MS4 Permit Requirements and Inspection/Maintenance of Stormwater Management Facilities

March 13, 2023

Presented to Hamilton Township

Rutgers Cooperative Extension Water Resources Program
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RUTGERS
New Jersey Agricultural Experiment Station

Overview

- Tier A MS4 Permit Requirements
- Catch Basin Inspections
- Outfalls Inspections/Repair
- What are Detention/Retention/Infiltration basins?
  - Typical Basin Structure
  - Detention/Retention/Infiltration Basin Inspection
  - Maintenance/Repair
    - Routine
    - Non-routine

Summary of MS4 Requirements (January 1, 2023)

Section A: Stormwater Management Program (Engineering)

- Overview of MS4 Permit and SPPP

Section B: Minimum Standards for Public Involvement (Engineering)

- Public participation and published information of stormwater website

Section C: Minimum Standards for Local Public Education (Engineering)

- Complete 12 points of educational stormwater activities annually

Section D: Minimum Standards for Construction Site Stormwater Runoff (Engineering)

- Construction runoff covered by separate permit

Summary of MS4 Requirements

Section E: Minimum Standards for Post Construction Stormwater Management in New Development and Redevelopment (Engineering)

- Sets forth review requirements of development plans for stormwater management

Section F: Minimum Standards for Pollution Prevention/ Good Housekeeping for Municipal Operators (DPW/Engineering/Rutgers)

- Ordinances, community measures, inspection of stormwater facilities, maintain logs, municipal maintenance yards, trainings

Section G: Minimum Stands for MS4 Mapping, and Scouring, and Illicit Discharge Detection and Elimination (DPW/Engineering/Rutgers)

- Mapping requirements, stream scour inspection (20% per year), illicit discharge detection and elimination from outfalls (20% per year)

Summary of MS4 Requirements

Section H: Watershed Improvement Plan (Engineering/Rutgers)

- Three phase document: Watershed Inventory Report (3rd year), Watershed Assessment Report (4th year), Watershed Improvement Plan Report (EDPA + 59 months)

Section I: Additional Measures and Optional Measures (Engineering)

- Allows additional measures/limits if desired

Section J: Recordkeeping (Engineering/DPW)

- Retain records of the permit for 5 years available on request

Section K: Annual Report and Certification (Engineering)

- Submit annual report to summarize compliance by May 1st annually

Section F Further Details

1. Community-wide Ordinances
   - Pet Waste, Wildlife Feeding, Litter Control, Improper Waste Disposal, Yard Waste, Private Inlet Retrofitting (existing)
   - Privately-Owned Salt Storage, Tree Removal/Replacement (EDPA + 12 months)
2. Community-wide Measures
   - Street Sweeping (triannual w/ inlets, annual w/o inlets)
   - Storm drain labeling and retrofitting
   - Herbicide Management (don't apply near storm drains or steep ground)
   - Excess De-Icing Material (remove within 72 hours excess salt piles)
   - Roadside Vegetative Waste management (proper disposal of yard waste)
   - Roadside Erosion Control (inspect municipal roads annually for erosion)
3. Inspection and Maintenance of Stormwater Facilities Owned and Operated
   - See future slides
4. Inspection and Maintenance of Stormwater Facilities Not Owned and Operated
   - Certify annually that facilities not owned or operated by the town constructed after February 7, 1984 are adequately cleaned and maintained

Section F Further Details

5. Municipal Maintenance Yards

- Many requirements in this section that should be reviewed. Focus on identifying possible sources of contamination to stormwater discharge on maintenance yards and how materials are stored.

6-10. Trainings

- 6. Stormwater Program Coordinator Training (participate in Department free training webinar within EDPA + 36 months and once per permit cycle thereafter)
- 7. Annual Employee Training (individual responsible for implementation of MS4 permit receive annual training, i.e. governing body members, municipal employees in public works, engineering, etc.)
- 8. Stormwater Management Design Review Training (those that review and approve stormwater management designs for major development complete required Department Training, once every 5 years)
- 9. Stormwater Management Rule Amendment Training (if permit amended complete training as require within a year of adoption)
- 10. Municipal Board and Governing Body Member Training (Complete “Asking the Right Question” Tool, to be completed once per term of service)

Key Sections for DPW

Section F

- 2. Community-Wide Measures (i.e. Street Sweeping, Storm Draining labeling/retrofitting, etc.)
- 3. Inspection and Maintenance of Stormwater Facilities Owned and Operates
  - Inlets, Catch Basins, Conveyance System, Stormwater Infrastructure (i.e. detention basins)
- 5. Municipal Maintenance Yard Requirements
- 7. Annual Training

Section G

- Assist with repair of outfall structures/erosion prevention
- If Rutgers does not continue inspections in the future, this would also fall on the DPW to inspect for erosion and illicit discharge connections

Tier A MS4 Permit Definitions

- "Catch Basin" means a cistern, vault, chamber or well that is typically built along a street and below an inlet grate as part of the storm sewer system that is designed to capture and retain sediment, debris, and pollutants so those particles do pass on to the stormwater sewer system.

- "Storm drain inlet" means the point of entry into the storm drain system and is, where a catch basin is present, the uppermost portion (or cover) of a catch basin.

Summary of MS4 Requirements (Section F-3)

Inspect storm drain inlets once per year

- Clean and maintain as frequently as necessary

Inspect catch basins once every 5 years with 20% per year

- Clean catch basins as needed, about 1/3 of basin filled with sediment

Inspect Conveyance structures

- Clean and maintain on as needed basis

Stormwater Infrastructure inspected according to approved maintenance plan

- Stormwater basins and other structures, i.e. underground storage systems, green stormwater infrastructure
- Maintain as needed according to maintenance plan

Summary of MS4 Requirements (Section F-3)

- Log activities to show compliance
- Correct maintenance and repairs within 90 day of discovery, unless authorized by DEP
- Certify in the MSRP Annual Report if facilities have been inspected, maintained, and properly function

What is the DPW's Responsibility?

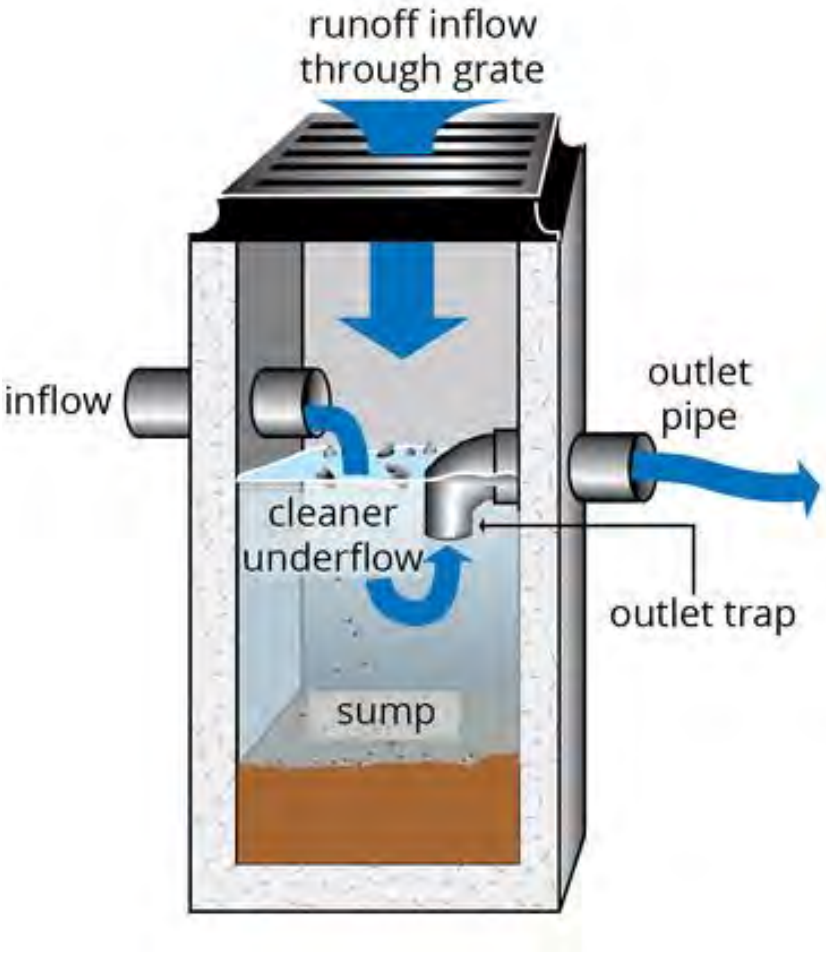
- Stormwater infrastructure owned or operated by the Township

