

Storm Water Practice Maintenance

Wisconsin Storm Water Regulations

When is storm water management required?

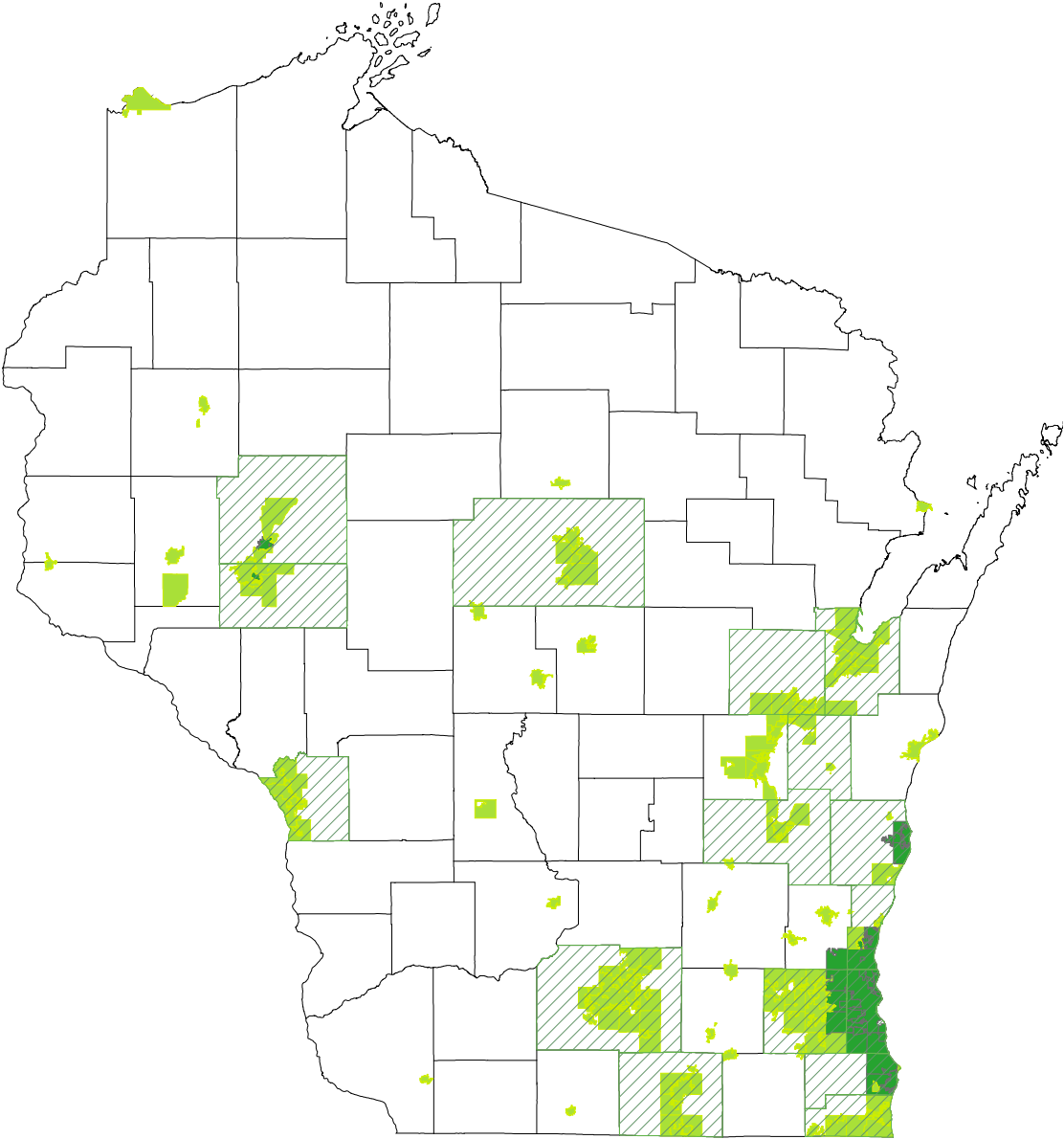
- Construction projects that will disturb 1 acre or more AND will involve construction or re-construction of impervious surfaces (e.g., buildings, parking lots, driveways).

What are the storm water management requirements?

- Provide storm water management practices to reduce pollutants and discharge rates.
- Inspect and maintain these practices on a routine basis per agreement with the local municipality.



