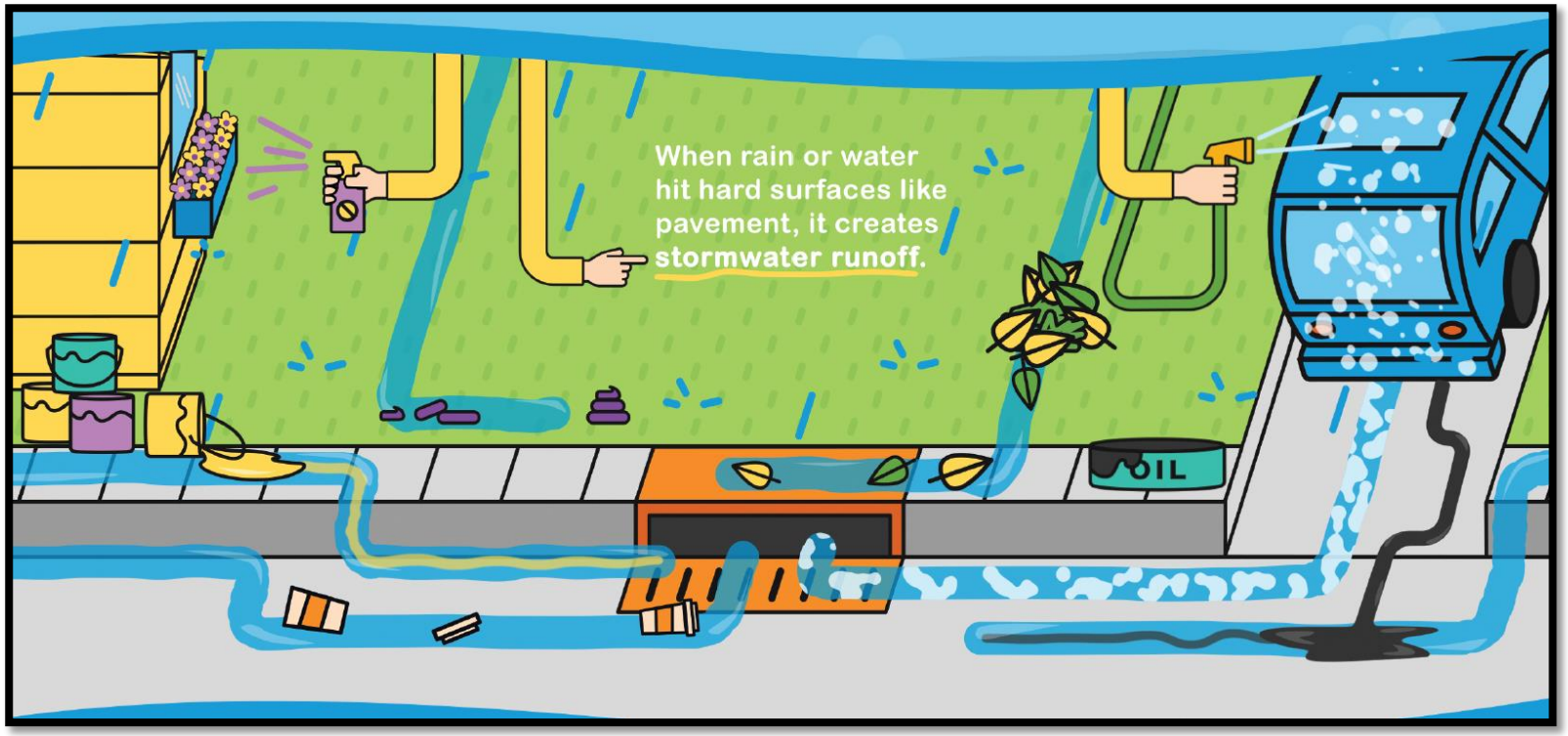
Stormwater Control in Your Community

Inspection & Maintenance Requirements

What is Stormwater?



Stormwater is the water that runs off hard surfaces when it rains or snow melts. Driveways, sidewalks, and other hard surfaces collect pollutants like pesticides, household waste, pet waste, trash and motor oil. It also picks up soil and organic material as it flows from hard surfaces and erodes less stable surfaces. When it rains, this untreated, polluted water flows directly into our streams and lakes where they destroy habitat and contaminate our drinking water.

Stormwater Control Measures Functions

Stormwater Quality

- Suspended solids/sediment
- Nutrients
- Heavy metals, oils/greases

Stormwater Quantity

- Flood control
- Groundwater recharge

Stormwater Control Measures: It's the Law

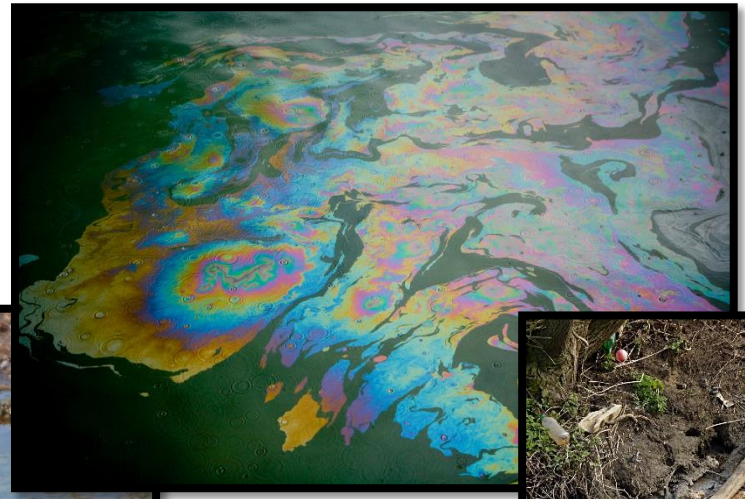
National Pollution Discharge Elimination System (NPDES) Program

NC Department of Environmental Quality

Chatham County Watershed Protection Department

Stormwater Control Measures Must be Inspected and Maintained

If proper maintenance is not provided, adverse environmental impacts such as the discharge of pollutants into ground and surface waters may occur.



Stormwater Inspection Requirements

In accordance with the Chatham County Stormwater Ordinance:

In the first year, quarterly reports shall be submitted to ensure the BMP(s) are functioning properly. Thereafter, unless otherwise directed by the Stormwater Administrator or required by the operation and maintenance agreement, annual inspection reports shall be submitted within thirty days of the date on the as-built certification.

Inspections must be completed by one of the following:

- **NC Professional Engineer**
- **Registered Landscape Architect**
- **Certified by NCSU for Stormwater Inspection & Maintenance**

This is a LEGAL REQUIREMENT on a federal, state and county level.

NC STATE UNIVERSITY Bio&Ag ENGINEERING

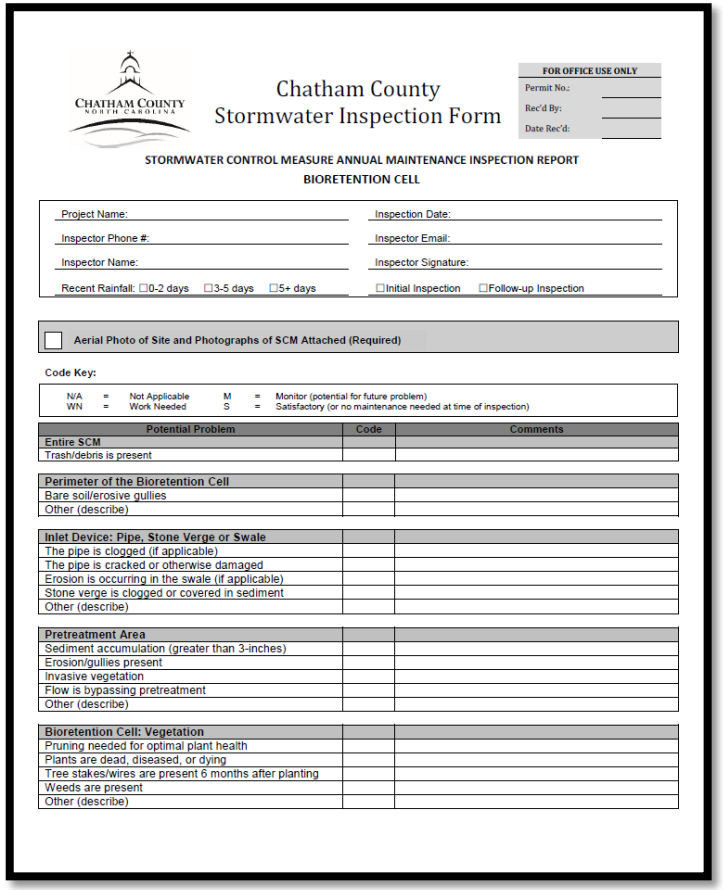
Certification Workshop Registration:
https://www.bae.ncsu.edu/workshops-conferences/

Stormwater Inspection Reports

Inspection Reports are available on the Chatham County Watershed Protection Department Website. A different form may be used as long as the necessary information is included, at a minimum:

The inspection report should contain the following:

- **The name and address of the land owner.**
- **The recorded book and page number of the lot of each structural SCM.**
- **A statement that an inspection was made of all structural SCMs.**
- **The date the inspection was made.**
- **A statement that all inspected structural SCMs are performing properly and are in compliance with the terms and conditions of the approved maintenance agreement required by this ordinance.**
- **Signature and seal of a registered engineer, landscape architect, or person certified by Certified by NCSU for Stormwater Inspection & Maintenance.**