- Hamilton owns or operates about has about 7,244 catch basins which include:
  - CBs in right of way
  - CBs on municipal property
  - CBs in stormwater related easements
- Hamilton owns or operates about 41 stormwater basins (see 2019 Stormwater Basin Assessment Summary (Year 5A))

- Inspections of this infrastructure must be done on a regular basis

Catch Basin Inspections

- "Storm drain inlet"
  - Grate surface
  - Inspected annually
  - Claim inspected during street sweeping, may need to inspect those not directly on the road separately
- "Catch basin"
  - The concrete vault below the street
  - Inspected once every five years



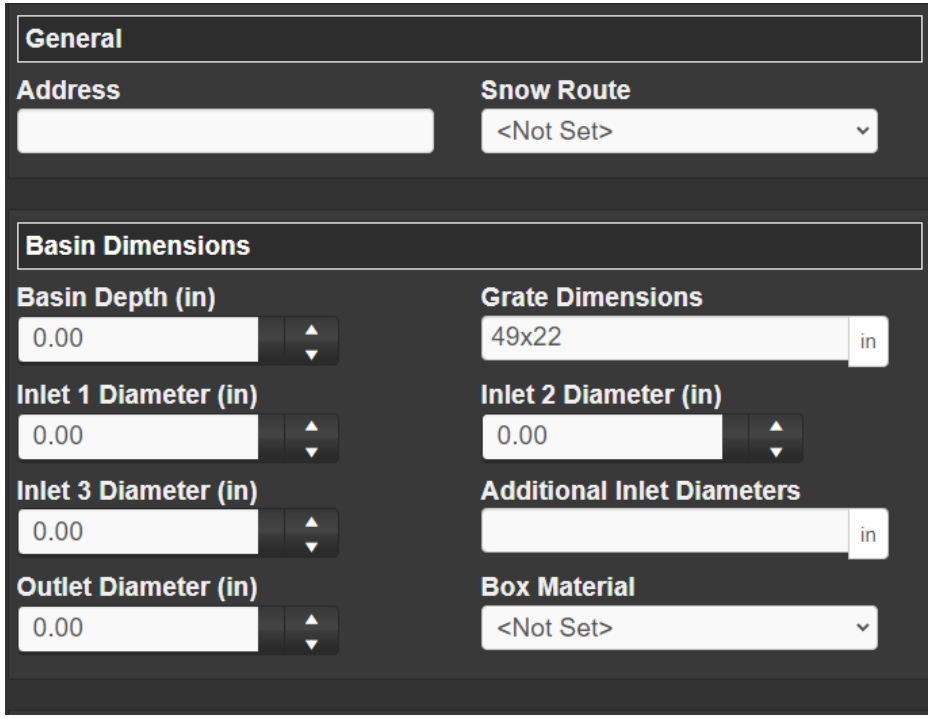
(portland.gov)

Catch Basin Inspections

- What to look for?
  - Is the grate clear to allow flow into the catch basin? Does it need to be cleaned?
  - Does the catch basin need to be cleaned of excessive sediments?
  - Is the catch basin structurally stable or is it in need of repair?
- What to log?
  - Type of Inlet
  - Depth of catch basin
  - Size of inflow outflow pipes
  - Amount of sediment

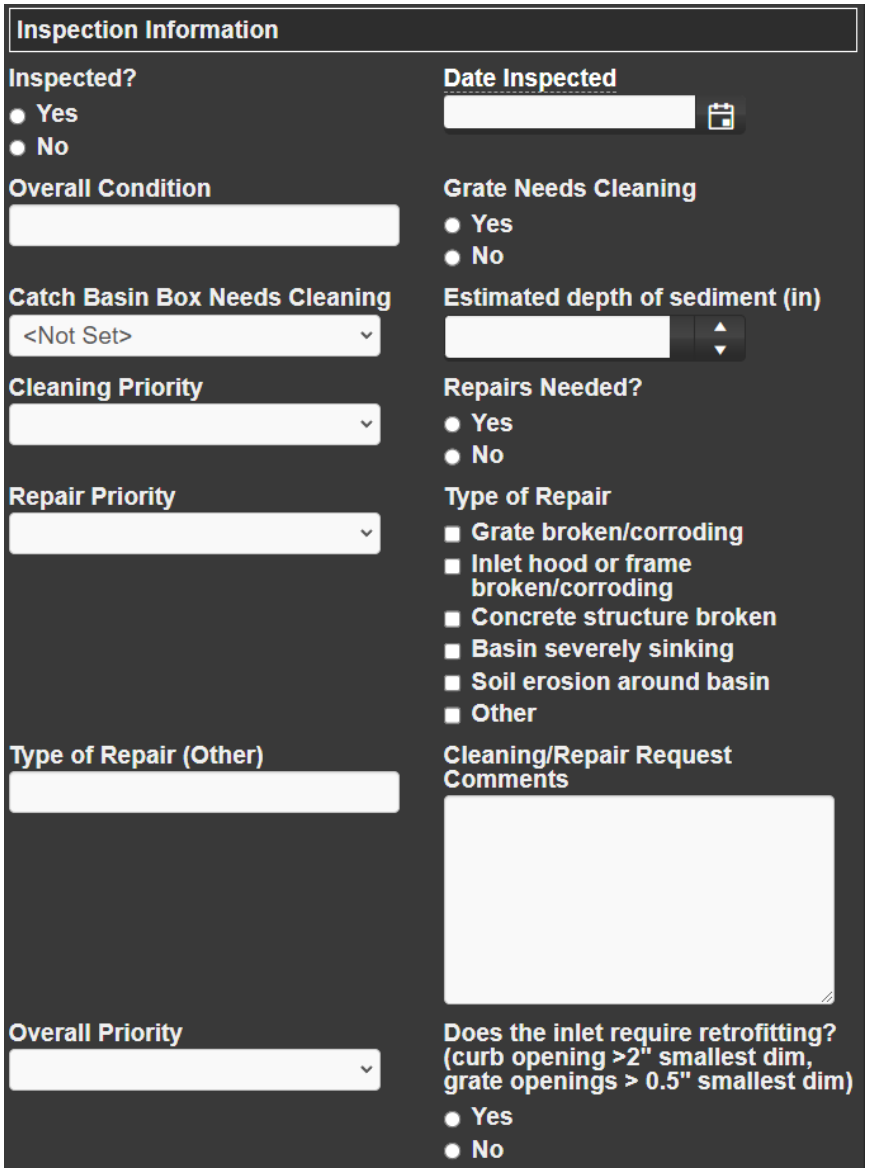
Data Collection

- Updated work order in Traisr to be used
- Trial run 2021, inspected 186 catch basins over two days w/ team of two
- Need ~16 days to inspect 1/5 of catch basins each year
- Rutgers proposal has 1,000 CBs to be inspected to assist in 2023



