping Your Best Management Practice (BMP) Working Properly

- What Makes a Functional BMP?
 - Retention BMPs
 - Detention BMPs
 - Green Infrastructure BMPs
 - Manufactured BMPs
- Why is Proper BMP Function Important?
- What is your Role to keep your BMP working?
- Common Components of ALL BMPs
- What do the Common Components of BMPs Look Like?
- BMP Success Factors



2.0 BMP Operational Success Factors

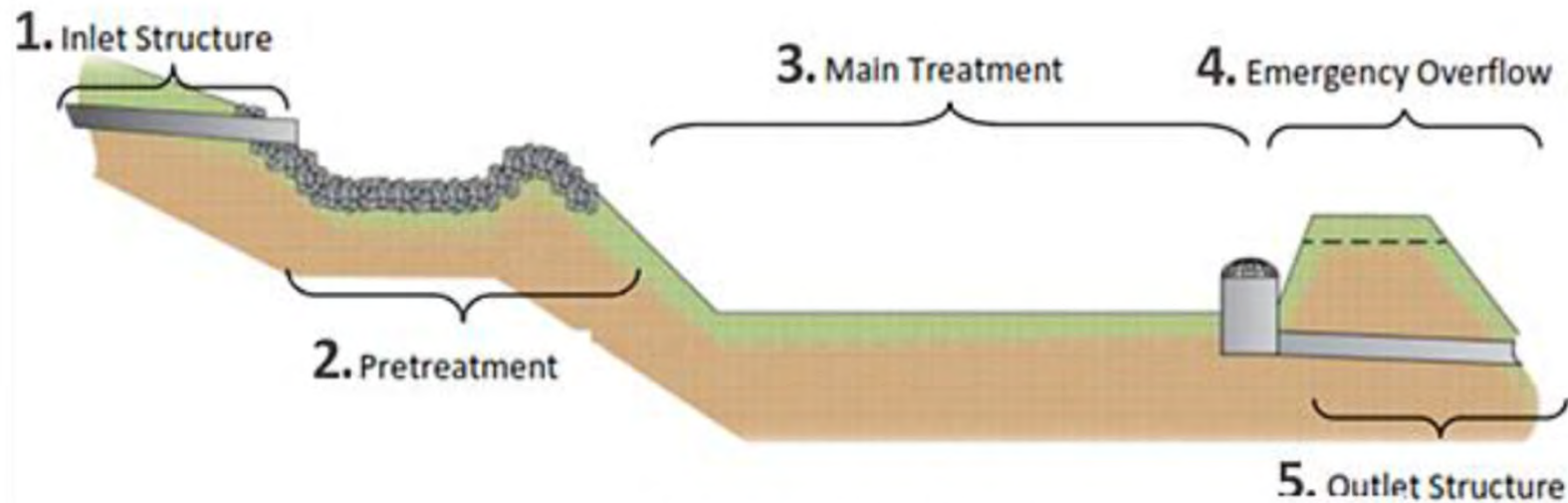


Figure 1: Detention Basin





WHAT DOES SUCCESS LOOK LIKE?

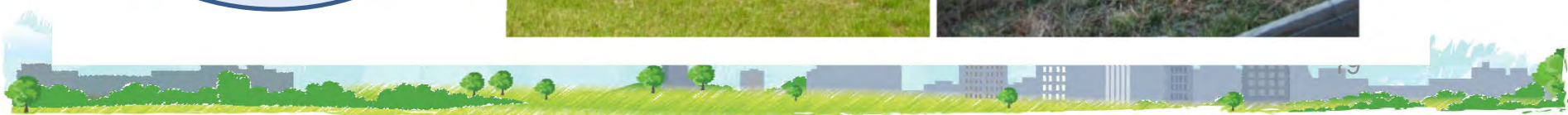
Inlet structures bring water into the BMP. They should be free of sediment, trash, and debris. Erosion, scour, and damage should be evaluated



WHAT DOES FAILURE LOOK LIKE?