Chatham County
Stormwater Inspection Form

FOR OFFICE USE ONLY
Permit No.:
Rec'd By:
Date Rec'd:

STORMWATER CONTROL MEASURE ANNUAL MAINTENANCE INSPECTION REPORT
BIORETENTION CELL

Project Name: | Inspection Date:
Inspector Phone #: | Inspector Email:
Inspector Name: | Inspector Signature:
Recent Rainfall: ☐0-2 days ☐3-5 days ☐5+ days | ☐Initial Inspection ☐Follow-up Inspection

☐ Aerial Photo of Site and Photographs of SCM Attached (Required)

Code Key:

N/A = Not Applicable; WN = Work Needed; M = Monitor (potential for future problem); S = Satisfactory (or no maintenance needed at time of inspection)

Potential Problem	Code	Comments
Entire SCM		
Trash/debris is present		
Perimeter of the Bioretention Cell		
Bare soil/erosive gullies		
Other (describe)		
Inlet Device: Pipe, Stone Verge or Swale		
The pipe is clogged (if applicable)		
The pipe is cracked or otherwise damaged		
Erosion is occurring in the swale (if applicable)		
Stone verge is clogged or covered in sediment		
Other (describe)		
Pretreatment Area		
Sediment accumulation (greater than 3-inches)		
Erosion/gullies present		
Invasive vegetation		
Flow is bypassing pretreatment		
Other (describe)		
Bioretention Cell: Vegetation		
Pruning needed for optimal plant health		
Plants are dead, diseased, or dying		
Tree stakes/wires are present 6 months after planting		
Weeds are present		
Other (describe)		

https://www.chathamnc.org/government/departments-programs/watershed-protection/stormwater

Site Visit Preparation

Before going into the field, the following list summarizes items that may be needed when conducting SCM inspections.

- **A copy of appropriate inspection report checklist**
- **GPS unit and local maps**
- **Trash bags**
- **A digital camera**
- **A shovel, bush axe, and/or rake**
- **Hand pruners and/or loppers**

Safety Considerations

Common safety concerns when performing SCM inspections:

- **Park in areas that provide safe entrance and exit of work area.**
- **Always wear protective clothing, boots, and safety vests.**
- **Take precautions around standing water; depths are likely unknown.**
- **Be aware of large vertical drops and avoid standing on retaining walls or other structures that present a fall hazard.**
- **If toxic, hazardous or unknown substances are discovered in the area, leave the vicinity and report the findings to the appropriate personnel.**
- **Be aware of loose material (such as riprap), excavation drop-off, tripping hazards, uneven ground, and other obstructions.**
- **Be aware of poisonous plants, insects, and snakes.**

Common Types of SCMs

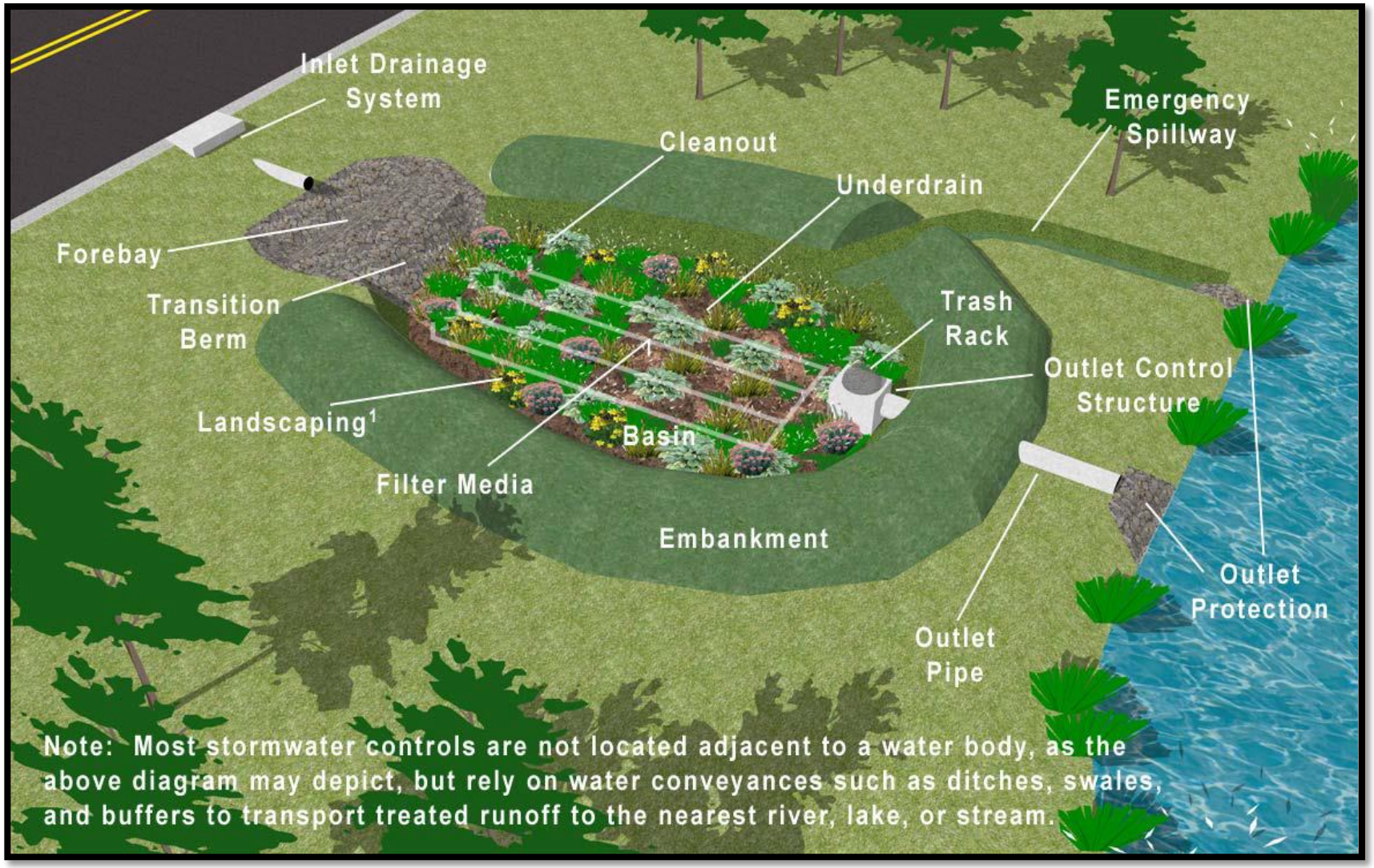
- Bioretention Cell
- Wet Detention Basin
- Dry Detention Basin
- Stormwater Wetland
- Level Spreader

- Grassed Swale
- Infiltration Basin
- Rainwater Harvesting
- Sand Filter
- Proprietary Devices

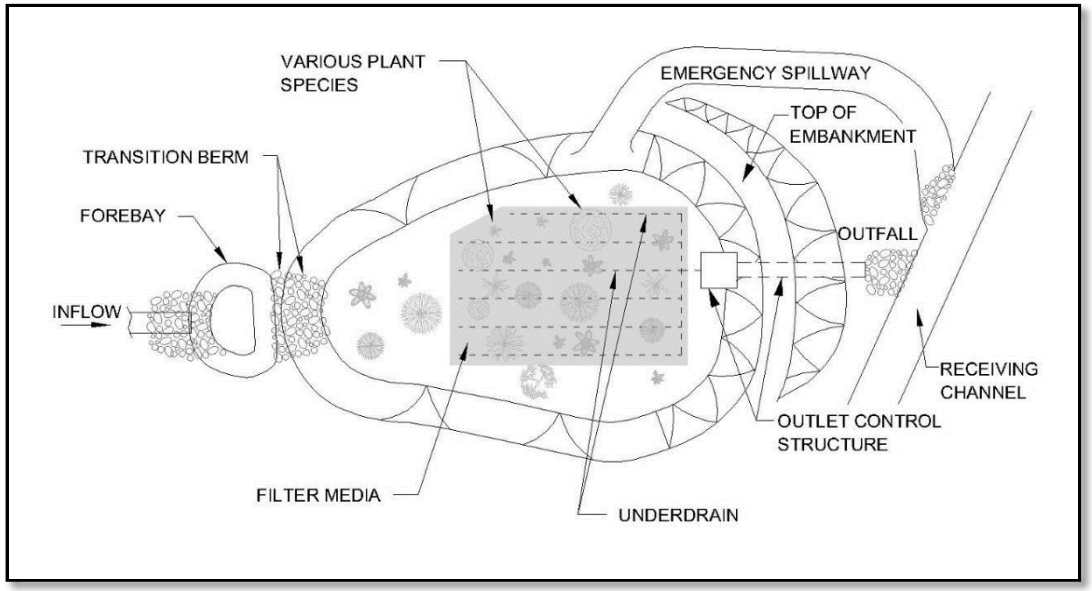
Bioretention Cell

- Catches runoff, allows water to slowly infiltrate in 2-5 days
- Pollutant removal through natural elements like grasses, shrubs, trees, sands and stone
- Filtered water then enters underdrain system and exits the basin