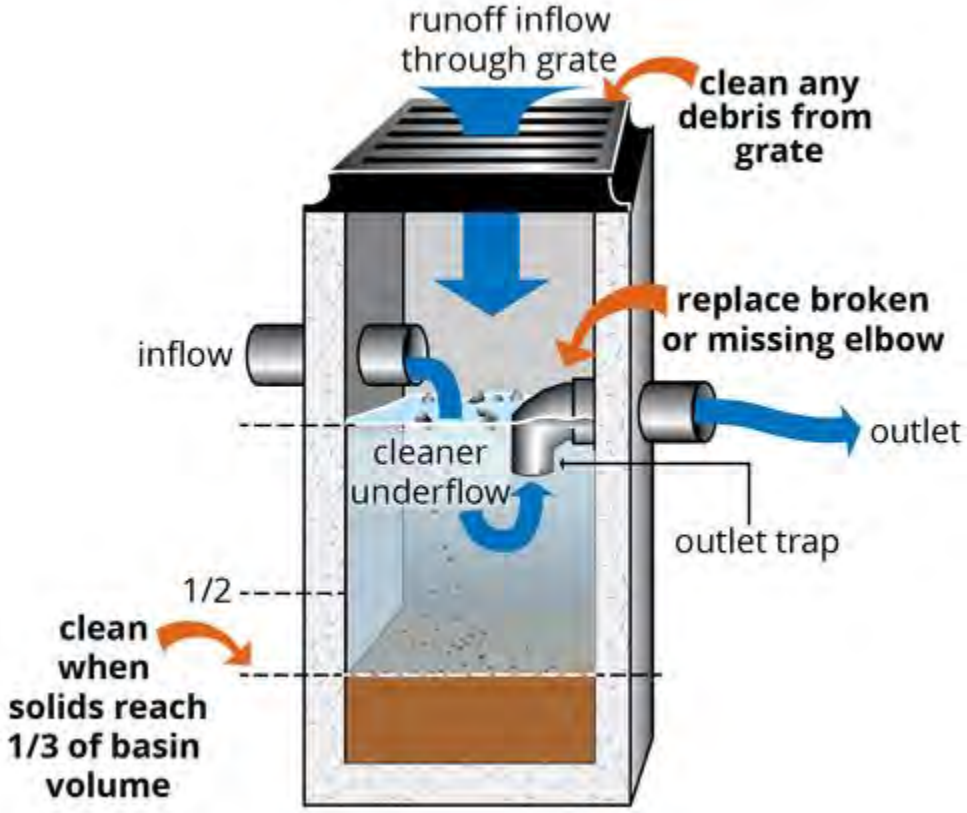
Proposed Inspection Schedule

- 1 – Snow Zones A & B: 1,498 (2022)
- 2 - Snow Zones C & D: 1,315 (2023)
- 3 – Snow Zone E: 1,399 (2024)
- 4 – Snow Zone F: 1,238 (2025)
- 5 – Snow Zones G & H: 1,794 (2026)
  - Total 7,244



Catch Basin Maintenance

- Clear vegetation or debris from basin surface
- Collect sediment from basin with vacuum truck
- Repair damaged structures



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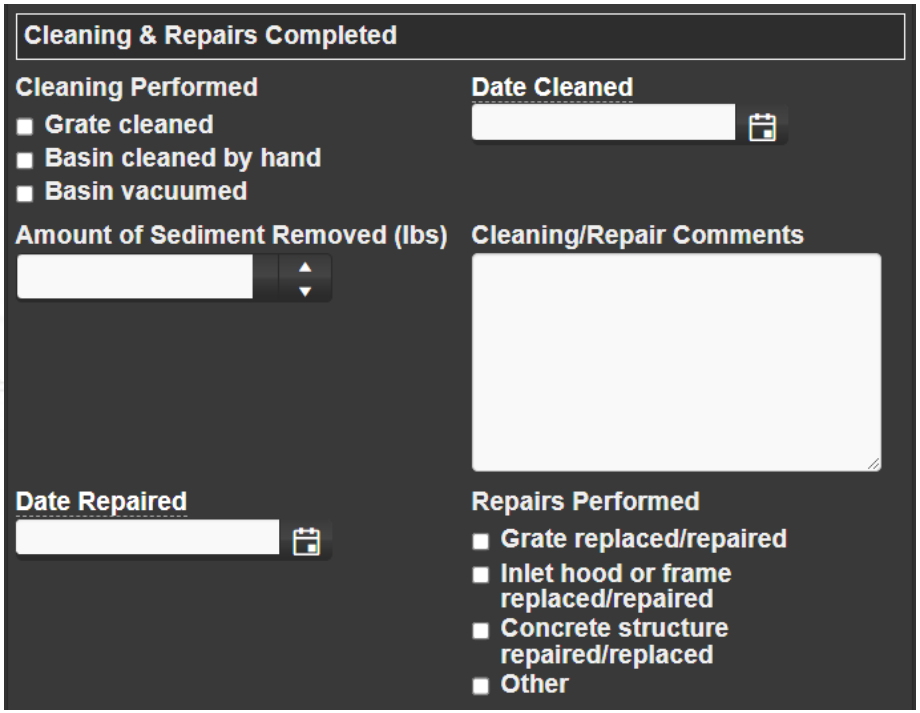


Outfalls

Tier A MS4 Permit Definition

- “Outfall” means any point source which discharges directly to waters of the United States and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other waters of the United States and are used to convey waters of the United States.
- "Stormwater facility" means stormwater infrastructure including, but not limited to, catch basins, infiltration basins, detention basins, green infrastructure, filter strips, riparian buffers, infiltration trenches, sand filters, constructed wetlands, wet basins, bioretention systems, low flow bypasses, and stormwater conveyances.

Outfall Requirements

- Inspected 20% annually for soil erosion and sign of illicit discharge
  - Currently being conduct by Rutgers
- Outfalls have been identified that require repair and erosion control
  - Should be repaired within 90 days of identification OR later if authorized by DEP.
  - Need plan/schedule of maintenance/repairs
  - Repairs may require permits (Freshwater Wetlands, Flood Hazard Area)
- See Outfall Inspection Report 2022

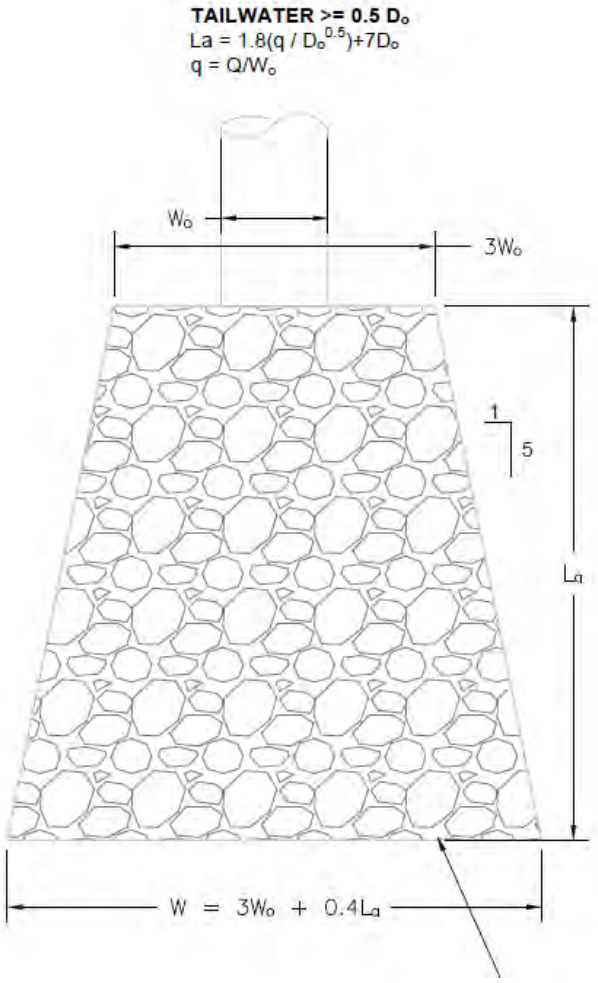
Outfall Scouring

- Fix scouring problems per appropriate solutions
  - Riprap apron, scour hole, riprap channel, rock/gabion flume
  - Anything at High and Medium Erosion should be planned for repair prioritizing highest erosion first
  - Minor monitored in future inspection