Pretreatment is the first layer of protection for the main treatment area. Debris and coarse sediment are removed, which reduces clogging in the main treatment area. The pretreatment area can be cleaned more easily than the main treatment area. It should be free of sediment, trash, and debris. Erosion, scour, and damage should be evaluated.





2.0 BMP Operational Success Factors

Success Factor 1: Vegetation



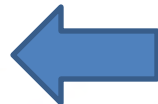
Vegetation should be healthy and maintained. Bare soil should not be visible in vegetated areas, nor should vegetation be overgrown.

Success Factor 2: Draindown



After rainfall, storm water should generally recede within 48 hours. There should not be regular, prolonged flooding. This can indicate a clog or other problem with filter media, underdrains, inlets, or outlets.

Success Factor 3: Protection



Pedestrian, vehicles, and heavy equipment can damage BMPs. There should not be signs of encroachment, such as compacted soil, pet waste or crushed vegetation

Success Factor 4: Cleanliness



The area around a BMP needs to be kept clean to reduce the chance that objectionable materials enter the BMP. There should not be sediment, litter, or stored pollutants in the BMP or its drainage area.





2.0 BMP Operational Success Factors



Success Factor 1: Vegetation

Vegetation is healthy and free from weeds



Success Factor 2: Drawdown

BMP is not holding water long after rain event



Success Factor 3: Protection

No signs of vehicle, equipment, or pedestrian damage.



Success Factor 4: Cleanliness

No signs of litter, erosion, pollution, or debris





2.0 BMP Operational Success Factors

Manufactured Treatment Device Success Factors



Success Factor 2: Drawdown

BMP is not holding water long after rain event



Success Factor 3: Protection

No signs of vehicle, equipment, or pedestrian damage.



Success Factor 4: Cleanliness

No signs of litter, erosion, pollution, or debris in the main treatment area.





3.0 BMP Inspection

Property Owner's Guide to Maintenance: Inspection of Best Management Practices (BMPs)

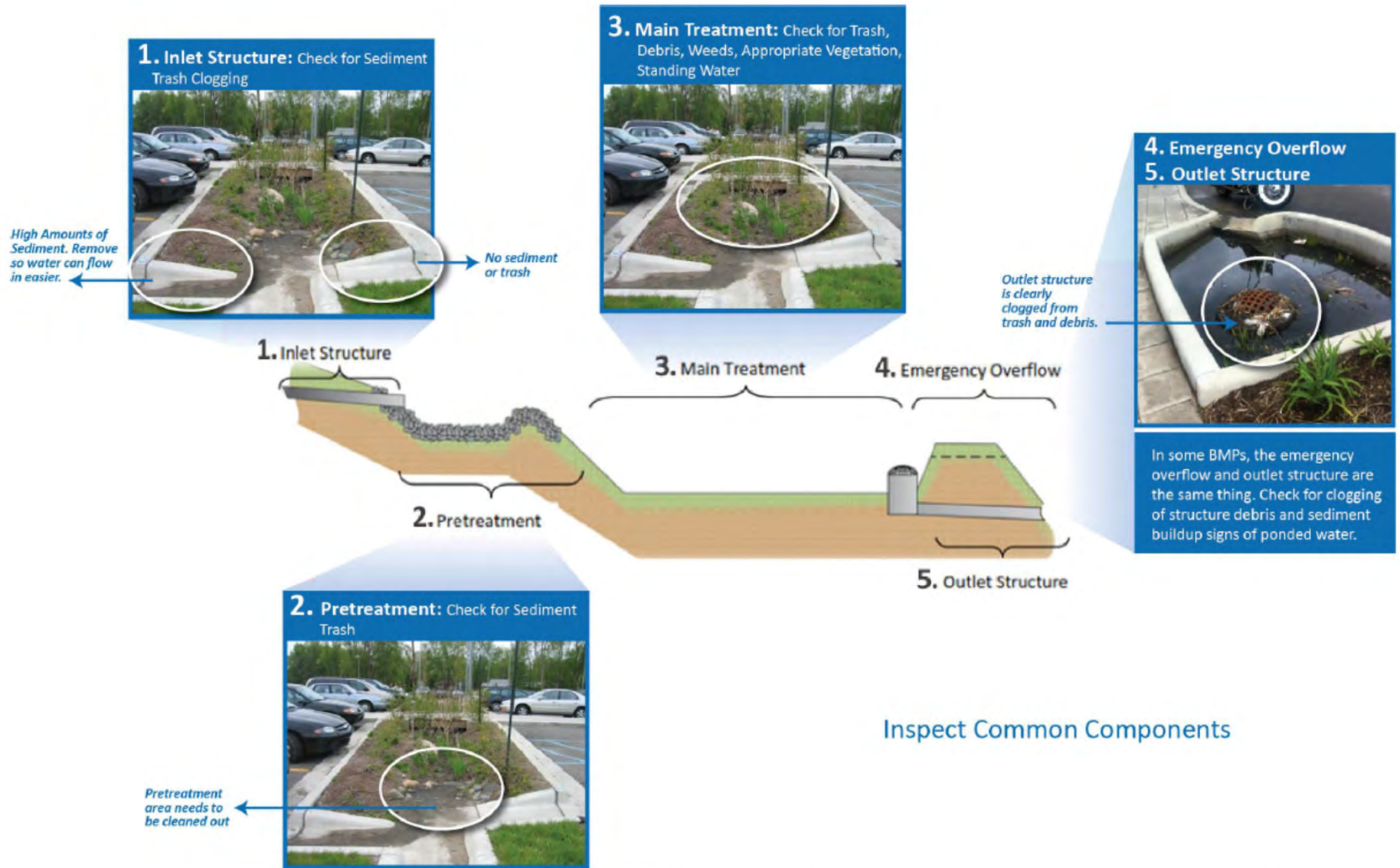
- Why inspect BMPs?
- How do I inspect my BMPs?
- How are Inspections Documented?
- What Happens after the Inspection?