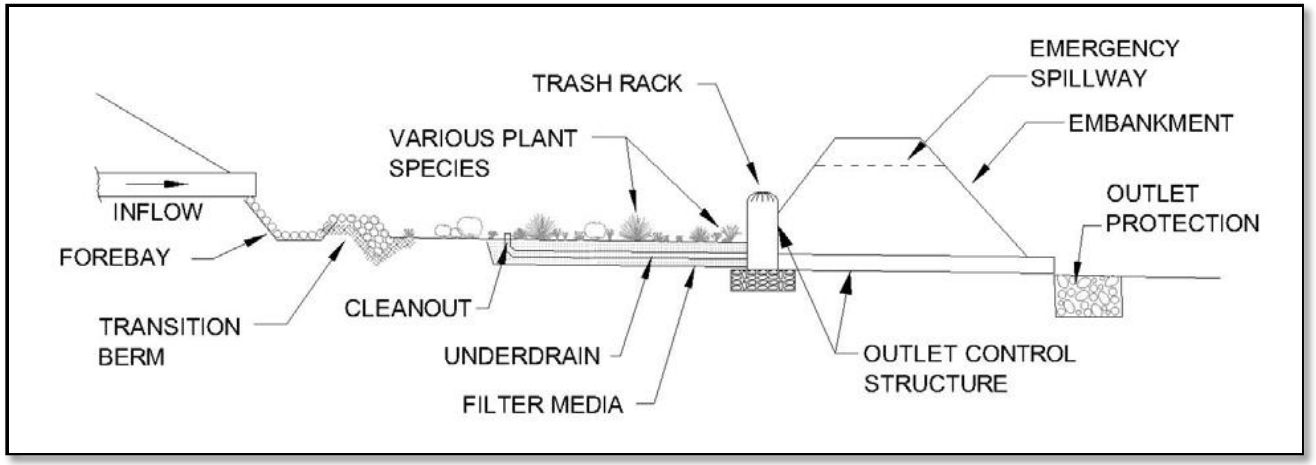
Bioretention Cell



Bioretention Cell



Plan view



Profile view

Bioretention Cell

Inlet Device – How runoff gets to the Bioretention Cell

Consists of ditches, pipes, stone verges or curb & gutter

What to Look For:

- Inspect pipes for cracks or other damage
- Ensure pipes aren't clogged with sediment, debris or trash
- Inspect ditches for erosion/gullies and invasive vegetation
- Inspect stone for sediment buildup

Bioretention Cell

Forebay - Pretreatment Area

Slows down the flow entering the device, allowing sediment to settle

What to Look For:

- Inspect for sediment accumulation > 3 inches
- Inspect for erosion/gullies
- Inspect for trash, debris and invasive vegetation
- Ensure that flow isn't bypassing forebay
- Inspect transition weir (if applicable)

Bioretention Cell

Mulch

Regulates soil conditions, removes heavy metals from runoff, prevents weed establishment and erosion

What to Look For:

- Inspect for mulch thickness of 3 - 4 inches
- Ensure mulch is double shredded hardwood mulch
- Inspect for erosion of mulch and accumulated sediment
- Inspect for trash, debris and invasive vegetation

Needs Maintenance

Bioretention Cell

Vegetation

Improves soil structure, removes metals and nutrients through microbial absorption, prevents erosion

What to Look For:

- Inspect for pruning needs for optimal growth
- Ensure turf grass is maintained 4 – 6 inches
- Inspect for diseased or dead plants
- Ensure that tree stakes/wires are present at least 6 months after planting
- Inspect for trash, debris and invasive vegetation

Pesticides should not be used in Bioretention as they reduce the system's ability to filter metals and nutrients

Bioretention Cell Plants

Purple Cone Flower

Swamp Milk-weed

Daylilies

Rushes & Sedges

Black Eyed Susan

Joe Pye Weed

Bushy Blue Stem

Tickseed

Switch-grass

Boneset

Bioretention Cell

Filter Media

Consists of an engineered mix of washed sand (75%-85%), fine clay and silt (8-10%) and organic matter (5%-10%)

What to Look For:

- **Inspect for water ponding longer than 2 – 5 days, this could indicate clogged media**
- **Inspect for cattails and other wetland plants, indicating ponding water**
- **Soil probe can be used to see profile of soil media**
- **Ensure vehicles are not entering basin and compacting media**

When replacing media, material should be toxicity tested for proper disposal due to metal accumulation

Bioretention Cell

Bioretention Cell

Underdrains

System of filter fabric covered PVC pipe to rain runoff out that has passed through filter media

What to Look For:

- **Inspect for missing or damaged cleanout pipe caps**
- **Inspect visually for sediment or standing water in pipe by removing cap from cleanout**
- **Pour water into cleanouts and observe flow at outlet control structure**
- **Inspect floor of Bioretention for depressions, which may indicate that sediment is entering underdrains**

Bioretention Cell

Outlet Control Structure – Releases stormwater through outlet system during large storm events

What to Look For:

- Inspect for clogging & remove trash and debris
- Ensure trash rack or grate is in place
- Ensure height is 12’ or less above basin bottom
- Remove trash and debris
- Inspect for damage to structure

Bioretention Cell

Receiving Water – Outlet draining downstream

May consist of ditches, pipes, culverts, and other structures

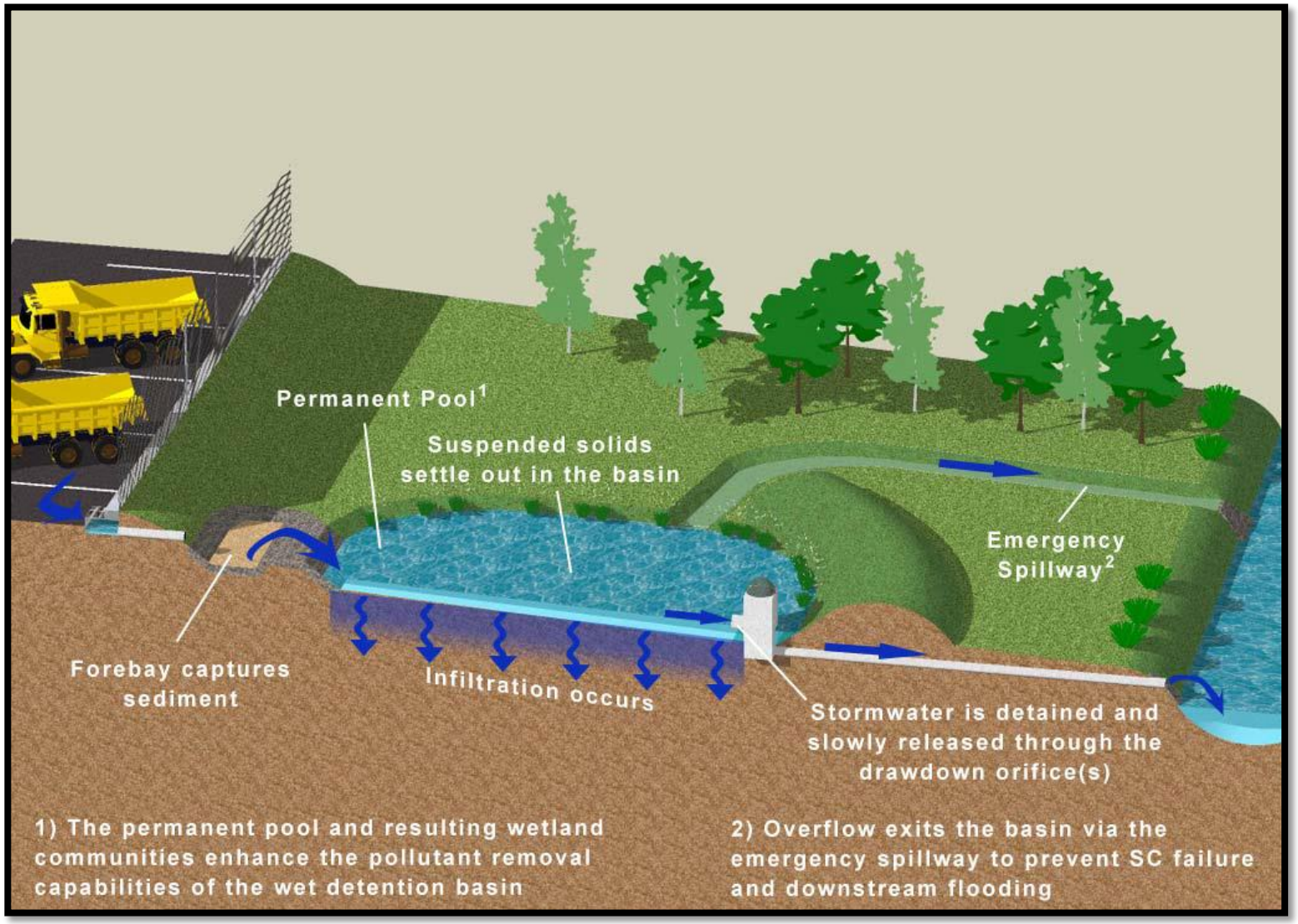
What to Look For:

- Inspect for erosion present at and downstream of basin outlet
- Inspect for adequate outlet protection (riprap)
- Inspect for trash and debris, invasive vegetation and major sediment accumulations