Outfall_ID	OLD_ID	Date of Inspection	Outfall Condition	Bank Stability	Stream Scour Present?	Scour Severity	Scour Extent	Notes	Overall Priority
AC06	D0101	8/16/2022	Needs Maintenance	Fair	Y	High	10-100 ft	minor cracking, major erosion likely caused by outfall	4 - High
MR08	B0309	7/21/2022	Proper condition	Fair	Y	High	10-100 ft	(Sampled) Bamboo growth around outfall	4 - High
MR21	B0317	7/21/2022	Needs Repair	Fair	Y	High	None	Pipe is intact, Foundation around pipe needs repair	4 - High
MR33	B0332	7/21/2022	Needs Repair	Needs Stabilization	Y	High	10-100 ft	Severe erosion, Pipe collapsed, needs immediate attention	5 -Highest
MR87	D0201	7/22/2022	Needs Maintenance	Needs Stabilization	Y	High	10-100 ft	Next to car wash, orange brown muck, undermining	4 - High
AC09	E0101	7/22/2022	Needs Repair	Needs Stabilization	Y	Medium	10-100 ft	(Sampled) Extreme undermining	5 -Highest
AC10		8/4/2022	Needs Maintenance	Needs Stabilization	Y	Medium	Under 10 ft	Major undermining present	4 - High
MR05	A0302	7/22/2022	Proper condition	Fair	Y	Medium	Over 100 ft	Low point in ground directly outside of outfall	4 - High
MR07	A0301	7/22/2022	Needs Maintenance	Fair	Y	Medium	Under 10 ft	Cracking at exit, undermining	3 - Medium
MR10	B0302	7/21/2022	Proper condition	Good	Y	Medium	10-100 ft	Sediment buildup, connected to catch basin 5 feet behind	3 - Medium
MR20	B0316	7/21/2022	Proper condition	Fair	Y	Medium	Under 10 ft	sediment inside, looks like field drainfield	2 - Low
MR30	B0320	7/21/2022	Needs Repair	Needs Stabilization	Y	Medium	Under 10 ft	Outfall still works but end piece fell off into stream, is is causing erosion	4 - High
MR36	B0329	7/21/2022	Proper condition	Fair	Y	Medium	Under 10 ft	60" x39" pipe	3 - Medium
MR38	B0209	7/21/2022	Needs Repair	Fair	Y	Medium	Under 10 ft	20 ft concrete channel has moderate erosion and undermining is occurring	3 - Medium
MR40	B0207	7/21/2022	Needs Maintenance	Fair	Y	Medium	Under 10 ft	Trees causing channel to crack; 20 ft channel causing erosion	3 - Medium
MR42	B0205	7/21/2022	Needs Maintenance	Fair	Y	Medium	10-100 ft	Concrete channel leading to the stream, part of it is cracked and broken	3 - Medium
MR51	C0204	7/22/2022	Needs Repair	Fair	Y	Medium	10-100 ft		4 - High
MR66		8/16/2022	Needs Maintenance	Fair	Y	Medium	10-100 ft		3 - Medium
MR68		8/16/2022	Needs Maintenance	Fair	Y	Medium	10-100 ft		3 - Medium
MR75	D0215	8/16/2022	Needs Maintenance	Fair	Y	Medium	Under 10 ft		3 - Medium
MR77	E0201	8/16/2022	Needs Maintenance		Y	Medium	Under 10 ft	partially filled with sediment. pipe corroding	4 - High
MR78	D0207	7/22/2022	Needs Maintenance	Fair	Y	Medium	10-100 ft	Pooling smelly substance and sediment inside, cats nearby, overgrown vegetation	4 - High
MR91		8/4/2022	Proper condition	Fair	Y	Medium	10-100 ft		3 - Medium
MR93		8/4/2022	Needs Repair	Needs Stabilization	Y	Medium	10-100 ft		4 - High