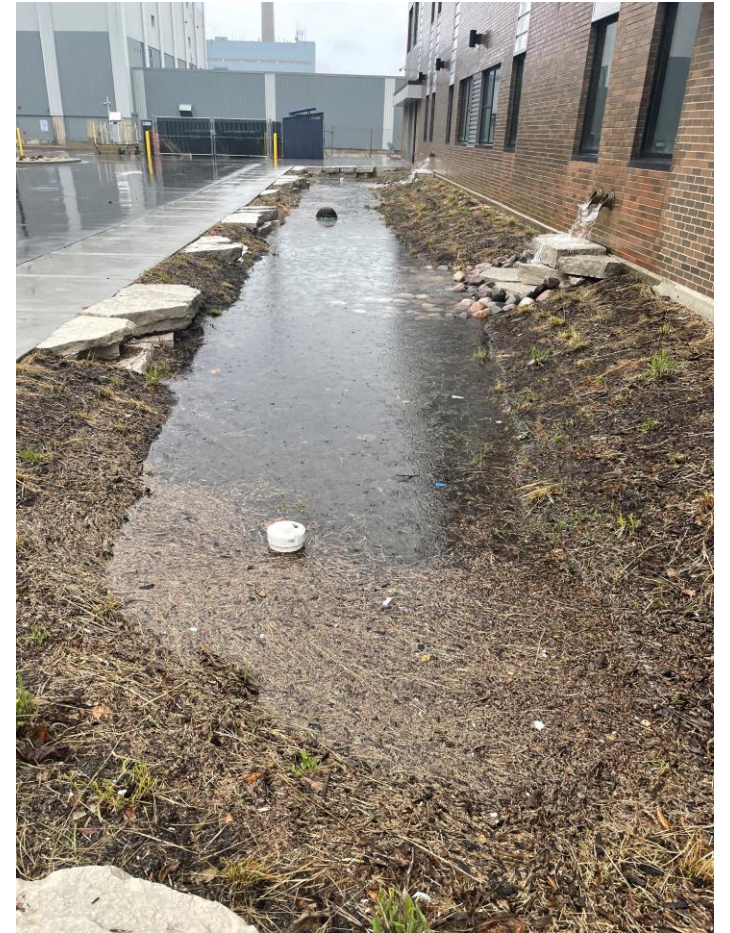
Municipal Storm Water Permit Areas



Ponds



Bioretention



Inspection & Maintenance Requirements

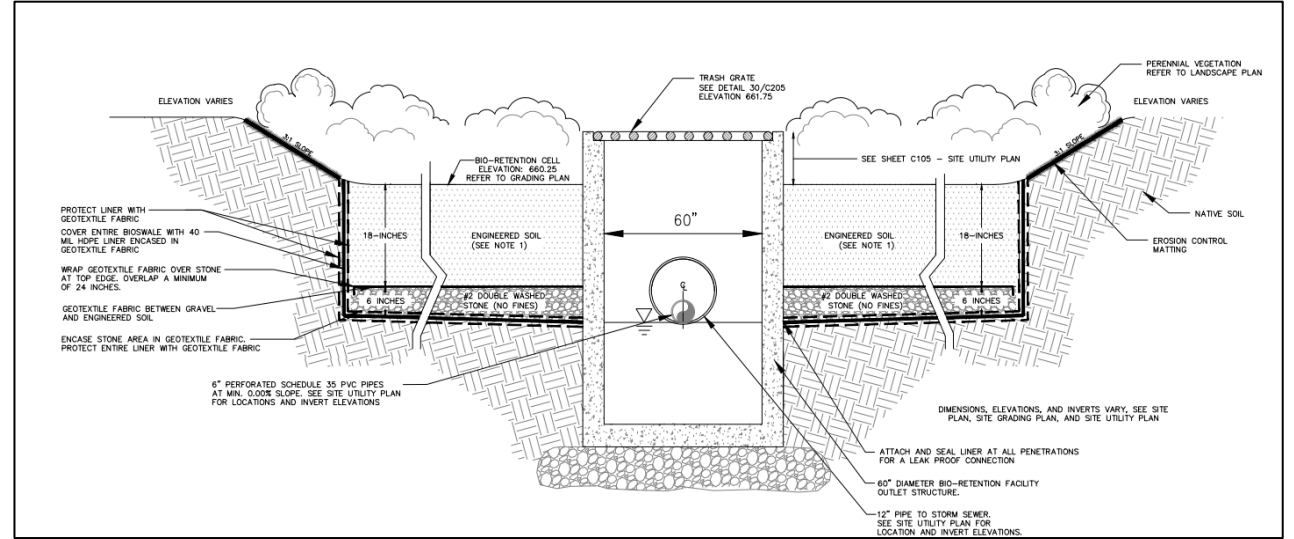
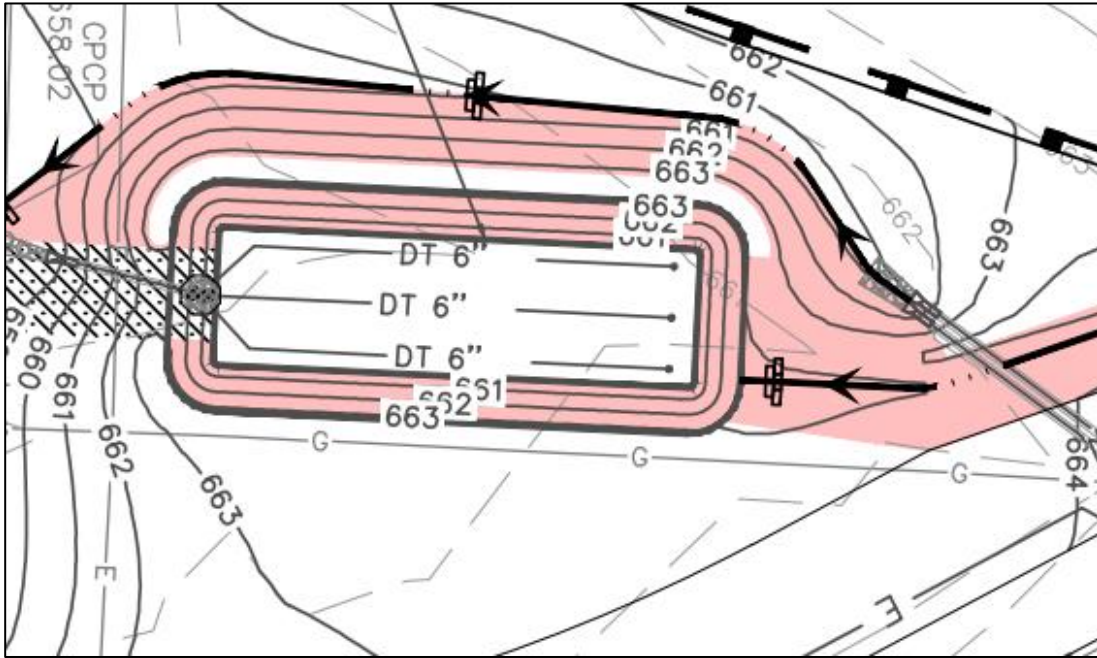
- Conduct annual inspection
 - Signs of erosion
 - Inlet/outlet clogging
 - Vegetation health
 - Accumulation of sediment or clogging
- Schedule and Conduct required maintenance
- Keep records of inspections and maintenance
- Budget for inspection and maintenance

Inspection & Maintenance Plan

Minimum Maintenance Requirements:

To ensure the proper long-term function of the stormwater management practices described above, the following activities must be completed:

1. All outlet pipes must be checked monthly to ensure there is no blockage from floating debris or ice, especially the washed stone in front of the 3-inch orifice and the trash rack on the riser in the main basin. Any blockage must be removed immediately. The washed stone must be replaced when it becomes clogged.
2. Grass swales shall be preserved to allow free flowing of surface runoff in accordance with approved grading plans. No buildings or other structures are allowed in these areas. No grading or filling is allowed that may interrupt flows in any way.
3. Grass swales, inlets and outlets must be checked after heavy rains (minimum of annually) for signs of erosion. Any eroding areas must be repaired immediately to prevent premature sediment build-up in the downstream forebays or basin. Erosion matting is recommended for repairing grassed areas.
4. NO trees are to be planted or allowed to grow on the earthen berms. Tree root systems can reduce soil compaction and cause berm failure. The berms must be inspected annually and any woody vegetation removed.
5. Invasive plant and animal species shall be managed in compliance with Wisconsin Administrative Code Chapter NR 40. This may require eradication of invasive species in some cases.
6. If the permanent pool falls below the safety shelf, a review shall be performed to determine whether the cause is liner leakage or an insufficient water budget. If the cause is leakage, the liner shall be repaired. Leakage due to muskrat burrows may require removal of the animals, repair of the liner with clay, and



Perennials						
CSS	Panicum virgatum 'Cheyenne Sky'	Cheyenne Sky Switchgrass	68	Per Plan	1 gal.	24-36"/12-18"
BIOMIX 1	Aster ericoides	Heath Aster	90	18" o.c.	3" plug	
BIOMIX 1	Aster novae-angliae	New England Aster	90	18" o.c.	3" plug	
BIOMIX 1	Baptisia leucantha	Wild White Indigo	90	18" o.c.	3" plug	
BIOMIX 1	Eupatorium maculatum	Spotted Joe Pye Weed	90	18" o.c.	3" plug	
BIOMIX 1	Liatris spicata	Marsh Blazing Star	90	18" o.c.	3" plug	
BIOMIX 1	Monarda fistulosa	Wild Bergamot	90	18" o.c.	3" plug	
BIOMIX 1	Ratibida hirta	Black-eyed Susan	90	18" o.c.	3" plug	
BIOMIX 1	Solidago rugosa 'Fireworks'	Fireworks Goldenrod	90	18" o.c.	3" plug	
BIOMIX 1	Tradescanta ohiensis	Spiderwort	90	18" o.c.	3" plug	
BIOMIX 1	Ratibida pinnata	Yellow Coneflower	90	18" o.c.	3" plug	
BIOMIX 1	Carex bebbi	Bebb's Sedge	210	18" o.c.	3" plug	
BIOMIX 1	Bromus ciliatus	Fringed Brome Grass	90	18" o.c.	3" plug	
BIOMIX 1	Panicum virgatum	Switch Grass	90	18" o.c.	3" plug	
BIOMIX 1	Elymus canadensis	Canada Wild Rye	90	18" o.c.	3" plug	
BIOMIX 1	Elymus virginicus	Virginia Wild Rye	90	18" o.c.	3" plug	
BIOMIX 1	Carex stipata	Common Fox Sedge	210	18" o.c.	3" plug	