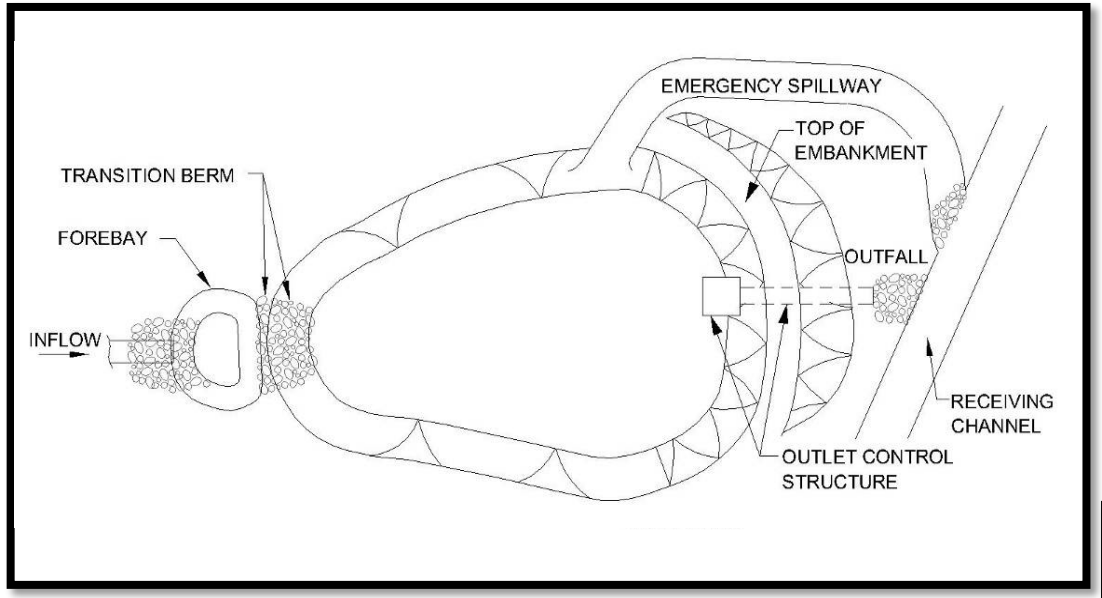
Wet Detention Basin

- Designed to store and slowly release stormwater
- Reduces flooding and erosive velocities
- Improves water quality by allowing contaminants to settle out
- Promotes wetland plants for pollutant reduction
- Landscape feature

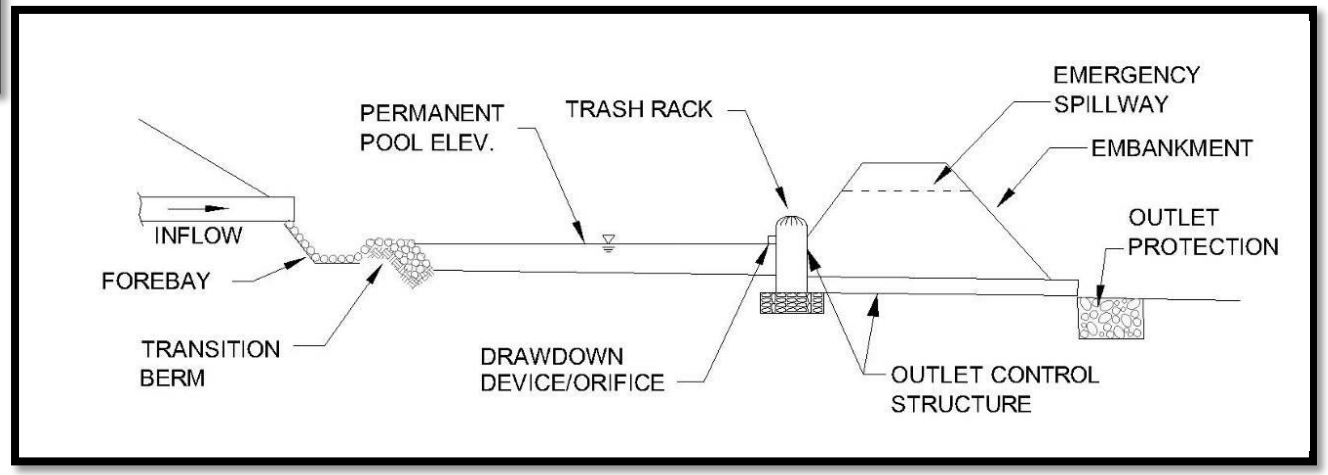
Wet Detention Basin



Wet Detention Basin



Plan view



Profile view

Wet Detention Basin

Inlet System - How runoff gets to the Wet Detention Basin

Consists of ditches, pipes, stone verges or curb & gutter

What to Look For:

- Inspect pipes for cracks or other damage
- Ensure pipes aren't clogged with sediment, debris or trash
- Inspect ditches for erosion/gullies and invasive vegetation
- Inspect stone for sediment buildup

Wet Detention Basin

Forebay - Pretreatment Area

Slows down the flow entering the device, allowing sediment to settle

What to Look For:

- **Inspect for sediment accumulation – should be less than 50% of storage capacity**
- **Inspect for erosion/gullies**
- **Inspect for trash, debris and invasive vegetation**
- **Inspect embankment and transition berm for structural integrity and erosion**

Sediment Storage

Wet Detention Basin

Vegetated Shelf – Provide pollutant uptake, protect shoreline of basin from erosion, discourage waterfowl and children from entering

What to Look For:

- Vegetation should be a minimum of 6 feet in width
- Needed pruning for optimal plat health
- Inspect for erosion/gullies
- Inspect for trash, debris and invasive vegetation

Wet Detention Basin

Main Treatment Area – Permanent pool of water in which sedimentation and biological uptake of pollutants occur

What to Look For:

- Visually inspect water for pollutants
- Inspect depth of sediment accumulation (design depth ~ 6 inches)
  - Remove sediment if depth is approaching drawdown orifice
- Inspect for excessive algae and invasive vegetation
- Inspect water levels
  - If too high, there may be a clog in the drainage system
  - If too low, infiltration rates may be higher than designed and a liner may be necessary

Wet Detention Basin

Embankment and Spillway – Walls of basin to contain the stormwater and spillway to allow a release in overflow

What to Look For:

- Inspect for signs of burrowing animals or beaver activity
- Inspect vegetation present and ensure proper maintenance (mow grass 6 – 15”)
- Growth of tree roots may impede structural integrity
- Inspect for erosion and inadequate vegetation cover
- Inspect riprap/concrete spillways

Wet Detention Basin

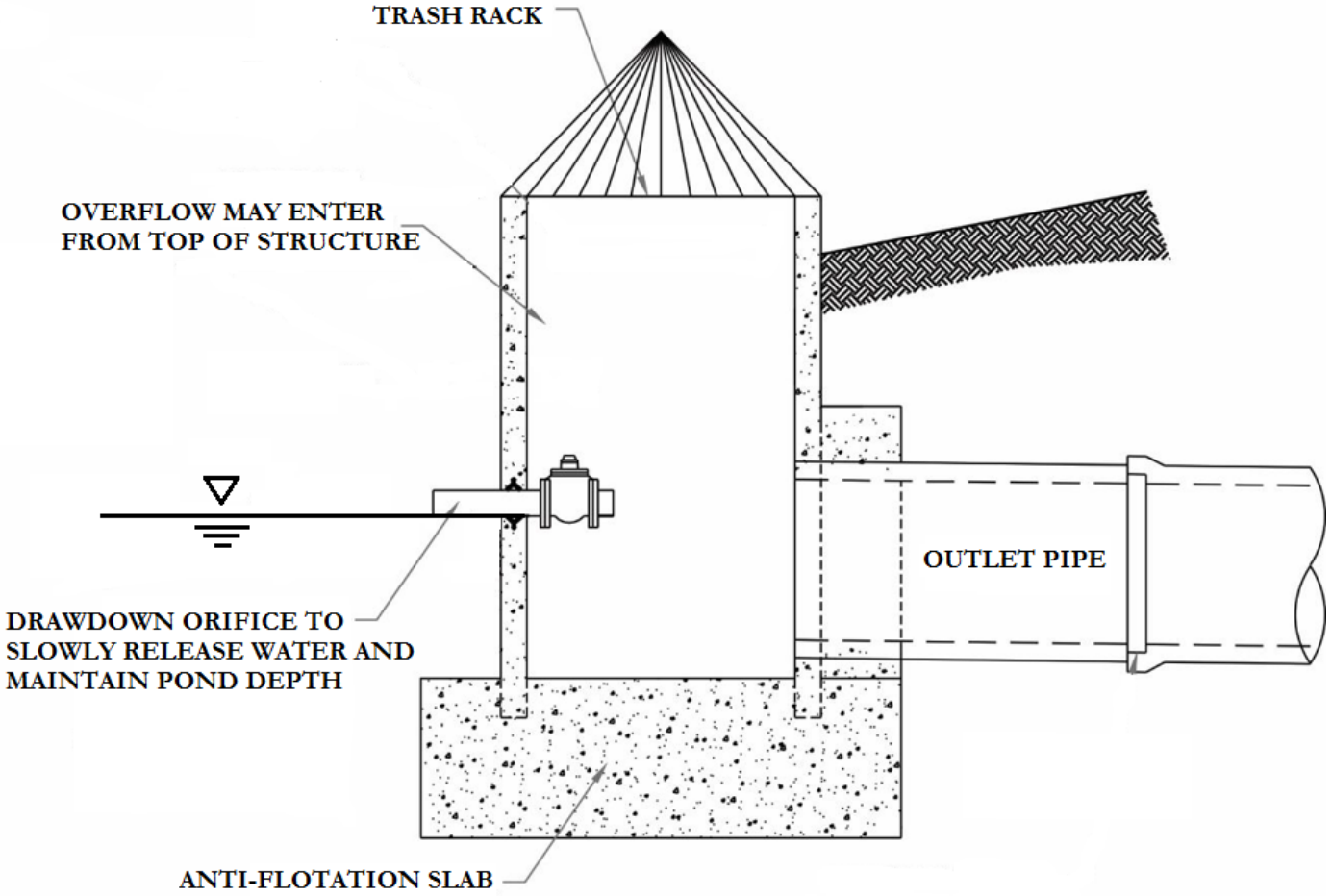
Outlet Device – Regulates the water level and slowly releases treated stormwater downstream