The key to the long-term success of a BMP is routine inspection and maintenance



3.0 BMP Inspection

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Check for the following:

Sediment/debris in main treatment areas and at inlet and outlet structures

Success Factor: Cleanliness



Sediment has accumulated on this inlet grate and needs to be cleaned off.



Sediment has accumulated in the infiltration area and needs to be cleaned out. Clogged media may require replacement

Erosion, settlement, or slope failures

Success Factor: Cleanliness



The slope of this berm has failed and eroded, requiring regrading and replanting



The slope near the outlet has eroded and requires repair

Clogging, as evidenced by frequent standing water for more than 2 or 3 days after storms

Success Factor: Drawdown



The outlet has clogged, which has led to flooding of the BMP and nearby property.



The outlet screen was filled with debris. After removal and cleaning, water can flow again

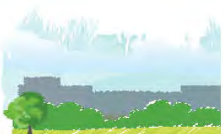


3.0



INSPECTION STEPS

1. Review your record drawing. Know the locations of your BMPs and their inlets, outlets, easements, and access routes
2. Inspect all the BMPs on your property, including all components
3. Assess any drainage issues or debris on your property that might be a result of a failed BMP
4. Complete the City inspection checklist
5. Make a plan for addressing any maintenance items and note follow-up items on the checklist
6. Provide your inspection checklist to the City
7. Maintain copies of your inspection records



4.0 BMP Maintenance

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Property Owner's Guide to Maintenance: Best Management Practice (BMP) Maintenance

- Preparing to Maintain Your BMP?
- Routine Maintenance?
- Maintenance in Response to Problems?
- Use of the Four Success Criteria to Guide Your Maintenance Efforts.
- Common Maintenance Tasks



4.0 BMP Maintenance



Some properties have multiple BMPs, which all require maintenance. This building has cisterns, green roofs, porous pavers, and a small bioretention area.