Inspection & Maintenance Report

Attachment A: Wet Detention Basin BMP Inspection Report Waukesha County, Wisconsin

Project Name: _____ Inspection Date: _____

BMP Description: _____ BMP ID Number: _____

Code Key:

N/A = Not Applicable M = Monitor (potential for future problem) NP = Not a Problem WN = Work Needed

INFLOW POINTS

Assessment	Code	Comments
Obstruction: vegetation/debris/sediment		
Erosion/undercutting		
Displacement of fabric/rip rap		
Pipe Condition		
Other (describe)		

FOREBAY

Assessment	Code	Comments
Sediment depth (ft. below principal outlet)		
Side slope erosion		
Invasive vegetation		
Safety shelf		
Other (describe)		

MAIN POOL

Assessment	Code	Comments
Visible pollution/water quality		
Sediment depth (ft. below principal outlet)		
Vegetation height/type		
Bare soil/erosion		
Invasive vegetation (estimate a %)		
Weeds/algae cover (estimate a %)		
Permanent pool elevation		
Pond liner		
Safety shelf		
Other (describe)		

EMBANKMENT

Assessment	Code	Comments
Erosion and/or loss of dam material		
Shrubs/trees present		
Animal burrows		
Soft spots or settlement		
Emergency spillway		
Other (describe)		

OUTLET DEVICE

Assessment	Code	Comments
Obstruction: vegetation/debris/sediment		
Erosion/undercutting		
Joint failure/loss of joint material		
Leaking device		
Outfall riprap/scour prevention		
Other (describe)		

MISCELLANEOUS

Assessment	Code	Comments
Trash/debris		
Access		
Vandalism		
Fence condition (if applicable)		
Fish/wildlife observations		
Signage (if applicable)		
Water balance		
Aerator/fountain		
Sediment disposal site (available?)		
Other (describe)		

PHOTOGRAPHS

Attach color digital photographs of the site and structural BMPs including a caption describing each photo.

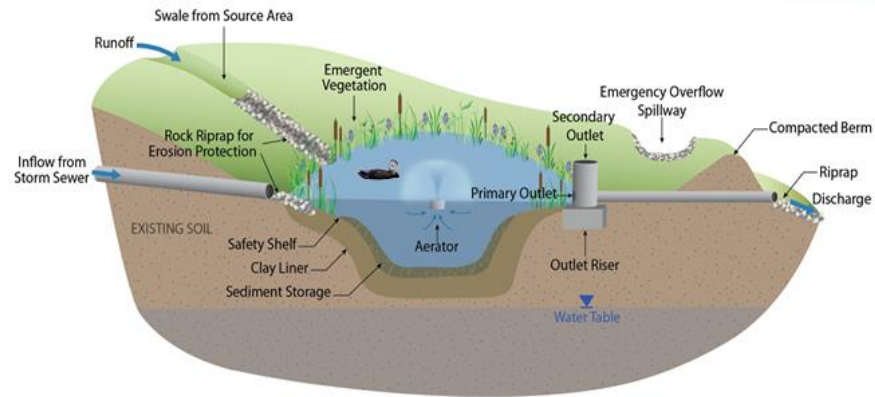
ADDITIONAL COMMENTS

STORMWATER PONDS

Guidelines for Maintenance

A **stormwater pond** is a best management practice (BMP) that collects and holds storm runoff to remove pollutants carried by the water before they enter our rivers and lakes. Water reaches the stormwater pond through a combination of underground pipes, ditches and overland flow. Once the runoff enters the stormwater pond, sediment and other pollutants settle to the bottom. The water that entered as polluted runoff leaves the pond gradually, resulting in cleaner water draining into our lakes and streams and reduced flooding problems downstream.

Stormwater ponds are carefully designed to hold and treat runoff. Over time, the pond fills in with sediments and begins to lose its ability to remove pollutants. A smaller "forebay" may be present, which may fill up with sediment first. Maintenance is needed for the pond to continue to function the way it was designed, to protect our lakes and streams. Maintenance is also required by an agreement on file with the municipality.



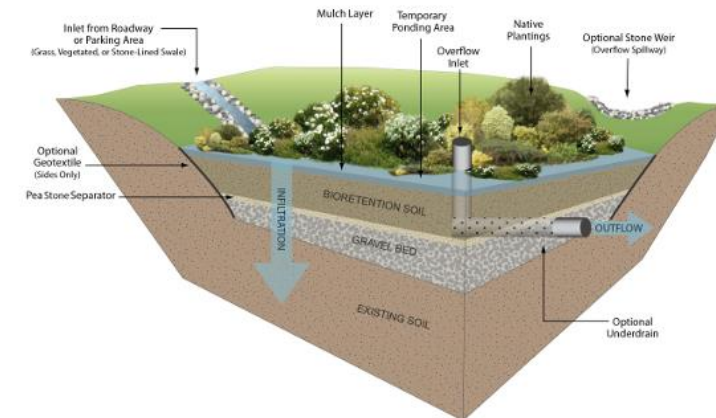
BIORETENTION BASINS

Guidelines for Maintenance

A **bioretention basin** is a storm water best management practice (BMP) that uses an engineered soil mix to reduce water pollution in urban runoff before it enters our lakes and streams. Runoff reaches the basin through a combination of underground pipes, ditches and overland flow. A bioretention basin is carefully designed to capture and treat runoff from small watersheds, usually less than two acres in size. Runoff will generally pond on the surface of the basin up to one foot in depth, but for no more than three days before it infiltrates. An overflow pipe and/or spillway will handle runoff events that exceed the design capacity. A small catch basin may be located near the inflow to trap sediment and other debris before it enters the basin.

In bioretention basins, the existing soil has been replaced with an engineered soil mix containing a high percentage of sand, intended to encourage infiltration and filter pollutants in the runoff. Under the engineered soil layer is a gravel bed that serves to temporarily store runoff, allowing it to infiltrate the underlying native soil. A perforated drainage pipe at the top of the gravel layer allows excess water to flow out of the basin, if necessary.

With this design, bioretention basins are commonly used in areas where the existing soil has a limited ability to absorb runoff. During the growing season, a cover of tall grasses and native wildflowers help make this BMP very effective at reducing water pollution, as illustrated below.