What to Look For:

- Inspect for structural damage
- Inspect pipes for damage
- Inspect for clogging of drawdown orifice
- Inspect trash rack on overflow structure for debris

Wet Detention Basin

Outlet Device – Regulates the water level and slowly releases treated stormwater downstream



Wet Detention Basin

Receiving Water – Outlet draining downstream

May consist of ditches, pipes, culverts, and other structures

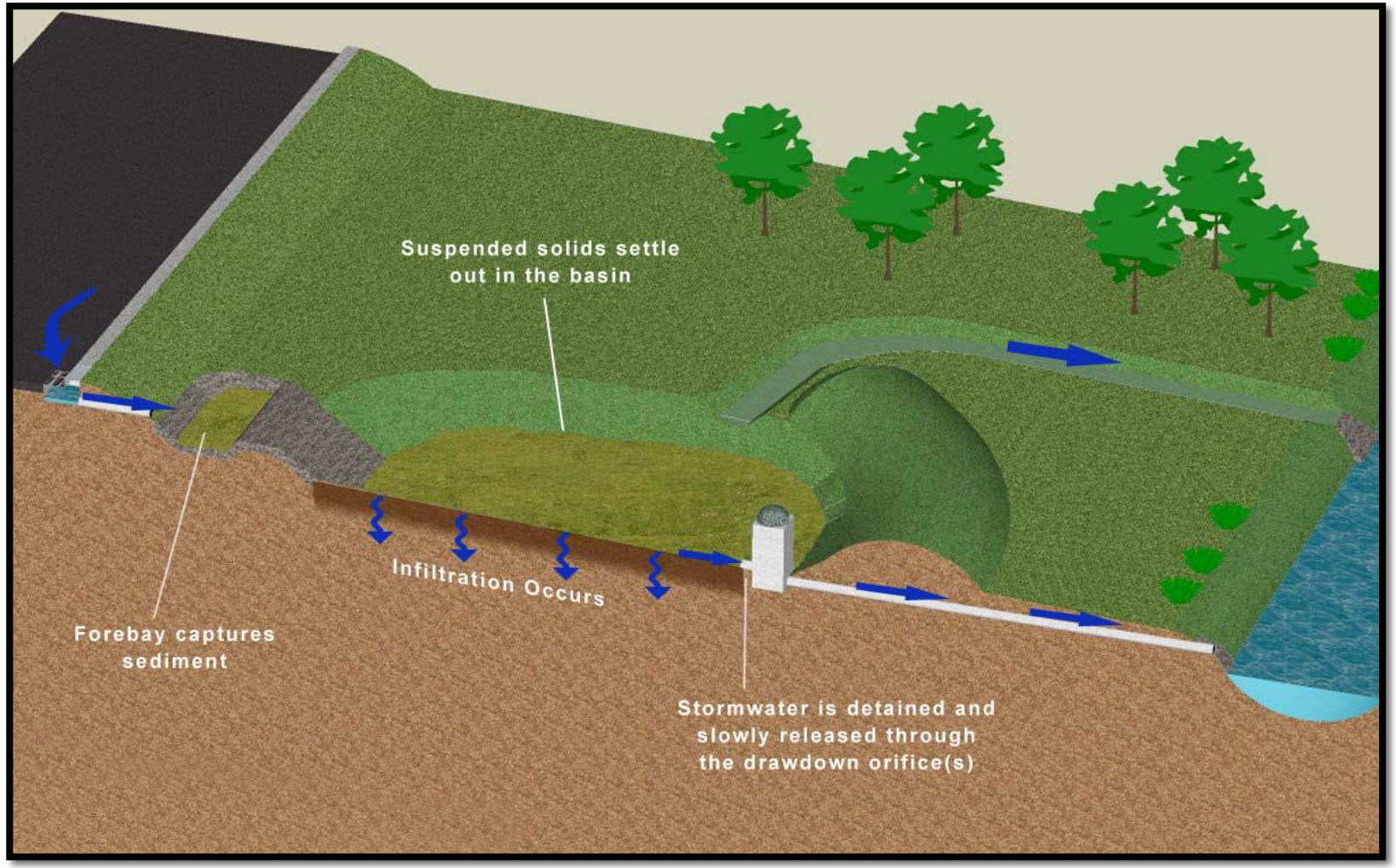
What to Look For:

- Inspect for erosion present at and downstream of basin outlet
- Inspect for adequate outlet protection (riprap)
- Inspect for trash and debris, invasive vegetation and major sediment accumulations

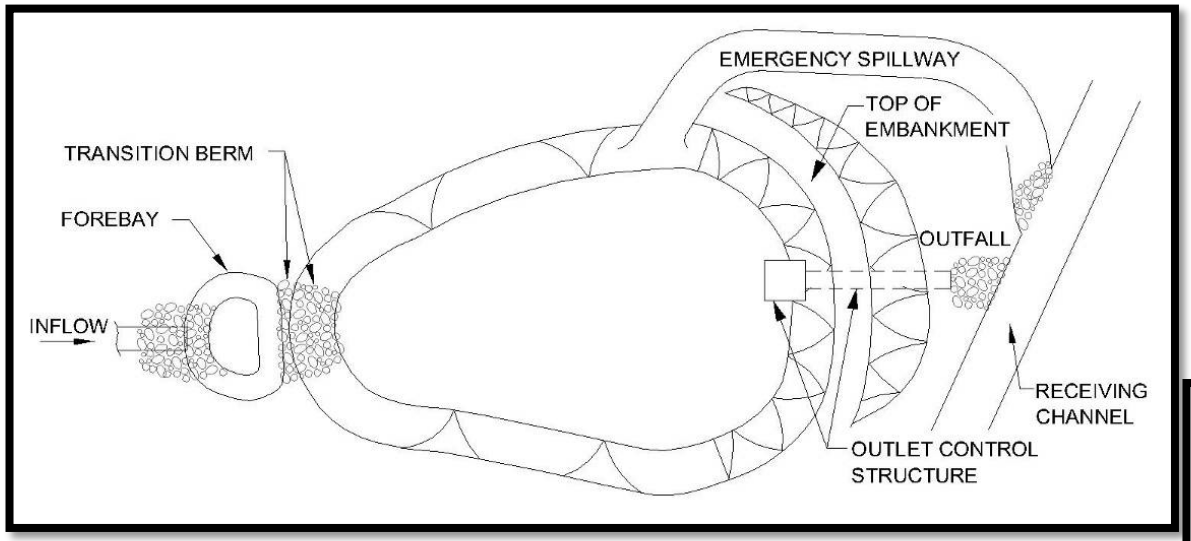
Dry Detention Basin

- Designed to temporarily store and slowly release stormwater
- Should remain dry between storm events, drain 2-3 days
- Reduces flooding and erosive velocities
- Improves water quality by allowing contaminants to settle out
- Landscape feature