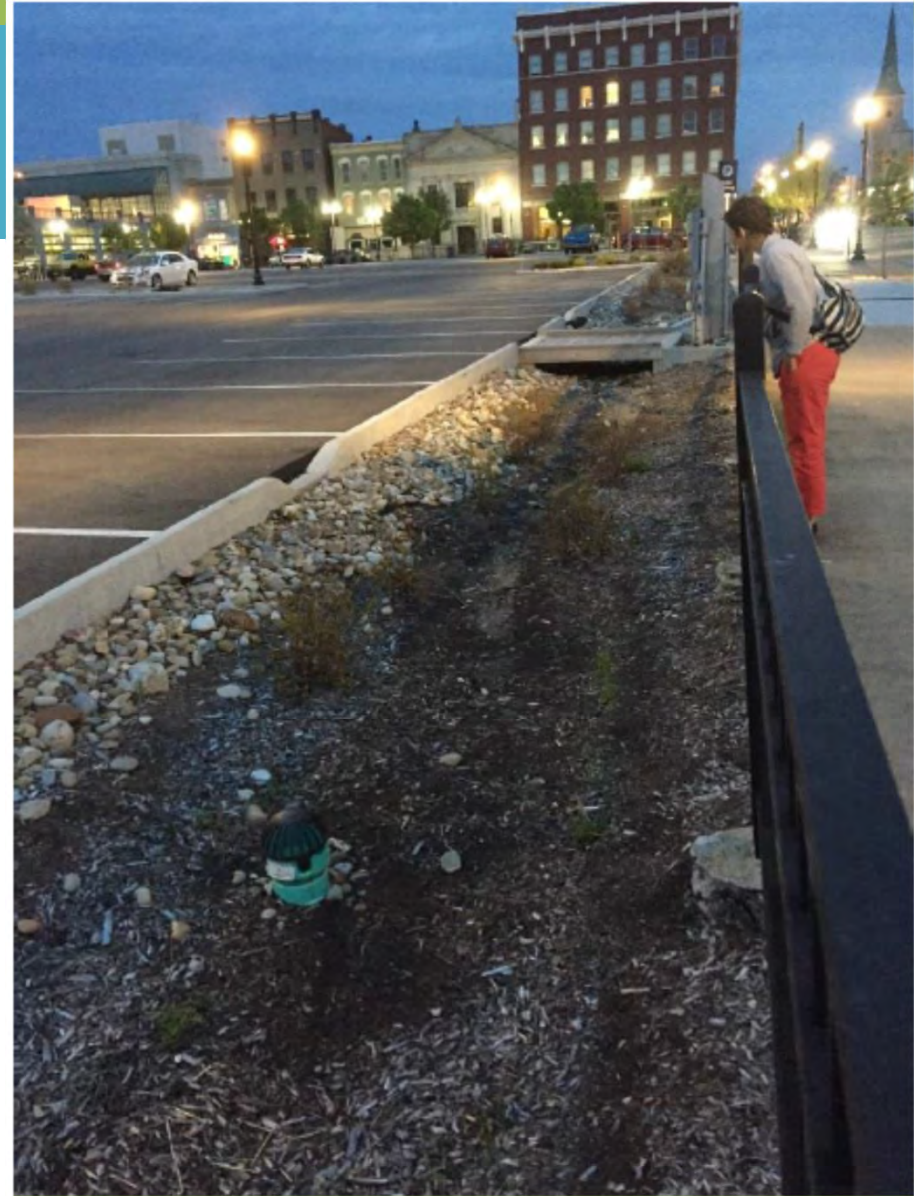
4.0 BMP Maintenance

■ Routine Maintenance

- Trash, debris, leaf, litter and minor sediment removal
- Inlet and outlet cleaning
- Mowing and pruning vegetation
- Erosion prevention and sediment control for bare soil or eroding surfaces
- Repair or replacement of signage

■ Large Maintenance

- Repairs of structural components
- Major sediment removal
- Addressing areas where soil has been compacted by heavy equipment
- Removal or replacement of BMP filters or filter media
- Large scale removal and replacement of dead, damaged or unhealthy vegetation



This bioretention area is being completely replanted as part of a large-scale maintenance effort.