<https://www.waukeshacounty.gov/landandparks/land-and-water-conservation/>

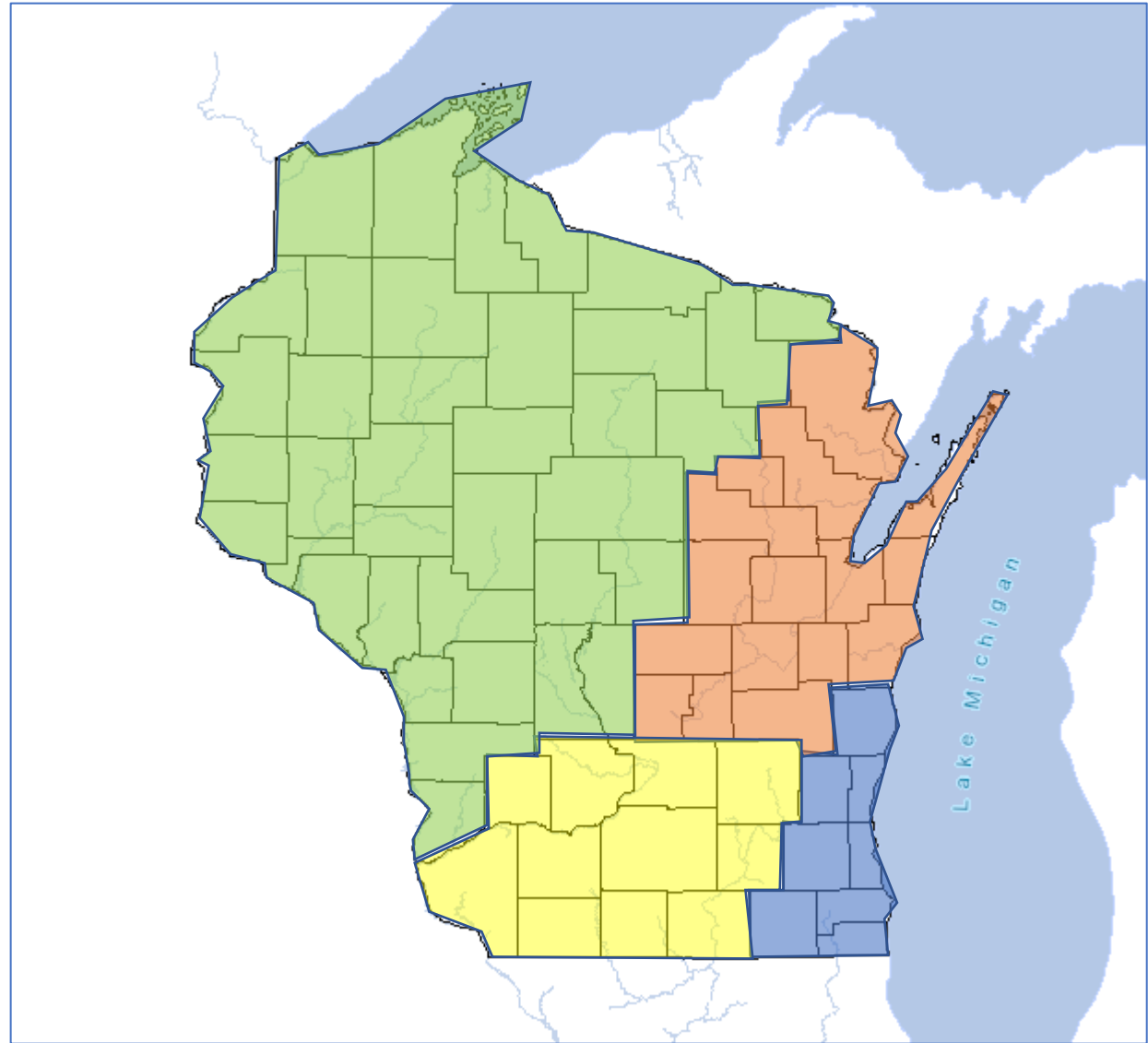
DNR Storm Water Engineers

Teagan Wagner
Ethan McGowan

Chris Linskens

Eric Rortvedt
Dan Bekta

Pete Wood

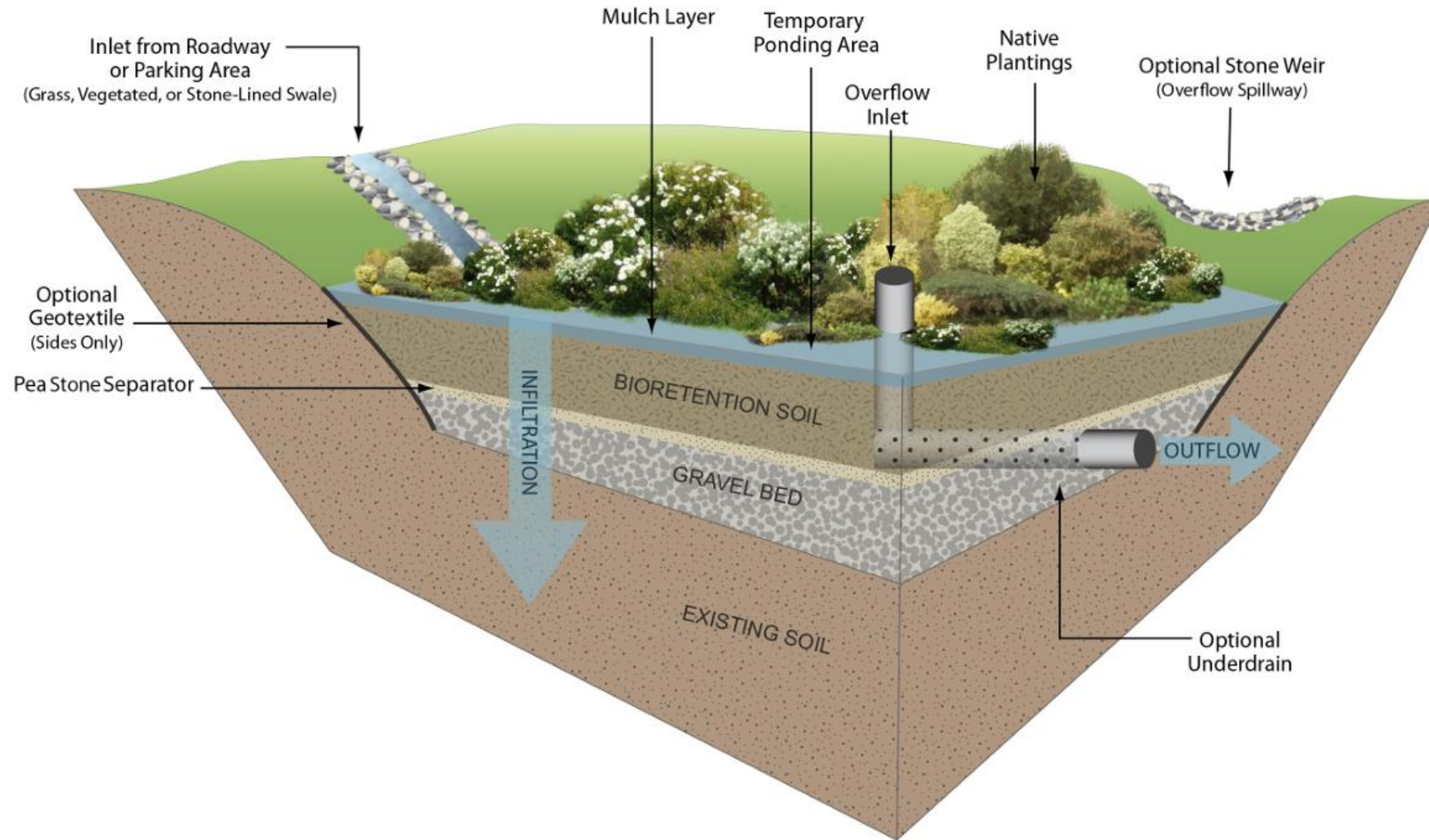


POND INSPECTIONS

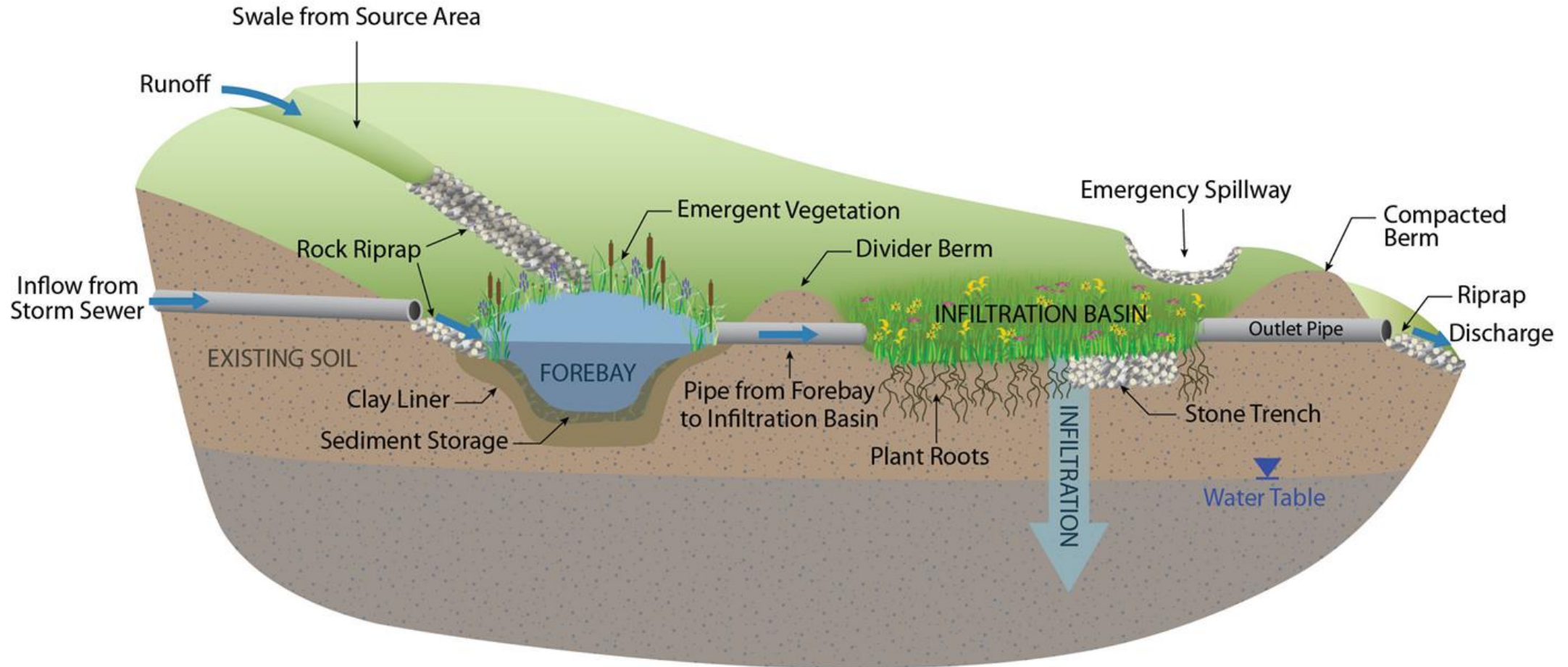
Mark Bruns, CISEC



Bioretention Basin



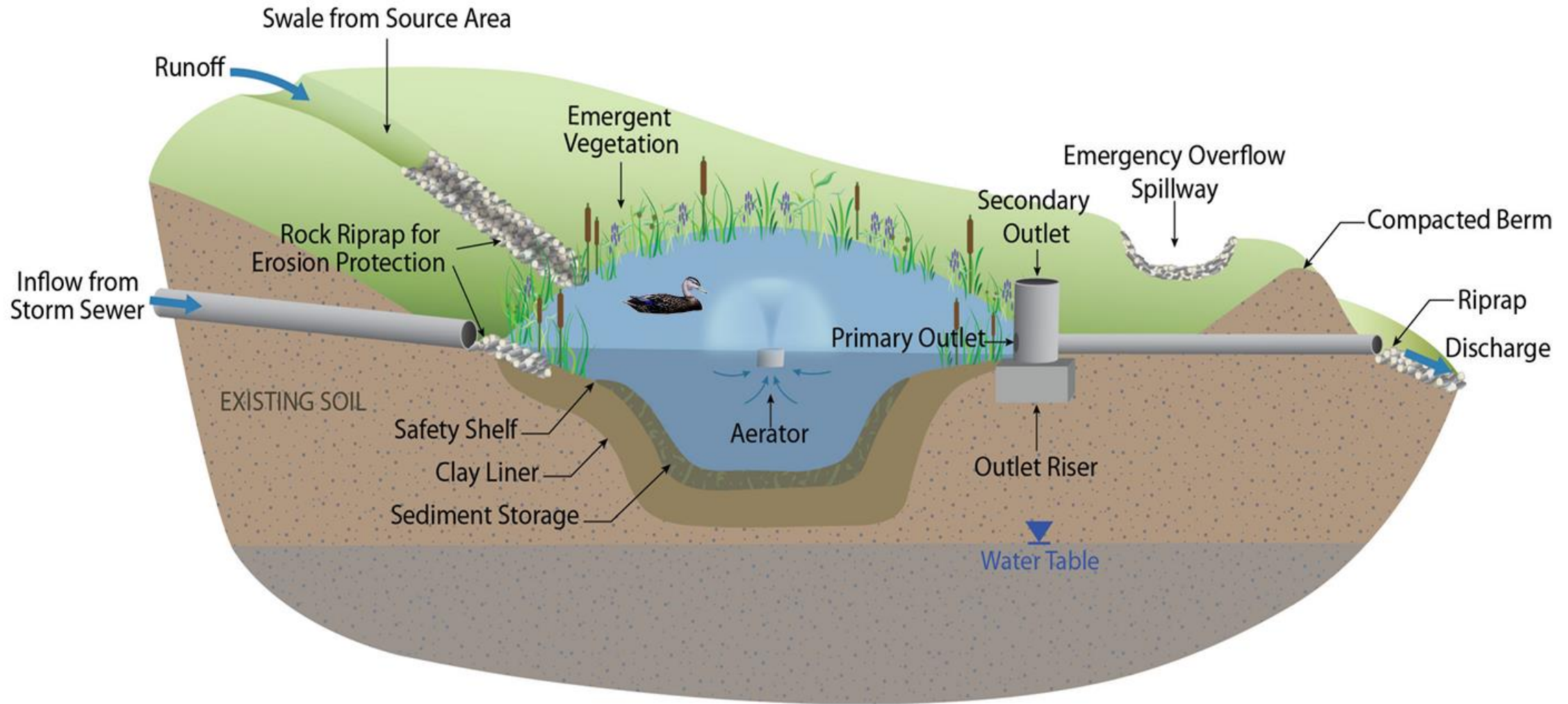
Infiltration Basin



Note: Rain gardens are essentially small infiltration basins. They are designed to capture and infiltrate runoff from small watersheds such as a rooftop, driveway or small parking lot. Some roadside or backyard swales are also designed as small infiltration practices.

NOT TO SCALE

Stormwater Ponds



Standard Form

[Link to Form](#)

Ruekert • Mielke		STORMWATER POND INSPECTION	
Pond Information			
Pond ID:		Pond Type:	
Location:			
Subdivision:		Watershed:	
Capacity:		Acres:	
Overflow Elev:		100 Year Elev:	
Year Constructed:		Date Input:	
Water Quality:		Private:	
Inspection Details			
Inspector Name(s):			
Inspection Date:		Start Time:	End Time:
Weather Condition:			Last Rainfall Date:

- Creates Consistency
- Ensures regulated features are assessed appropriately

Standard Form, Dry Pond

Issue	Checked			Maintenance Needed			Comments