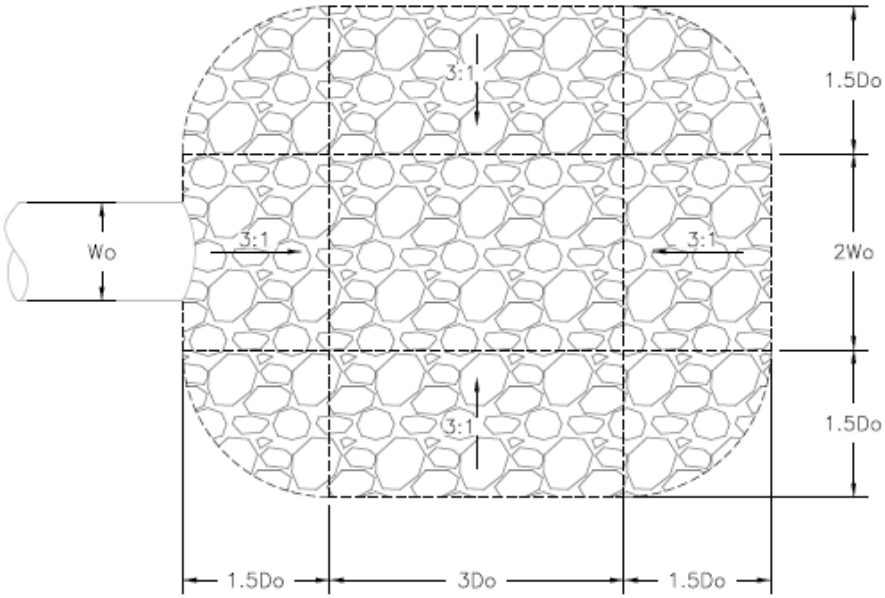
E606

Rirap Apron

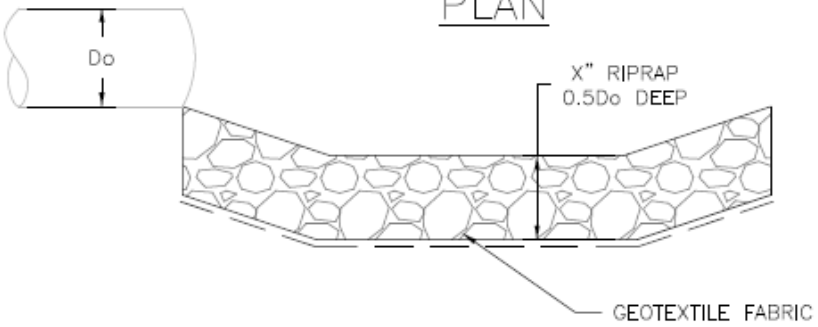


G506

Scour Hole



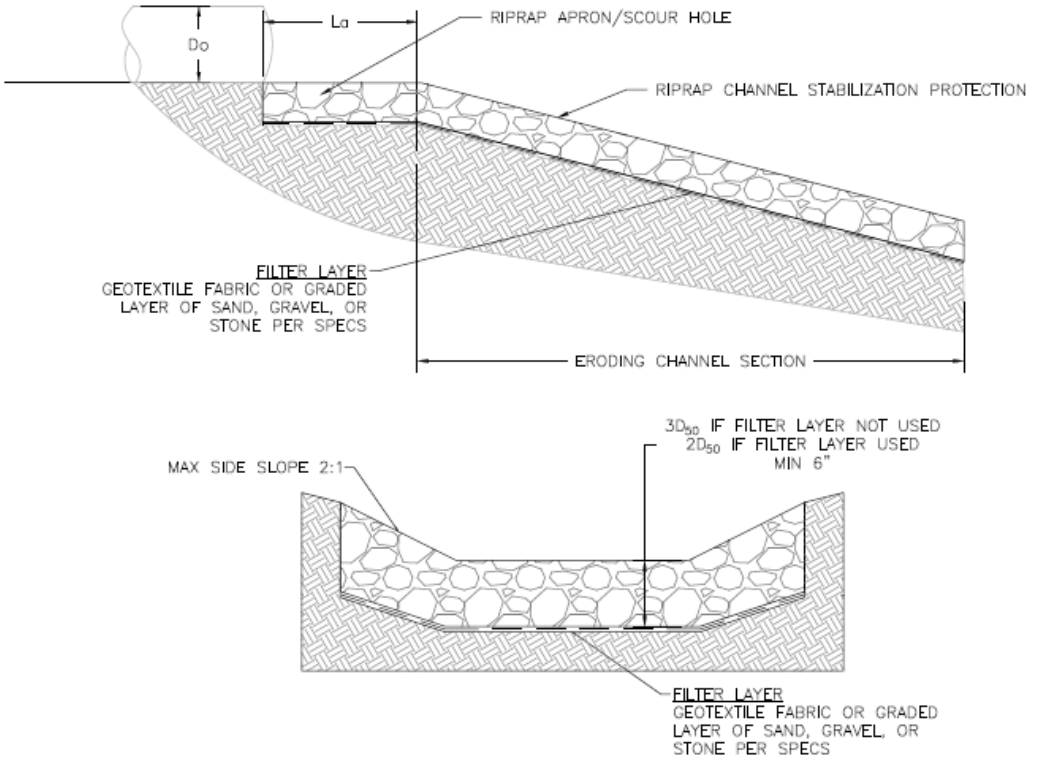
PLAN



SECTION

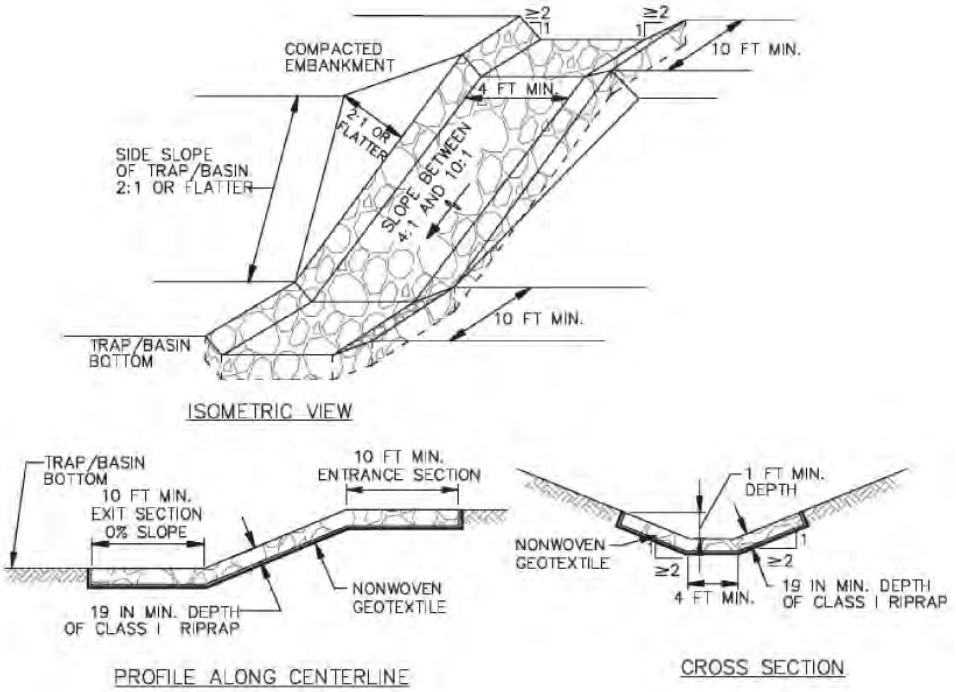
E602

Riprap Channel



C602

Rock/Gabion Flume



Outfall Repair

- Repair Outfall Structures
  - Remove sediments to restore conveyance, stabilize base structure, reconstruct outfall structure
  - Anything with major or moderate cracking should be planned for repair prioritizing highest erosion first, minor monitored in future inspection
- Designs to be developed for AC09 and MR33

Outfall_ID	OLD_ID	Is the discharge coming directly from a pipe?	Pipe Diameter [in] (if applicable)	Pipe Material	Distance to pipe from channel outlet (if applicable)	Channel Type (if applicable)	Date of Inspection	Outfall Condition	Bank Stability	Outfall Damage	Notes	Overall Priority
AC09	E0101	Y	30	Concrete			7/22/2022	Needs Repair	Needs Stabilization	3 - Major Cracking or Corrosion	(Sampled) Extreme undermining	5 -Highest
MR21	B0317	Y	24	Concrete			7/21/2022	Needs Repair	Fair	3 - Major Cracking or Corrosion	Pipe is intact, Foundation around pipe needs repair	4 - High
MR30	B0320	Y	18	Concrete			7/21/2022	Needs Repair	Needs Stabilization	3 - Major Cracking or Corrosion	Outfall still works but end piece fell off into stream, is is causing erosion	4 - High
MR33	B0332	Y	18	Concrete			7/21/2022	Needs Repair	Needs Stabilization	3 - Major Cracking or Corrosion	Severe erosion, Pipe collapsed, needs immediate attention	5 -Highest
MR51	C0204	Y	36	Concrete			7/22/2022	Needs Repair	Fair	3 - Major Cracking or Corrosion		4 - High
MR62	C0213	Y	30	Concrete			7/22/2022	Needs Repair	Fair	3 - Major Cracking or Corrosion	Portion of pipe unseated, some erosion control in the form of sticks and stones placed at outfall preventing worse erosion	3 - Medium
MR69		Y	30	Concrete			8/16/2022	Needs Repair	Fair	3 - Major Cracking or Corrosion	Pipe is cracked and disconnected	4 - High
MR93		Y					8/4/2022	Needs Repair	Needs Stabilization	3 - Major Cracking or Corrosion		4 - High
MR01		Y	40	Concrete			8/4/2022	Needs Maintenance	Fair	2 - Moderate Cracking or Corrosion		3 - Medium
MR17	B0313	Y	18	Metal			7/21/2022	Needs Repair	Needs Stabilization	2 - Moderate Cracking or Corrosion	Undermining; pipe is half buried with sediment; overall structure is collapsing	4 - High
MR26	B0322	Y	6	Concrete			7/21/2022	Needs Maintenance	Needs Stabilization	2 - Moderate Cracking or Corrosion	pipe subsided into stream	3 - Medium
MR27	B0325	Y	12	Concrete	36		7/21/2022	Proper condition	Fair	2 - Moderate Cracking or Corrosion	Part of concrete flow pad broken, but doesn't appear to be leading to major erosion issues	3 - Medium
MR35	B0331	Y	24	Concrete			7/21/2022	Needs Maintenance	Fair	2 - Moderate Cracking or Corrosion	Undermining at the bottom	3 - Medium
MR38	B0209	Y	24	Concrete			7/21/2022	Needs Repair	Fair	2 - Moderate Cracking or Corrosion	20 ft concrete channel has moderate erosion and undermining is occurring	3 - Medium
MR42	B0205	Y	24	Concrete			7/21/2022	Needs Maintenance	Fair	2 - Moderate Cracking or Corrosion	Concrete channel leading to the stream, part of it is cracked and broken	3 - Medium
MR47	B0202	Y	8	Concrete			7/21/2022	Needs Repair	Fair	2 - Moderate Cracking or Corrosion	Outfall largely buried	3 - Medium
MR66		Y	40	Concrete			8/16/2022	Needs Maintenance	Fair	2 - Moderate Cracking or Corrosion		3 - Medium
MR77	E0201	Y	34	Metal			8/16/2022	Needs Maintenance		2 - Moderate Cracking or Corrosion	partially filled with sediment. pipe corroding	4 - High
MR80	D0206	Y	24	Metal			7/22/2022	Needs Maintenance	Needs Stabilization	2 - Moderate Cracking or Corrosion	Very hidden , some undermining, pipe to the left	3 - Medium
MR88	D0202	Y	34	Concrete			7/22/2022	Needs Maintenance	Good	2 - Moderate Cracking or Corrosion	Lots of sediment, 6 inches sediment	3 - Medium
MR94	E0214	Y	13	Concrete			7/22/2022	Needs Maintenance	Needs Stabilization	2 - Moderate Cracking or Corrosion	mostly covered with sediment	3 - Medium

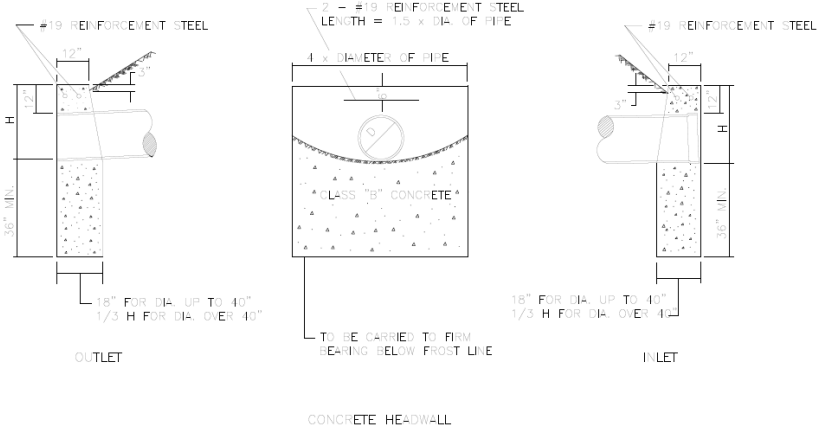
MR77

Remove Sediments

MR51

Stabilize Structure

Reconstruct Outfall or Headwall



AC09

Stormwater Facility
Tier A MS4 Permit Definition

- "Stormwater facility" means stormwater infrastructure including, but not limited to, catch basins, infiltration basins, detention basins, green infrastructure, filter strips, riparian buffers, infiltration trenches, sand filters, constructed wetlands, wet basins, bioretention systems, low flow bypasses, and stormwater conveyances.