4.0 BMP Maintenance

wood.



Use the four Success Criteria to guide your maintenance efforts

Success Criteria 1: Vegetation



Look for bare soil: this could indicate dead vegetation.

Look for overgrown vegetation: This could indicate weeds or necessitate mowing or pruning.

Fertilizers and pesticides should be avoided within and near BMPs.

Vegetation may need watering, to establish new plants, or if weather is very dry.

If you have questions about what vegetation should be present, the BMP record drawing should show the planting plan, the type of plants, and the location of the plants.

Success Criteria 2: Draindown



Look for ponded water: After a rainfall, storm water should generally recede within 48 hours.

Look for sediment and debris that may be causing clogging or high water levels.

Check observation wells and cleanouts if you suspect problems with drainage are beneath the ground surface.

The BMP record drawing should show the normal pool, or water level, for your BMP.



4.0 BMP Maintenance

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Success Criteria 3: Protection

Look for signs of encroachment, such as compacted soil, pet waste or crushed vegetation.

Look for damage to signage, berms, and other barriers.

The BMP record drawing should show the types and locations of signs and barriers.



Success Criteria 4: Cleanliness

Look for sediment, which needs to be removed periodically and can also indicate erosion nearby.

Look for litter and leaf litter, which can cause clogging of structures and prevent proper draindown times. It needs to be removed.

Look for signs of pollutants, such as leaking vehicles/equipment or stockpiles of salt, soil, etc.

Check for visibly dirty water and oil sheens.

Check observation wells and cleanouts for signs of clogging.



4.0 BMP Maintenance

wood.



Pretreatment is the first layer of protection for the main treatment area. Debris and coarse sediment are removed, which reduces clogging in the main treatment area. The pretreatment area can be cleaned more easily than the main treatment area. It should be free of sediment, trash, and debris. Erosion, scour, and damage should be evaluated.



This pretreatment area has been mowed to an appropriate length and litter has been removed to prevent clogging.




This pretreatment area is full of sediment. Sediment should be removed and the property should be checked for the source of the sediment, such as an eroded area. Larger jobs may require a contractor and/or special equipment.




4.0 BMP Maintenance

wood.



 Extensive erosion can be caused by spillways that are too steep. Check the record drawing for the correct slope. Regrading and slope protection with rock may be required.



 The slope next to this spillway has failed, causing erosion. New vegetation needs to be established. Installation of additional soil, rock outlet protection, or other measures is required.



Vegetation has grown over this outlet, which blocks the flow of water. The plants should be trimmed back to allow water drain from the BMP.