	Y	N	N/A	Y	N	N/A	
Dry Pond							
1. Standing water or wet spots?			N/A			N/A	
2. Sediment or trash accumulation?			N/A			N/A	
3. Low flow channels unobstructed?			N/A			N/A	
4. Other?			N/A			N/A	



■ Cattails Present

Standard Form, Dry Pond

Issue	Checked			Maintenance Needed			Comments
	Y	N	N/A	Y	N	N/A	
Dry Pond							
1. Standing water or wet spots?			N/A			N/A	
2. Sediment or trash accumulation?			N/A			N/A	
3. Low flow channels unobstructed?			N/A			N/A	
4. Other?			N/A			N/A	



- Patchy vegetation can be an indicator of flooding or standing water.

Standard Form, Dry Pond

Issue	Checked			Maintenance Needed			Comments
	Y	N	N/A	Y	N	N/A	
Dry Pond							
1. Standing water or wet spots?	N/A			N/A			
2. Sediment or trash accumulation?	N/A			N/A			
3. Low flow channels unobstructed?	N/A			N/A			
4. Other?	N/A			N/A			



- This dry pond had an unusual looking riser pipe. No grate or trash rack

Standard Form, Wet Pond

Wet Pond			
1. Removal of floating debris required?	N/A	N/A	
2. Visible oil/chemical presence?	N/A	N/A	
3. Evidence of wave action?	N/A	N/A	
4. Safety shelf erosion or failure?	N/A	N/A	
5. Other?	N/A	N/A	

- This outlet structure has obstructions on the top of the overflow and algae and logs around the structure. This along with vegetation can block the structure orifices.