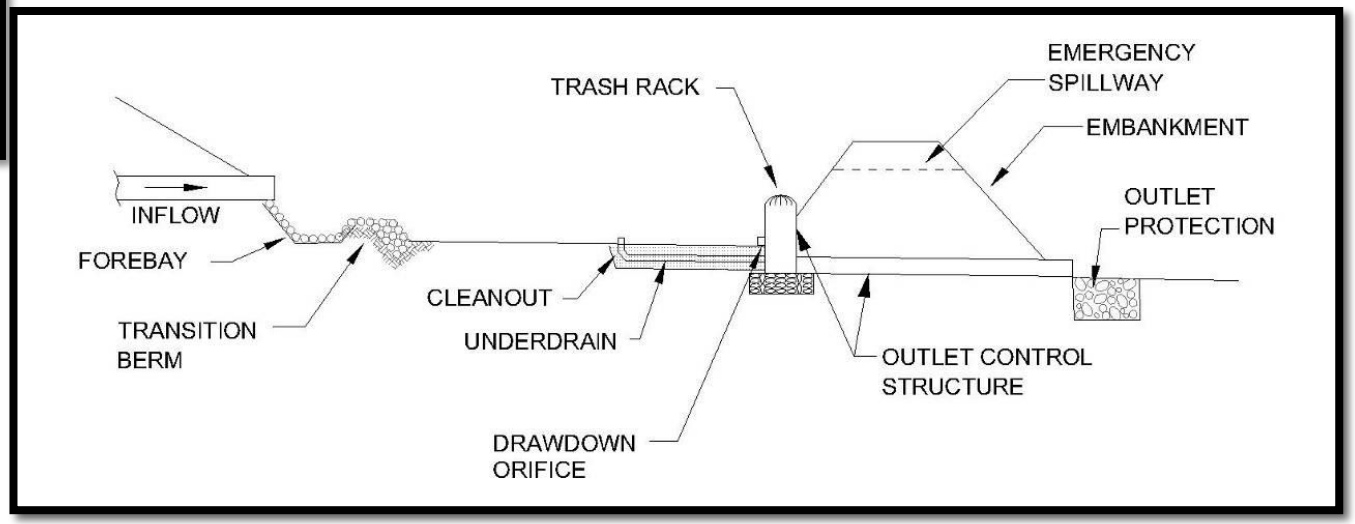
Dry Detention Basin



Dry Detention Basin



Plan view



Profile view

Dry Detention Basin

Inlet System - How runoff gets to the Dry Detention Basin

Consists of ditches, pipes, stone verges or curb & gutter

What to Look For:

- Inspect pipes for cracks or other damage
- Ensure pipes aren't clogged with sediment, debris or trash
- Inspect ditches for erosion/gullies and invasive vegetation
- Inspect stone for sediment buildup

Dry Detention Basin

Forebay - Pretreatment Area

Slows down the flow entering the device, allowing sediment to settle

What to Look For:

- Inspect for sediment accumulation – should be less than 50% of storage capacity
- Inspect for erosion/gullies
- Inspect for trash, debris and invasive vegetation
- Inspect embankment and transition berm for structural integrity and erosion

Dry Detention Basin

Main Treatment Area – Reduces the rate of runoff and allows suspended solids to settle

What to Look For:

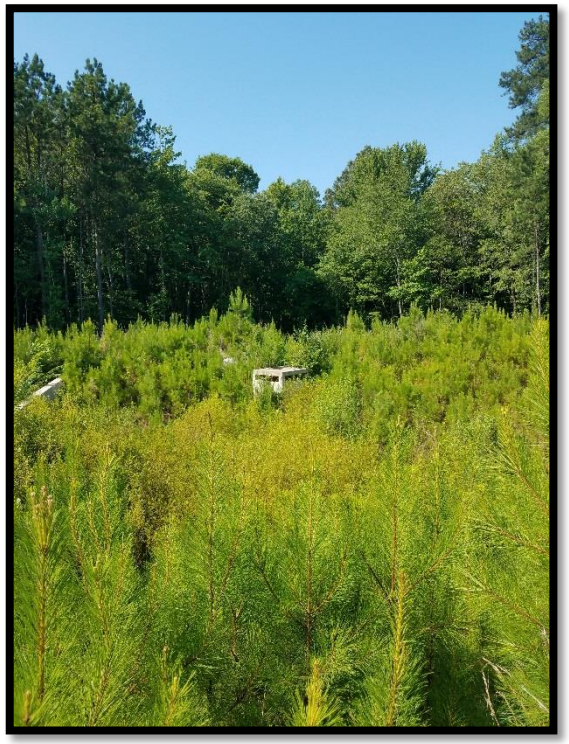
- Ensure basin floor has established turf grass mowed 6-15” or landscaped
- Inspect depth of sediment accumulation (design depth ~ 6 inches)
  - Remove sediment if depth is approaching drawdown orifice
- Inspect for invasive vegetation
- Ensure pond does not hold water greater than 5 days after a storm event
  - If it does, there may be a clog in the outlet system

Dry Detention Basin

Embankment and Spillway – Walls of basin to temporarily contain the stormwater and spillway to allow a release in overflow

What to Look For:

- Inspect for signs of burrowing animals or beaver activity
- Inspect vegetation present and ensure proper maintenance (mow grass 6 – 15”)
- Growth of tree roots may impede structural integrity
- Inspect for erosion and inadequate vegetation cover
- Inspect riprap/concrete spillways



Dry Detention Basin

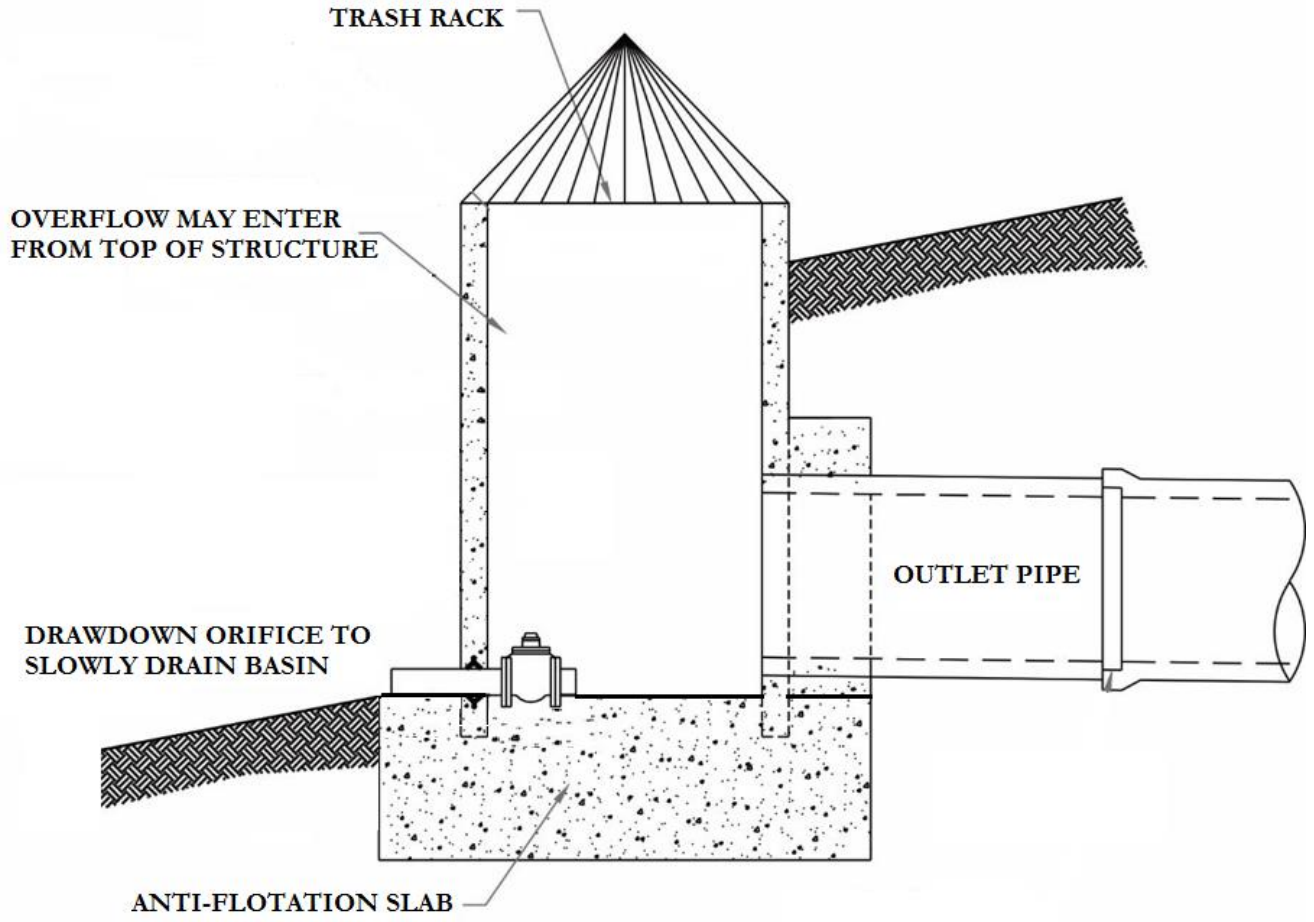
Outlet Device – Slowly drains stormwater from basin downstream, between 2-5 day drawdown time

What to Look For:

- Inspect for structural damage
- Inspect pipes for damage
- Inspect for clogging of drawdown orifice
- Inspect trash rack on overflow structure for debris
- Inspect and lubricate sluice gate, if applicable