This

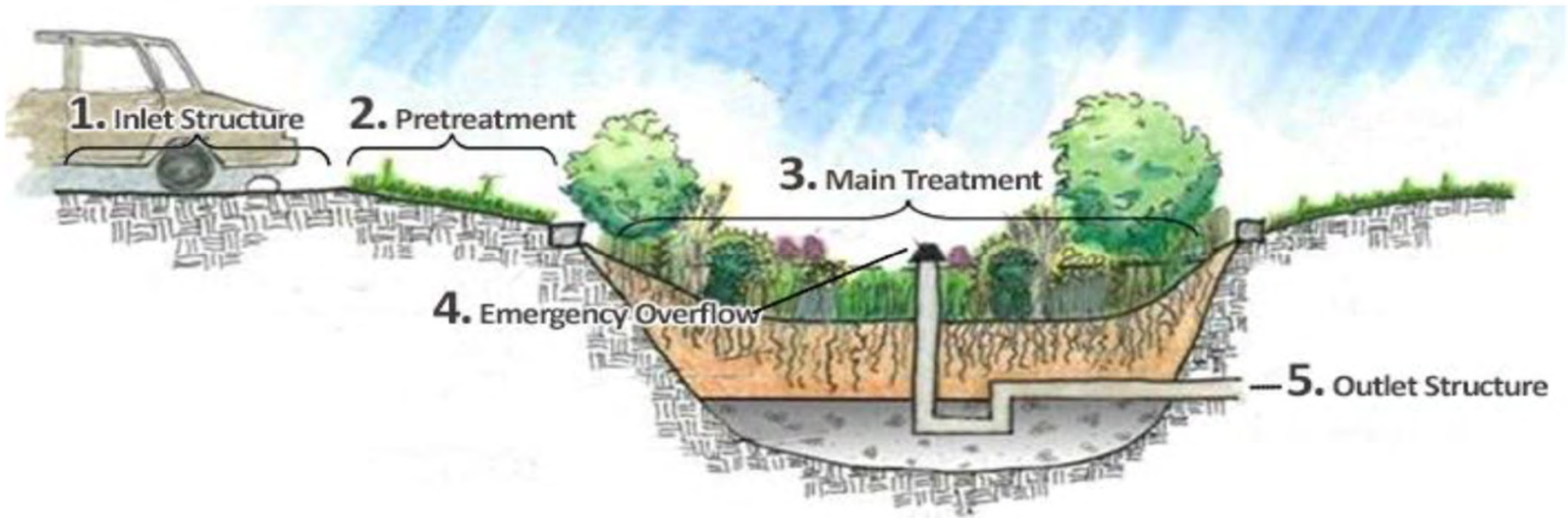
bioretention area has bare soil and dead plants. It will need to be replanted. The planting plan from the record drawing should be checked for the types of plants needed.

5.0 Individual BMP Inspection and Maintenance Requirements?

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■ General Description and Definition



5.0 Individual BMP Inspection and Maintenance Requirements? **wood.**



Vegetation

Activity	Schedule
<ul style="list-style-type: none"> ✓ Check for stressed, dying or dead plants. Treat or replace if necessary. ✓ Check for signs of encroachment (broken or flattened plants). Adjust protective measures if needed. 	<i>As Needed</i>
<ul style="list-style-type: none"> ✓ Remove large stands of weeds or other invasive plant species. 	<i>Monthly</i>
<ul style="list-style-type: none"> ✓ Perform seasonal vegetative maintenance to ensure vegetation coverage and survivability. 	<i>Seasonally</i>

Protection

Activity	Schedule
<ul style="list-style-type: none"> ✓ Inspect for signs of pedestrian, vehicle or heavy equipment damage. ✓ Inspect for compacted soil, pet waste or crushed vegetation. 	<i>As Needed</i>
<ul style="list-style-type: none"> ✓ Inspect for areas of bare soil. Cover, vegetate or repair immediately. 	<i>Monthly</i>
<ul style="list-style-type: none"> ✓ Inspect protective measures. Repair fencing, signage, pathways and other measures quickly. 	



Drawdown

Activity	Schedule
<ul style="list-style-type: none"> ✓ Take notice if water regularly ponds in the area for more than 3 to 4 days after a rainfall. Consult the City of Birmingham. 	<i>As Needed</i>
<ul style="list-style-type: none"> ✓ Clear litter, debris, leaves and sediment from inlets, outlets and overflow areas. 	
<ul style="list-style-type: none"> ✓ Inspect underdrain cleanout for sediment buildup. 	<i>Monthly</i>

Cleanliness

Activity	Schedule
<ul style="list-style-type: none"> ✓ Clear litter, grass clippings, debris, leaves, and repair areas of erosion or bare soil. 	<i>As Needed</i>
<ul style="list-style-type: none"> ✓ Inspect for sources of pollutants (e.g., stored chemicals, stockpiles). Cover or remove immediately. 	



5.0 Individual BMP Inspection and Maintenance Requirements?

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Check the property frequently for bare soil, erosion, litter, plant health and soil compaction.



Remove weeds and invasive plants. Re-stock with healthy vegetation and ensure that basic requirements for plant health are met.



Perform informal inspections and routine maintenance on a regular basis. Make repairs as soon as problems are noticed.