Standard Form, Wet Pond

Wet Pond			
1. Removal of floating debris required?	N/A	N/A	
2. Visible oil/chemical presence?	N/A	N/A	
3. Evidence of wave action?	N/A	N/A	
4. Safety shelf erosion or failure?	N/A	N/A	
5. Other?	N/A	N/A	



- We look for erosion occurring along the bank
- Wave action is occurring

Standard Form, Infiltration Basin

Infiltration Basin			
1. Standing water or wet spots?	Y	Y	
2. Sediment or trash accumulation?	Y	N	
3. Under drain functioning?	N/A	N/A	
4. Other?	N/A	N/A	



Standard Form, Infiltration Basin

Infiltration Basin			
1. Standing water or wet spots?	Y	Y	
2. Sediment or trash accumulation?	Y	N	
3. Under drain functioning?	N/A	N/A	
4. Other?	N/A	N/A	



■ Rocks obstructing inlet pipe

Standard Form, Vegetation – Adequate Cover

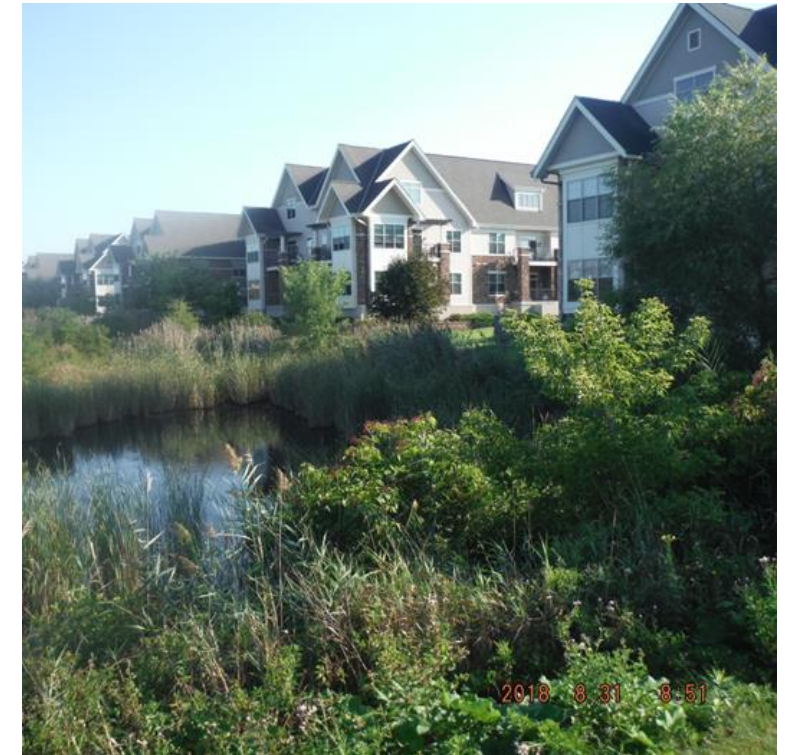
Issue	Checked			Maintenance Needed			Comments
	Y	N	N/A	Y	N	N/A	
Vegetation							
1. Adequate vegetation cover?			N/A			N/A	
2. Appropriate vegetation?			N/A			N/A	
3. Presence of invasive or undesirable vegetation/woody growth?			N/A			N/A	
4. Excessive nuisance aquatic vegetation present?			N/A			N/A	
5. Other?			N/A			N/A	



- Storm inlets tributary to the inlet pipe to the pond
- Is there adequate vegetation or anything unusual or of concern?