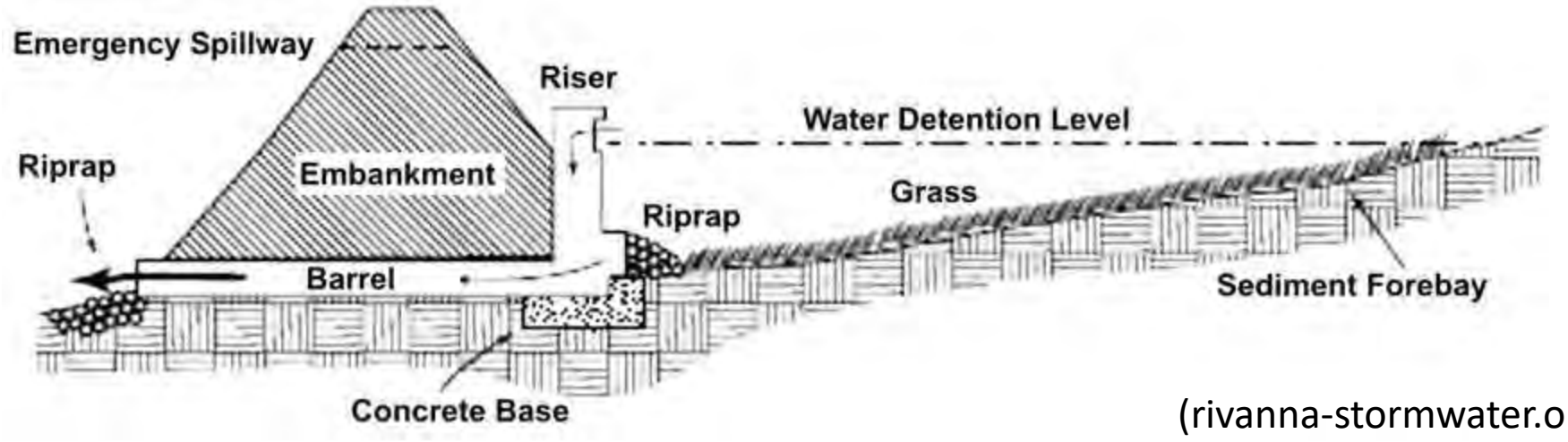
Stormwater Basin Types

- Detention
  - Retains and slowly releases stormwater completely
- Retention
  - Permanently retains water to allow settling while still providing detention
- Infiltration
  - Outlet orifice is raised to allow portion of stormwater to infiltrate into the ground. Provides detention during larger storm events.

What is a Detention Basin?

Detention basins are designed to detain stormwater runoff during a storm and slowly release the stormwater after the storm.

- Prevents downstream flooding
- Removes pollutants only through settling
- Typically goes dry 48-hours after storm
- Usually contains turf grass that is regularly mowed
- Often contain concrete low-flow channel
- Follow old regulation standard



(rivanna-stormwater.org)

Typical Detention Basin

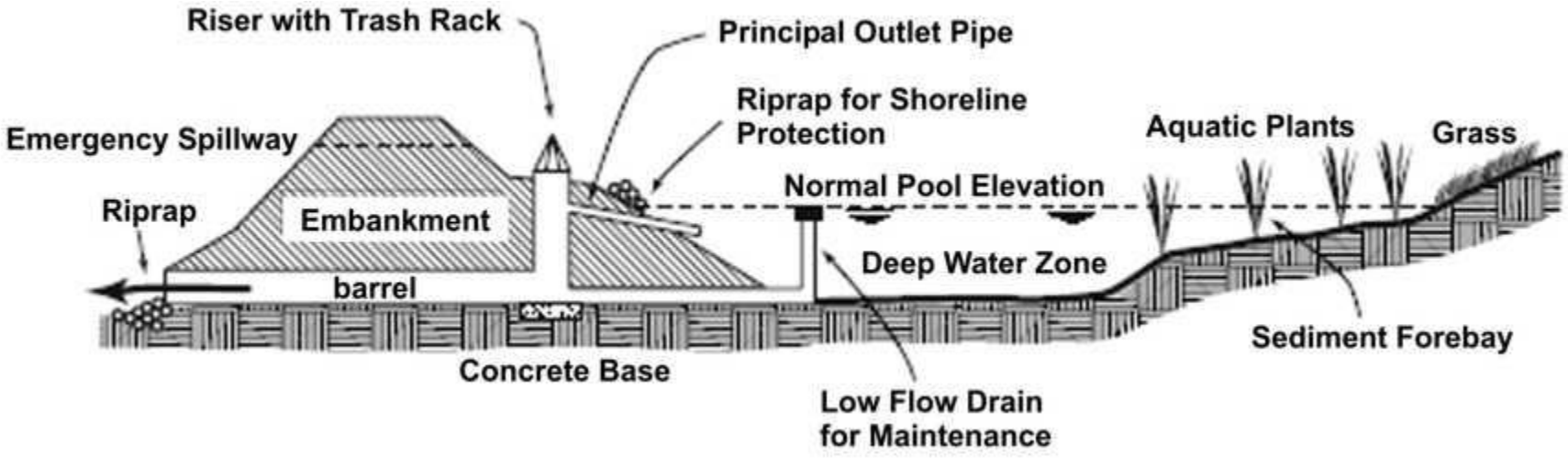
Typical Detention Basin

What is a Retention Basin?

(a.k.a. stormwater ponds, wet retention ponds, wet ponds)

Retention basins maintains permanent pools and stores stormwater runoff on tope of existing standing water.

- Prevents downstream flooding
- Removes pollutants mainly through settling and algal uptake
- Always has a minimum of three feet of standing water
- Often attract lots of geese
- Can require dredging



(rivanna-stormwater.org)

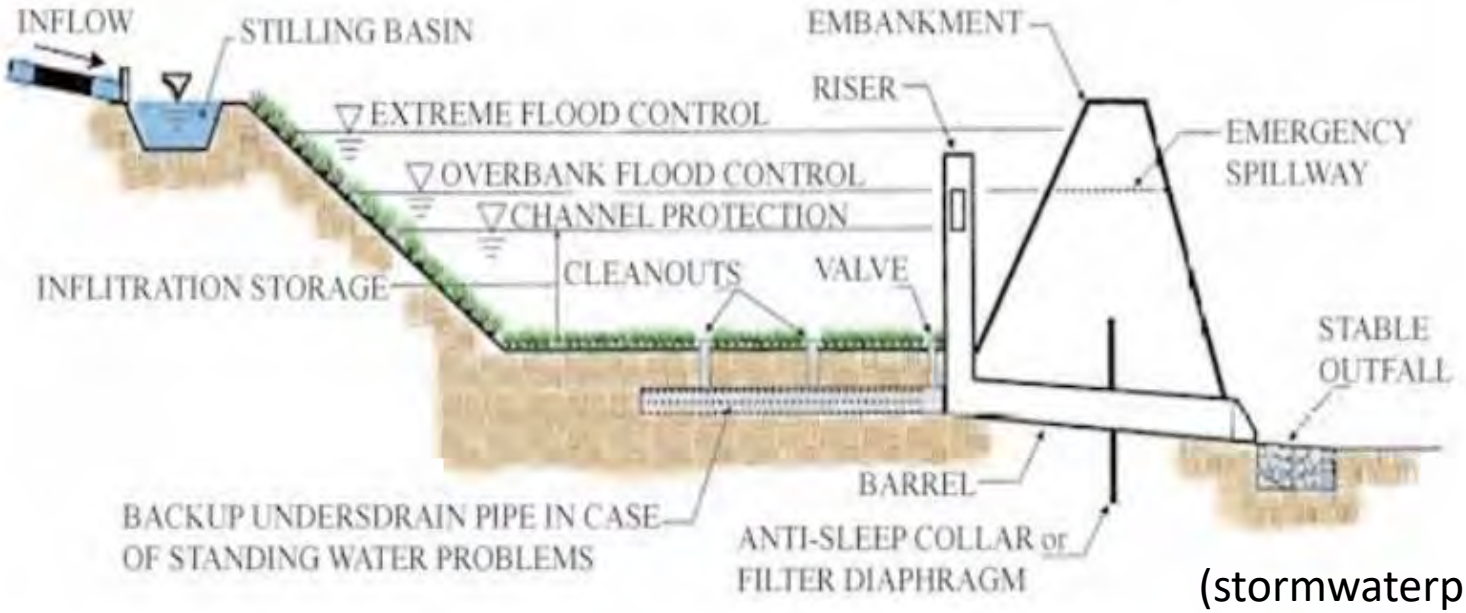
Typical Detention Basin

Typical Retention Basin

What is an Infiltration Basin?