Perform an annual inspection. See the Bioretention Annual Inspection Form at the end of this guidance sheet.



Don't use excessive amounts of salt and sand around the bioretention area in the winter.



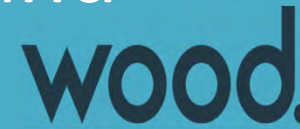
Apply fertilizer, herbicides or pesticides inside the planting area, and use these materials sparingly on your property. Contact a local nursery or landscape professional if your plants aren't thriving.



Don't allow heavy equipment in the bioretention areas, or use it as a storage area, even for landscape materials (e.g., leaves, snow, soil mulch etc).



5.0 Individual BMP Inspection and Maintenance Requirements?



Bioretention Area Inspection Form



Bioretention Name	Note: The bioretention area name will be shown on the BMP location map included with the Platt or Record Drawings for this property. A typical name would be "Bioretention Area 1" or "Bioretention Area A".				Today's Date:
					Date of Last Inspection:
Property Info	Street Address:	City:	State:	Zip:	
Who is Inspecting the Bioretention?	Name (Owner, Tenant, Property Manager or Landscape Company):		Contact Name (If Different):		
	Street Address (If conducted by a company, use company address):		City:	State:	Zip:
	Phone #:		Email:		
Who Owns the Bioretention?	Name (Person(s) or Company):		Contact Name (If Different):		
	Street Address:		City:	State:	Zip:
	Phone #:		Email:		

This Section is for City of Birmingham Use Only	
Identification Number	Has the City Entered and Approved this Inspection? Yes No
Name of Staff Approving This Inspection Report:	Date of Inspection Approval: Yes No
Is a Follow Up Inspection by Staff Required? Circle One:	Reason for Follow Up?

Completed forms can be submitted by mail or email:
 Storm Water Management • Department of Planning, Engineering & Permits
 710 North 20th Street • Birmingham, AL 35203
Email:



5.0 Individual BMP Inspection and Maintenance Requirements?

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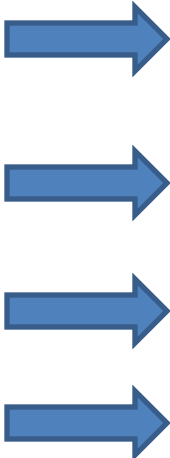
Bioretention Area Inspection Form

All items listed must be inspected unless Not Applicable (NA).

Answering "Yes" indicates a need for maintenance.

Please include an approximate date for repairs for those items that require maintenance.

Inspection Question	Answer			Describe problem(s) and solution(s)
	Y	N	NA	
The Main Treatment Area:				Success Factors: Draindown, Protection and Cleanliness
1. Is trash, sediment, debris, leaves, grass clippings or other similar materials present in the main treatment area? <i>Guidance: Remove unwanted materials and correct any other problems that can cause clogging or otherwise prevent percolation of storm water into the soil.</i>				
2. Are there signs of human encroachment in the main treatment area unrelated to maintenance, such as compacted or displaced mulch, damaged plants, tire tracks, or other? <i>Guidance: Repair or replace protection measures if damaged (e.g., fences, hedges, signs, etc.). Increase protection measures if this is a frequent problem. Rake and refresh mulch and soil layers to loosen compacted areas. If standing water has become a problem, see #4 below.</i>				
3. Is there evidence of soil erosion or are there patches of exposed soil? <i>Guidance: Repair the erosion or bare soil areas with vegetation and/or mulch. Identify the cause of erosion and take steps to prevent future occurrences.</i>				
4. Are there signs of soil clogging or underdrain blockage? Signs include frequent standing water, a hard packed planting layer, etc. <i>Guidance: If the underdrain is clogged, contact the City of Birmingham. If the soil is compacted, the entire planting layer may need repair to restore percolation.</i>				
The Main Treatment Area: Vegetation (Trees, shrubs and grasses)				Success Factors: Vegetation, Protection and Cleanliness
1. Is vegetation overgrown and in need of weeding, pruning or clipping? <i>Guidance: Remove overgrown vegetation. Do not dispose of clippings and other wastes in the bioretention area.</i>				
2. Do plants or trees (not including weeds) cover less than 75% of the planting area? <i>Guidance: Supplement vegetation as needed to achieve at least 75% planting area coverage. Native species are preferred.</i>				



Completed forms can be submitted by mail or email:
 Storm Water Management • Department of Planning, Engineering & Permits
 710 North 20th Street • Birmingham, AL 35203
Email:



6.0 Additional Resources



NEED HELP WITH YOUR BMP?