Dry Detention Basin

Outlet Device –slowly releases treated stormwater downstream



Dry Detention Basin

Receiving Water – Outlet draining downstream

May consist of ditches, pipes, culverts, and other structures

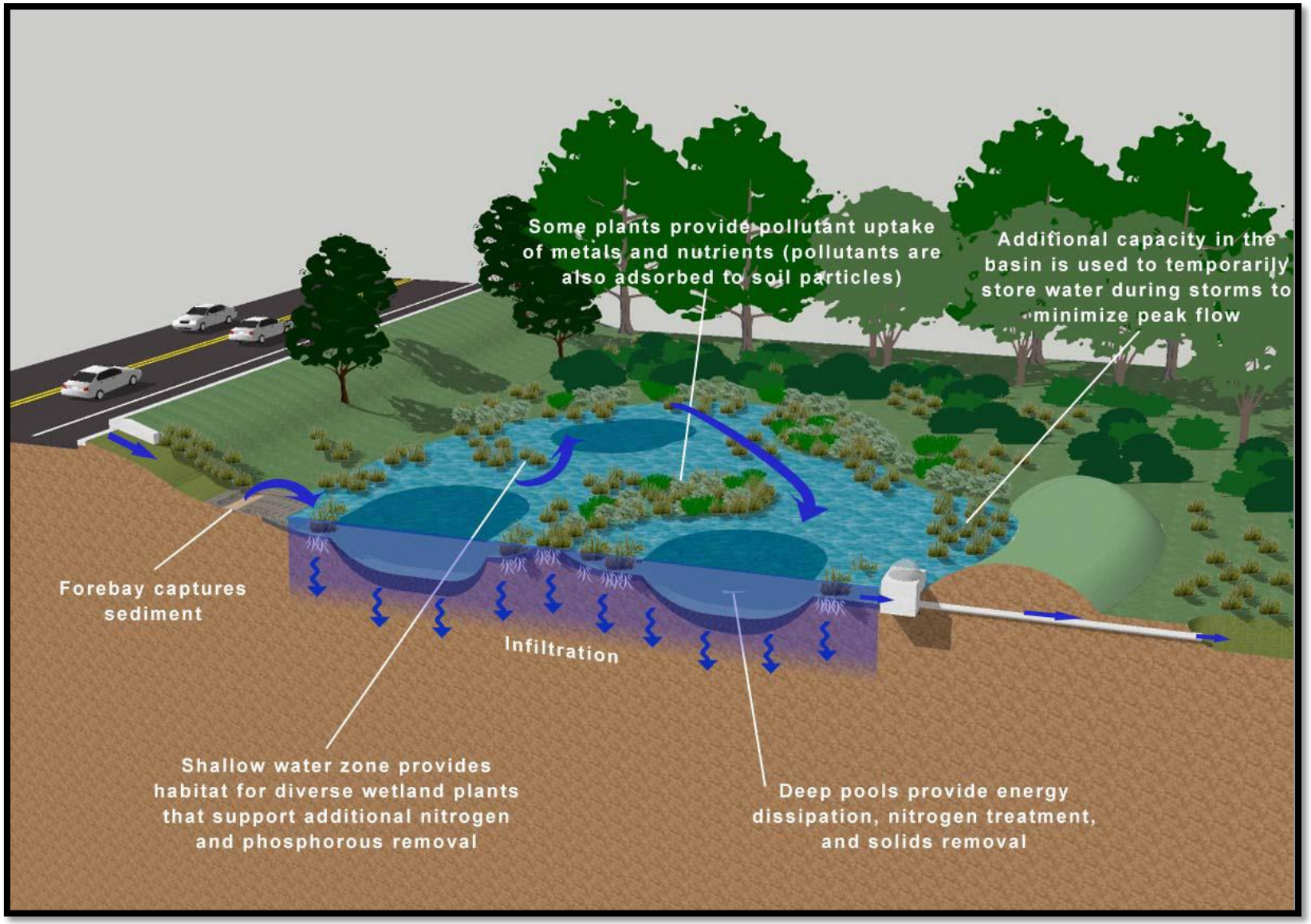
What to Look For:

- Inspect for erosion present at and downstream of basin outlet
- Inspect for adequate outlet protection (riprap)
- Inspect for trash and debris, invasive vegetation and major sediment accumulations

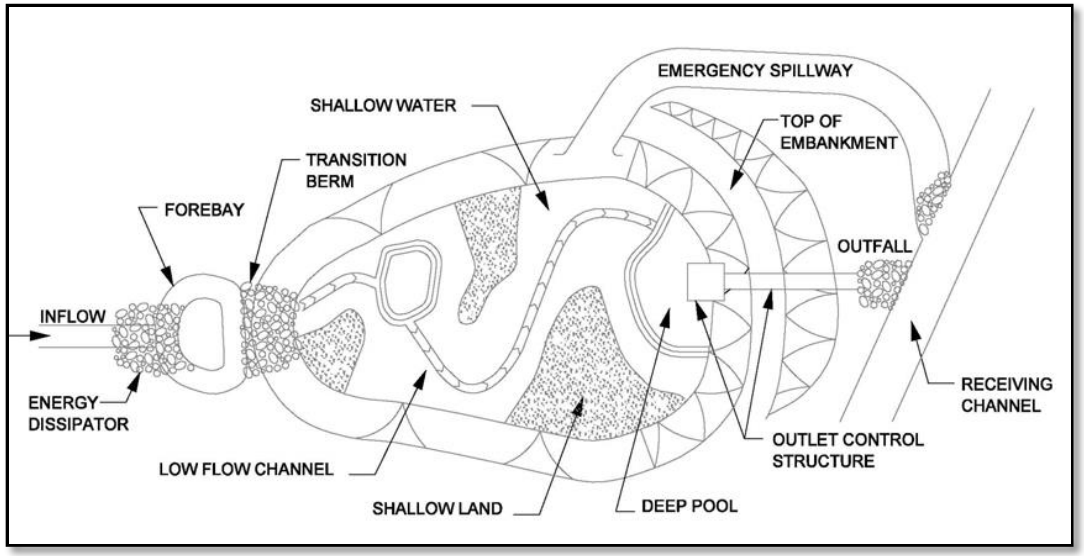
Stormwater Wetland

- An engineered marsh or swamp with dense wetland vegetation
- Improves water quality with pollutant removal through plant update and infiltration
- Promotes ecological habitat & aesthetics

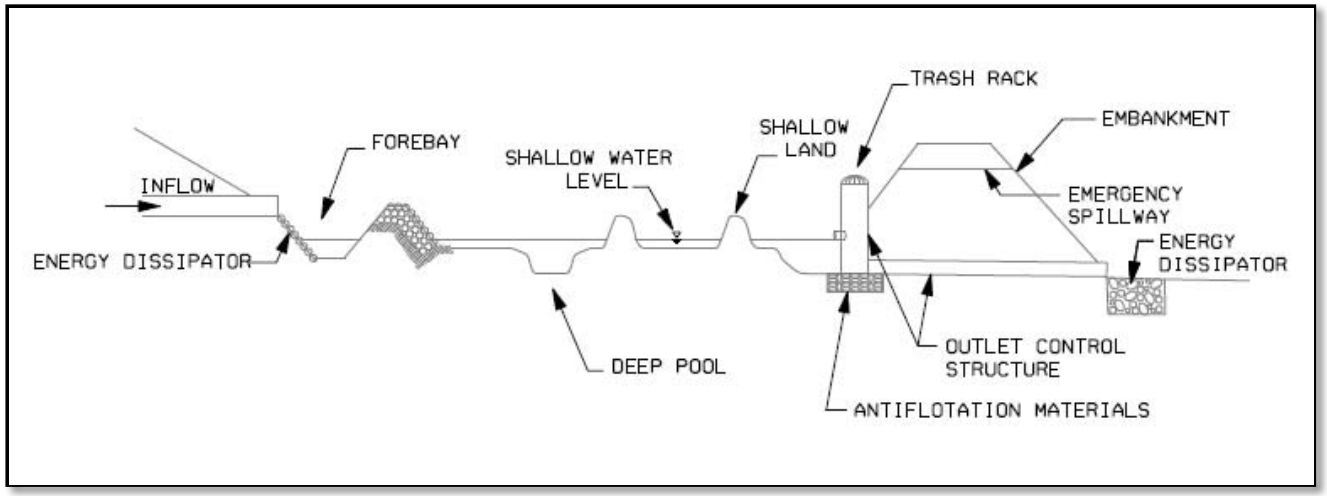
Stormwater Wetland



Stormwater Wetland



Plan view



Profile view

Stormwater Wetland

Inlet System - How runoff gets to the Stormwater Wetland

Consists of ditches, pipes, stone verges or curb & gutter

What to Look For:

- Inspect pipes for cracks or other damage
- Ensure pipes aren't clogged with sediment, debris or trash
- Inspect ditches for erosion/gullies and invasive vegetation
- Inspect stone for sediment buildup

Stormwater Wetland

Forebay - Pretreatment Area

Slows down the flow and allows sediment to settle before entering through transition berm into the wetland

What to Look For:

- Inspect for sediment accumulation –less than 50% of storage capacity
- Inspect for erosion/gullies
- Inspect for trash, debris and invasive vegetation
- Inspect embankment and transition berm for structural integrity and erosion

Stormwater Wetland

Deep Pools (5-15%)

Submerged and floating plants

Retain at least 18” water depth

Certain soils require a liner to ensure water doesn’t infiltrate

Water lilies
Gambusia fish

Shallow Water (35-45%)

Construct hydraulic connection between inlet & outlet

Occasionally dry during drought

Maintains 0-9” water depth

Sweetflag
Blue flag iris
Soft rush

Shallow Land (30-45%)

Rooted plants for pollutants

Only wet after storm events

Natural elements like coconut fiber rolls and logs used to structurally reinforce these areas