Standard Form, Vegetation

Issue	Checked			Maintenance Needed			Comments
	Y	N	N/A	Y	N	N/A	
Vegetation							
1. Adequate vegetation cover?			N/A			N/A	
2. Appropriate vegetation?			N/A			N/A	
3. Presence of invasive or undesirable vegetation/woody growth?			N/A			N/A	
4. Excessive nuisance aquatic vegetation present?			N/A			N/A	
5. Other?			N/A			N/A	



- Heavy vegetation along the pond side slopes makes it difficult to inspect and requires more work to bring it into compliance
- Woody growth at inlet pipe

Standard Form, Sediment Forebays

Sediment Forebays			
1. Is sediment accumulation >50%? If yes, maintenance is needed immediately.	N/A	N/A	
2. Evidence of excessive velocity/ scour?	N/A	N/A	
3. Maintenance access clear of obstructions?	N/A	N/A	
4. Other?	N/A	N/A	



- Sediment Forebay – with erosion at the south inlet flowline

Standard Form, Embankment & Emergency Spillway

Embankment & Emergency Spillway			
1. Is the spillway level?	N/A	N/A	
2. Adequate Freeboard? (min 1' from top of bank to highest outlet)	N/A	N/A	
3. Embankment erosion evident?	N/A	N/A	
4. Cracking, bulging or sliding of embankment?	N/A	N/A	
5. Evidence of animal burrows?	N/A	N/A	
6. Seepage evident on exterior face of embankment?	N/A	N/A	
7. Vertical & horizontal alignment of top of dam as per plans?	N/A	N/A	
8. Emergency spillway clear of obstructions & debris?	N/A	N/A	
9. Maintenance access clear of obstruction?	N/A	N/A	
10. Other?	N/A	N/A	



Standard Form, Embankment & Emergency Spillway

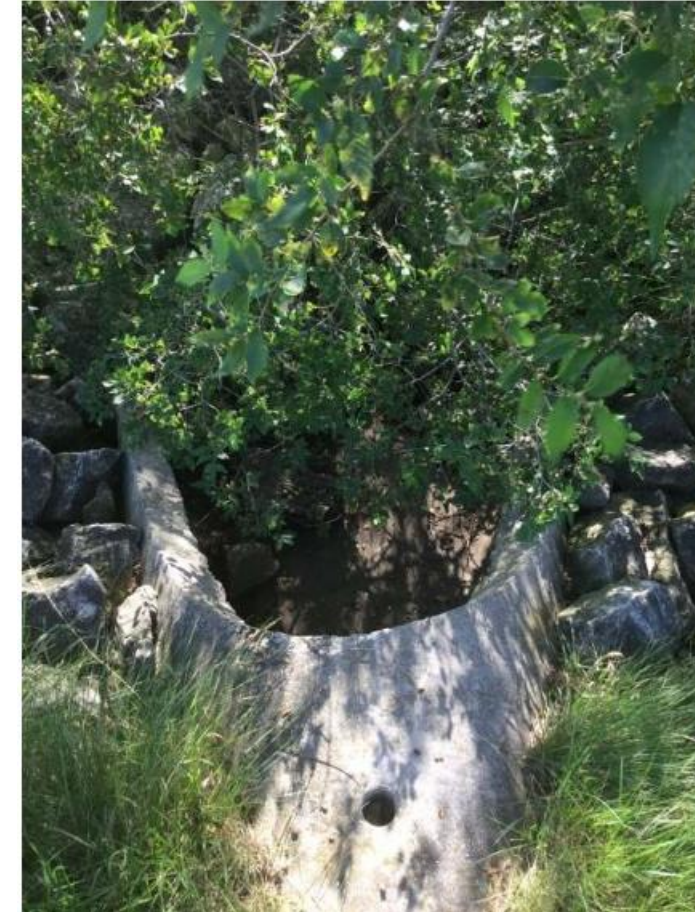
Embankment & Emergency Spillway			
1. Is the spillway level?	N/A	N/A	
2. Adequate Freeboard? (min 1' from top of bank to highest outlet)	N/A	N/A	
3. Embankment erosion evident?	N/A	N/A	
4. Cracking, bulging or sliding of embankment?	N/A	N/A	
5. Evidence of animal burrows?	N/A	N/A	
6. Seepage evident on exterior face of embankment?	N/A	N/A	
7. Vertical & horizontal alignment of top of dam as per plans?	N/A	N/A	
8. Emergency spillway clear of obstructions & debris?	N/A	N/A	
9. Maintenance access clear of obstruction?	N/A	N/A	
10. Other?	N/A	N/A	



- Trees and other woody growth may impede the flow and its root system may affect the integrity of the spillway.

Standard Form, Riser & Outfall Spillway

Riser & Outfall Spillway			
1. Low flow orifice obstructed?	N/A	N/A	
2. Low flow trash rack debris/corrosion?	N/A	N/A	
3. Weir trash rack debris/corrosion?	N/A	N/A	
4. Excessive sediment accumulation inside the riser?	N/A	N/A	
5. Sediment accumulation in outlet pipe?	N/A	N/A	
6. Outfall channels functioning?	N/A	N/A	
7. Under drain functioning?	N/A	N/A	
8. Slope protection or rip-rap failures?	N/A	N/A	
9. Other?	N/A	N/A	



Standard Form, Riser & Outfall Spillway

Riser & Outfall Spillway			
1. Low flow orifice obstructed?	N/A	N/A	
2. Low flow trash rack debris/corrosion?	N/A	N/A	
3. Weir trash rack debris/corrosion?	N/A	N/A	
4. Excessive sediment accumulation inside the riser?	N/A	N/A	
5. Sediment accumulation in outlet pipe?	N/A	N/A	
6. Outfall channels functioning?	N/A	N/A	
7. Under drain functioning?	N/A	N/A	
8. Slope protection or rip-rap failures?	N/A	N/A	
9. Other?	N/A	N/A	



- We look for overall pipe and structure conditions

Standard Form, Riser & Outfall Spillway

Riser & Outfall Spillway			
1. Low flow orifice obstructed?	N/A	N/A	
2. Low flow trash rack debris/corrosion?	N/A	N/A	
3. Weir trash rack debris/corrosion?	N/A	N/A	
4. Excessive sediment accumulation inside the riser?	N/A	N/A	
5. Sediment accumulation in outlet pipe?	N/A	N/A	
6. Outfall channels functioning?	N/A	N/A	
7. Under drain functioning?	N/A	N/A	
8. Slope protection or rip-rap failures?	N/A	N/A	
9. Other?	N/A	N/A	



- Erosion along and downstream of riprap at inlet swale

Standard Form, Other

Other			
1. Encroachments on pond or easement area?	N/A	N/A	
2. Complaints from residents?	N/A	N/A	
3. Odor?	N/A	N/A	
4. Mowing required?	N/A	N/A	
5. Graffiti removal needed?	N/A	N/A	
6. Insects in excess?	N/A	N/A	
7. Public hazards?	N/A	N/A	
8. Other?	N/A	N/A	



- 8-10 ft buffer strips can help deter waterfowl

Standard Form, Other

Other			
1. Encroachments on pond or easement area?	N/A	N/A	
2. Complaints from residents?	N/A	N/A	
3. Odor?	N/A	N/A	
4. Mowing required?	N/A	N/A	
5. Graffiti removal needed?	N/A	N/A	
6. Insects in excess?	N/A	N/A	
7. Public hazards?	N/A	N/A	
8. Other?	N/A	N/A	