- ✓ The City of Birmingham's Storm Water Management Department can answer questions about your BMP or refer you to additional resources.
- ✓ More technical questions may require the assistance of a professional engineer or landscape architect.
- ✓ Landscape firms can help you maintain your BMP's soil and vegetation.
- ✓ Master Gardeners are volunteers with valuable plant knowledge.
- ✓ Native Plant Nurseries can provide plants and information on keeping them healthy.
- ✓ Additional, online resources are also included in this section.



6.0 Additional Resources



Alabama Low Impact Development Handbook

<http://adem.alabama.gov/programs/water/waterforms/LIDHandbook.pdf>

Alabama A&M and Auburn University Extension Water Resources Web Site

<http://www.aces.edu/natural-resources/water-resources/>

Alabama Wildflower Society

<http://www.alwildflowers.org/>

Environmental Protection Agency Stormwater Pollution Website

<https://www.epa.gov/npdes/npdes-stormwater-program>

Georgia Stormwater Management Manual

<https://atlantaregional.org/natural-resources/water/georgia-stormwater-management-manual/>



Website Development and Resource Center

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The screenshot displays a web browser window with several tabs open, including "Management Portal", "Deltek Time & Ex...", "Flood Map Moder...", "assets.lawrenceks...", "wichita.gov", "assets.lawrenceks...", "assets.lawrenceks...", "CNN - Breaking N...", and "City of Atlanta...". The website content is organized into a grid of blue navigation buttons: "BMP Inspection", "BMP Maintenance", "Individual BMPs and Checklist", "Additional Resources", "BMP Annual Checklist Submittal", and "Track My BMP". A large blue banner at the top left of the page reads "Introduction/BMP 101". Below this banner, the text states: "Atlanta City Council's October 2017 adoption of the Green Infrastructure Strategic Action Plan positions Atlanta as a leader in Green Infrastructure for a resilient, sustainable, and equitable future. The Department of Watershed Management's Office of Watershed Protection, charged with protecting water quality and watershed health, has been developing and implementing components of a program over the past two decades to supplement traditional gray stormwater infrastructure systems with innovative green infrastructure solutions that are aesthetically appealing, environmentally friendly, and cost effective." Below the text is a section titled "What is Green Infrastructure" with a sub-heading "Green Infrastructure (GI) is a collection of natural lands, working landscapes, open spaces, street trees, and appropriate construction interventions that conserves and enhances ecosystem services and provides benefits to human populations, including improving air and water quality, mitigating climate extremes, supporting biodiversity, and enhancing public health and well-being. Applied in stormwater management, GI reduces the volume of polluted runoff entering our streams and pipe systems by preserving or mimicking the hydrology of natural systems, while providing added environmental, economic, and social benefits." At the bottom of the text, there is a blue arrow pointing down and the text "Do you have a Green Infrastructure project you would like to see featured on this page? Submit your project". The background of the website is a photograph of a green infrastructure site, showing a rocky stream bed with concrete structures and lush green vegetation. The browser's taskbar at the bottom shows various application icons and the system clock indicating 2:49 PM on 11/6/2018.



NEXT STEPS.....



- **Maintenance Program**
 - Implement outreach on new program
 - Set up a maintenance certification program
 - Develop app for inspection checklist and content
- **Overall Stormwater Program**
 - Develop Stormwater quantity and quality CIP
 - Design/Build Green Infrastructure Pilot Projects
 - Set up off site mitigation program



Follow Up



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