Milkweed
Cardinal flower
Scarlet rose mallow

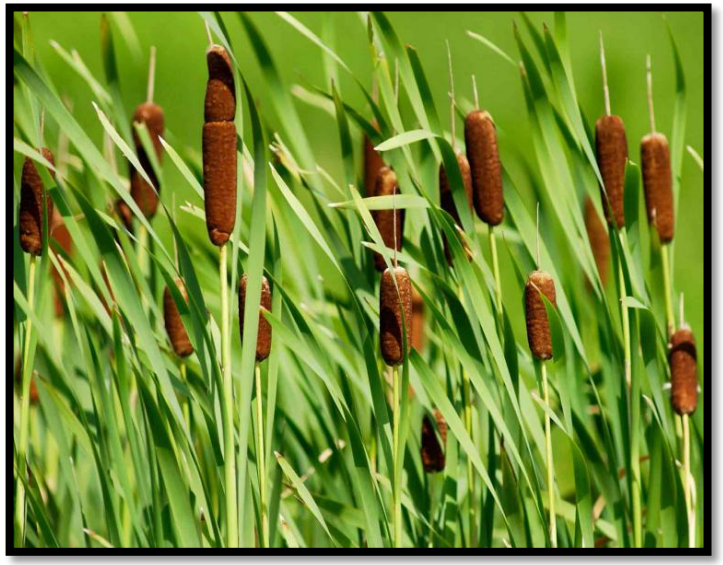
Stormwater Wetland

Deep Pools, Shallow Water & Shallow Land Areas – Various depths contain unique plants and aquatic species for pollutant removal

What to Look For:

- Excessive algal, due to higher water temperatures & nutrients
- Inspect for good vegetation density
- Invasive plants, primarily cattails
- Inspect for sediment accumulation (75% of deep pool depth)
- Shallow land component flooded greater than 5 days after storm event

Hand removal of invasives is best. Use only aquatic herbicides if necessary.

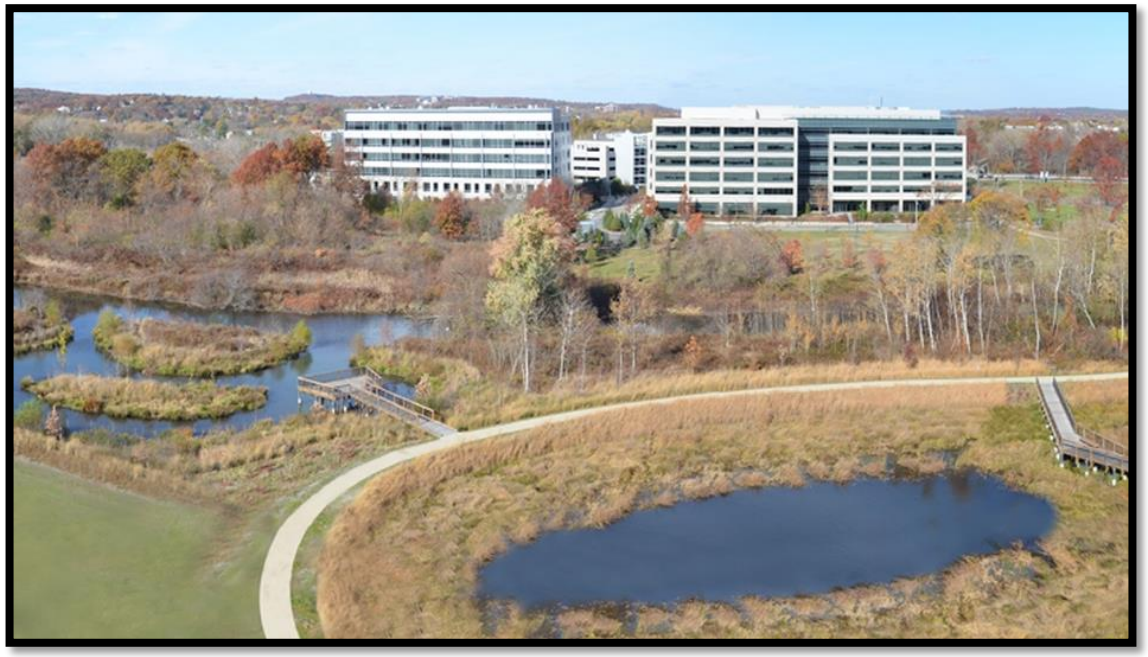


Stormwater Wetland

Embankment – Perimeter of wetland to contain the stormwater and spillway to allow a release in overflow

What to Look For:

- Inspect for signs of burrowing animals or beaver activity
- Inspect vegetation present and ensure proper maintenance (mow grass 6 – 15”)
- Growth of tree roots may impede structural integrity
- Inspect for erosion and inadequate vegetation cover
- Inspect riprap/concrete spillways



Stormwater Wetland

Outlet Device – Maintain a shallow water level and slowly releases treated stormwater downstream

Standard Riser Outlet
Small opening to dewater and larger opening at top for overflow

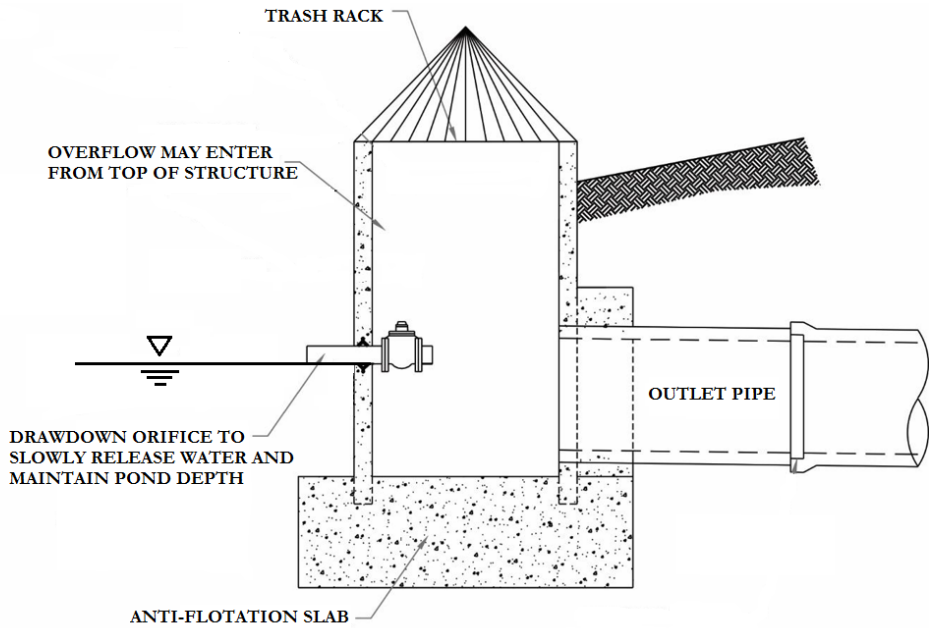
What to Look For:

- Inspect for structural damage
- Inspect for clogging of drawdown orifice
- Inspect trash rack on overflow structure for debris
- Inspect and lubricate sluice gate, if applicable

Flashboard Riser Outlet
One wall of riser have movable boards to adjust water levels

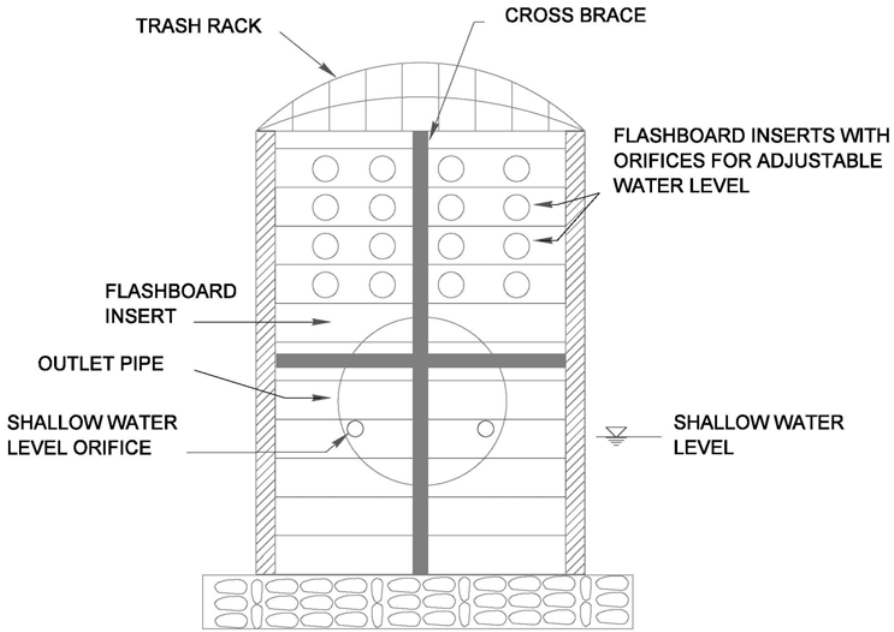
Stormwater Wetland

Outlet Device –Maintain a shallow water level and slowly releases treated stormwater downstream



Standard Riser Outlet

Small opening to dewater and larger opening at top for overflow



Flashboard Riser Outlet

One wall of riser have movable boards to adjust water levels

Stormwater Wetland

Receiving Water – Outlet draining downstream

May consist of ditches, pipes, culverts, and other structures

What to Look For:

- Inspect for erosion present at and downstream of wetland outlet
- Inspect for adequate outlet protection (riprap)
- Inspect for trash and debris, invasive vegetation and major sediment accumulations