Infiltration basins have a raised outlet structure to allow infiltration with the intention of the system fully draining

- Prevents downstream flooding
- Removes pollutants through infiltration
- Typically dry 48 hours after storm
- Follow more modern regulation standards, but now largely replaced by bioretention systems (similar but with vegetation)



(stormwaterpa.org)

Typical Infiltration Basin

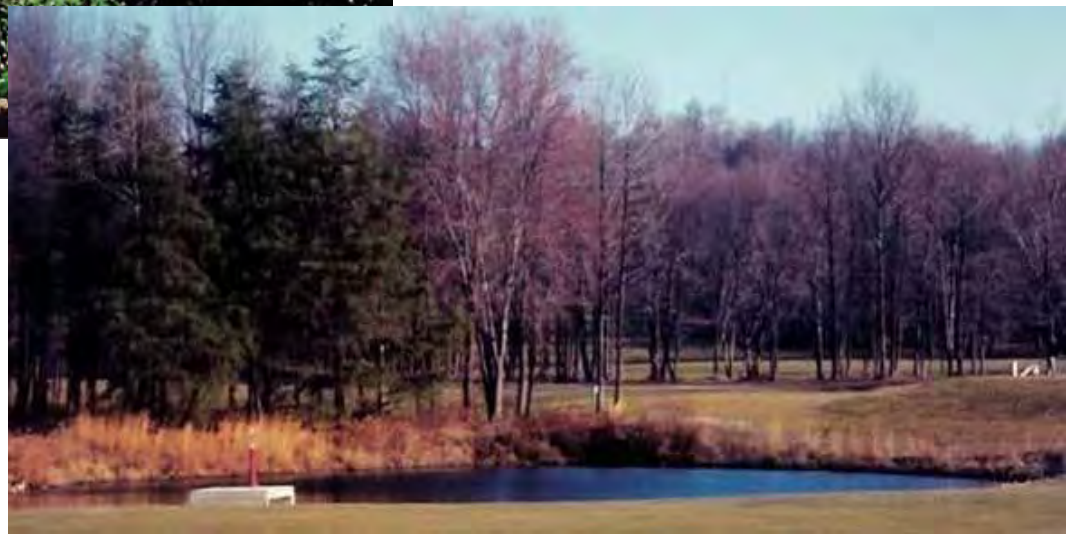
Detention/Infiltration Basin vs. Retention Basin

Does the basin hold a permanent pool of water?

NO – Detention/Infiltration

USEPA

YES – Retention



USEPA

Detention Basin vs. Infiltration Basin

Is the basins primarily outlet at the bottom of the basin or does the basin have a low flow channel?