- Sediment and heavy vegetation at and in the inlet pipe to the pond

Standard Form, Other

Other			
1. Encroachments on pond or easement area?	N/A	N/A	
2. Complaints from residents?	N/A	N/A	
3. Odor?	N/A	N/A	
4. Mowing required?	N/A	N/A	
5. Graffiti removal needed?	N/A	N/A	
6. Insects in excess?	N/A	N/A	
7. Public hazards?	N/A	N/A	
8. Other?	N/A	N/A	



Severe issues through out



Same pond

Standard Form, Other



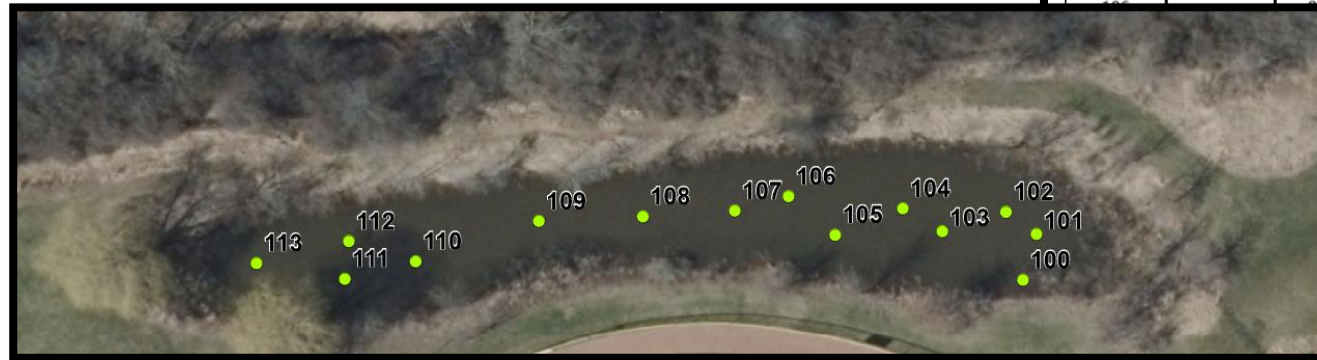
- Excessive algae is present



- No apparent issues with water clarity or algae

Siltation Depth Survey

Pond Siltation Depth Survey Elevations - (Eisenhower - Device #1)						
Survey Shots	Water Surface Elevation	Top of Silt Elevation	Bottom of Silt Elevation	Thickness of Silt Layer (Ft)	Distance from Water Surface to Top of Silt (Ft)	Distance from Water Surface to Bottom of Silt (Ft)
100	870.51	-----	-----	-----	-----	-----
101		868.41	867.81	0.6	2.1	2.7
102		866.81	865.01	1.8	3.7	5.5
103		866.01	864.61	1.4	4.5	5.9
104		865.91	864.41	1.5	4.6	6.1
105		866.51	864.91	1.6	4.0	5.6
106		866.71	866.21	0.5	3.8	4.3
107		864.61	864.61	1.7	4.2	5.9
108		865.31	865.31	1.2	4.0	5.2
109		865.21	865.21	1.2	4.1	5.3
110		863.61	863.61	2.2	4.7	6.9
111		865.21	865.21	1.0	4.3	5.3
112		866.51	865.51	1.0	4.0	5.0
113		867.01	866.31	0.7	3.5	4.2



Summary Report with Recommendations

Wet Pond (Eisenhower High School – Device #1) is a wet pond that functions as a water quality and water quantity device. At the time of inspection, this device did appear to be functioning properly. Although, there were some items documented as part of the inspection that should be considered for maintenance to keep the device functioning properly in the future.

- **The pond embankment** has thick vegetation (not all desirable), small trees and brush further up on the embankment above the typical high-water elevation. Consider removing growth in accordance with the maintenance agreement and mowing the remainder of the embankment in accordance with the maintenance agreement at a height of 5 to 8 inches.
- **The outlet pipe** should have vegetation removed from around it. There is also some erosion occurring at the end of the outlet pipe. Repair erosion and place rip-rap to help dissipate velocity and prevent additional erosion in the future.
- **The water surface** has some very minor algae. The report recommends removal of algae once that

Eisenhower - Device #1 - Overflow area north of the wet pond.



Eisenhower - Device #1 - Facing east across the device. Algae is present.

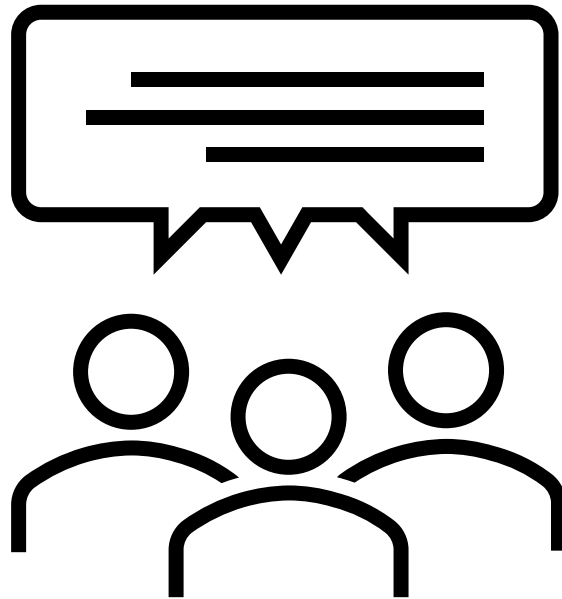


Pond Information							
Pond ID:	Eisenhower - Device #1	Pond Type:	Wet Pond				
Location:	New Berlin Eisenhower - 4333 S. Sunny Slope Road, New Berlin						
Subdivision:	N/A	Watershed:	Unknown				
Capacity:	Unknown	Acres:	Unknown				
Overflow Elev:	Unknown	100 Year Elev:	Unknown				
Year Constructed:	Unknown	Date Input:	Unknown				
Water Quality:	Yes	Private:	No				
Inspection Details							
Inspector Name(s):	Mark Bruns and Elizabeth Brown						
Inspection Date:	08/13/2019	Start Time:	2:40 PM				
		End Time:	3:10 PM				
Weather Condition:	Cloudy, 75 Degrees		Last Rainfall Date:				
			08/11/19 0.16 Inches				
Issue	Checked			Maintenance Needed			Comments
	Y	N	N/A	Y	N	N/A	

Anticipated Inspection - LOE

- Inspections: 2-3 hours per device for 1 person
 - Travel time is additional and varies per location
- Sediment Surveys: 2 hours per device for 2 surveyors with a boat
 - Travel time is additional and varies per location
- Summary report with compilation of findings and recommendations.
 - Device Inspection and Summary Report: ~\$2000
 - Sediment Survey and Summary Report: ~\$2,500

Questions?



Ruekert & Mielke, Inc.

Visit Booth #14 - Near Entrance to Exhibitor Hall!



WASBO Raffle



Proactive Pavement Putt-Putt