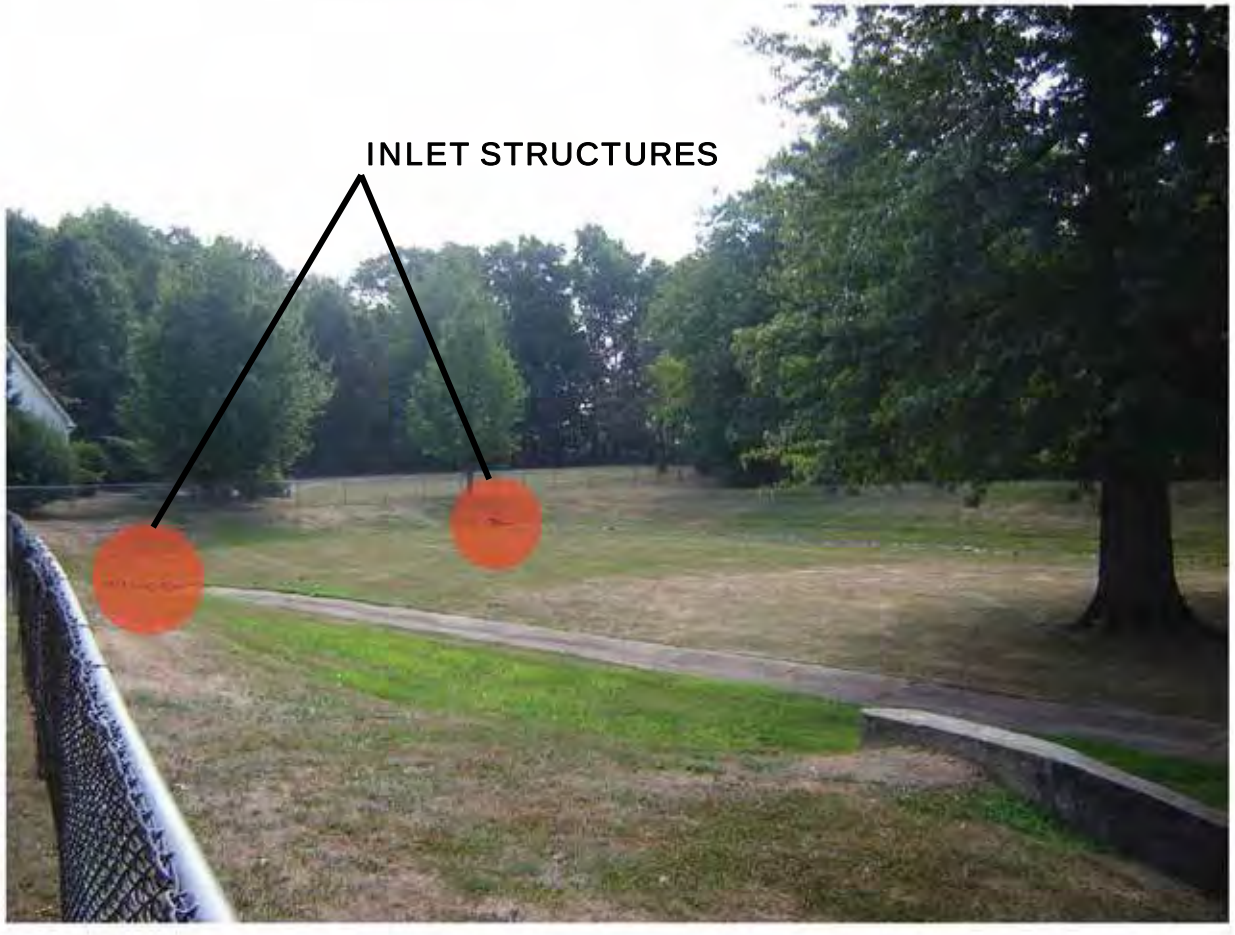
NO – Infiltration

YES – Detention

USEPA

Detention Basin Anatomy

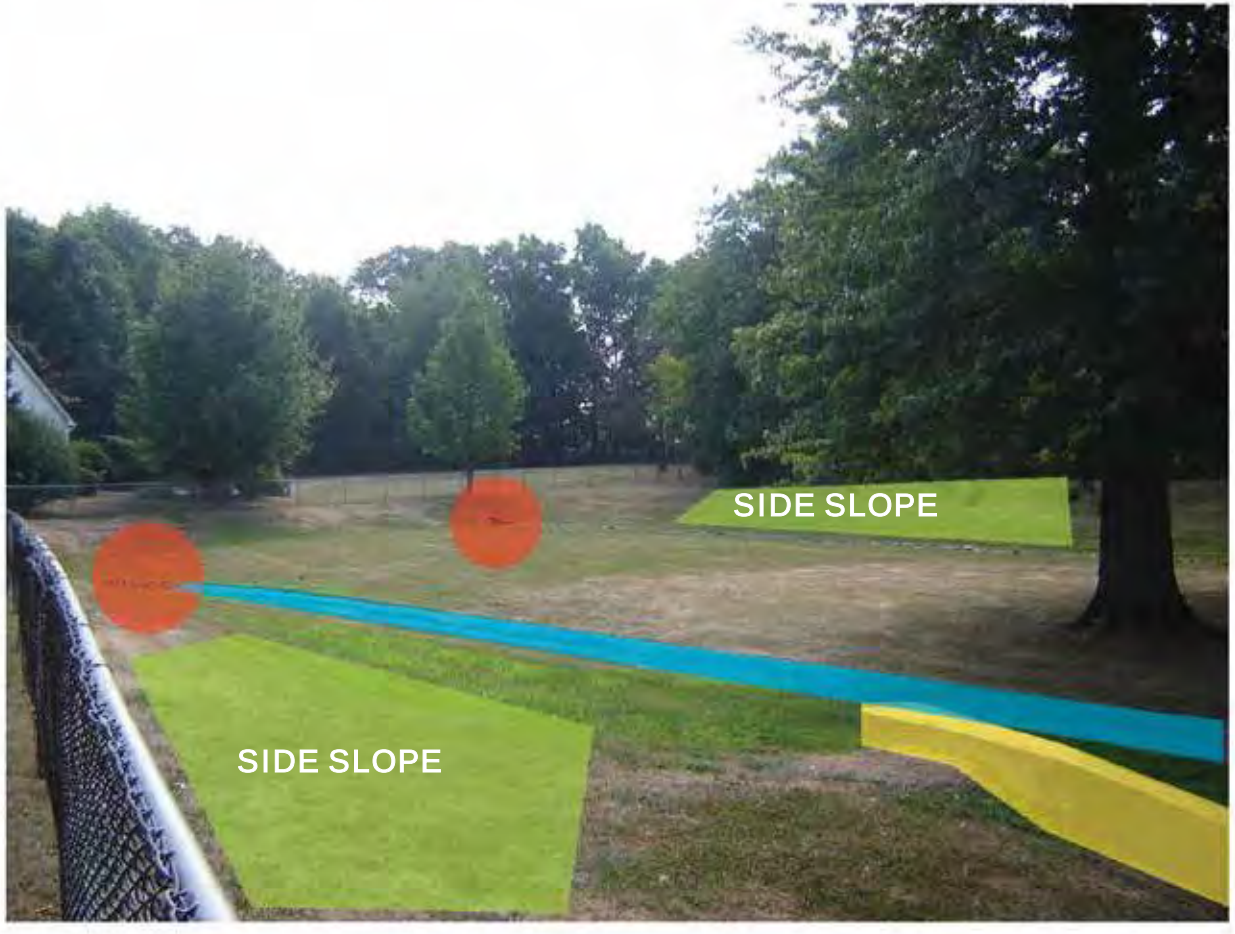
Detention Basin Anatomy



Detention Basin Anatomy

Detention Basin Anatomy

Detention Basin Anatomy



Detention Basin Anatomy

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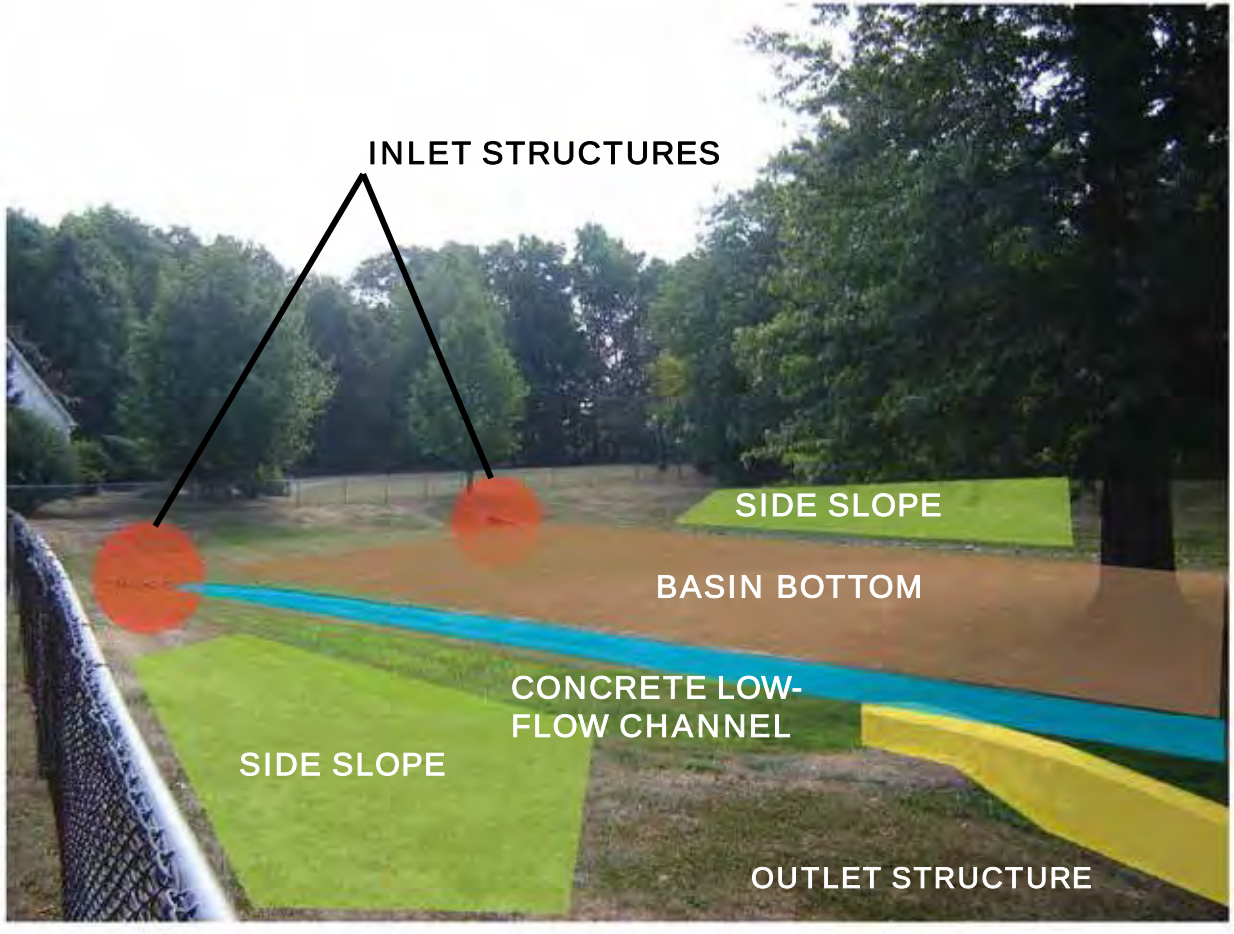

Detention Basin Inspections

- Inspection Frequency
  - Pursuant to approved maintenance plans
  - OR, if there are no approved maintenance plans for certain stormwater infrastructure, the permittee shall inspect that infrastructure at least 4 times annually, and after each rainstorm exceeding 1 inch of total rainfall, unless the NJ Stormwater BMP Manual recommends a less frequent schedule

Detention Basin Inspections

- Is there erosion of the side slopes or basin bottom?
- Is there sediment accumulation in the forebay or basin?
- Are the inlets and outlet devices free of debris and operational?
- Is the concrete low-flow channel clogged or broken?
- Is there standing water?
- Are there floatables accumulated in the basin?
- Is the grass healthy? Are there bare spots? Are there undesirable weeds or woody vegetation?
- Is there evidence of geese?

Who does inspections?

MS4 Permit requires municipalities to ensure that all stormwater facilities (public and private) are being maintained and operating as designed.

- Municipality inspects public facilities
- Municipality require private facilities to be inspected by a stormwater professional
- Annual inspection reports are required

Inspection Form (handout)

Hamilton Township Stormwater Infrastructure
Assessment Program
Stormwater Basin Inspection Checklist

GENERAL INFORMATION	
Name(s) person inspecting the basin:	Site ID: Date:
Location Address and Cross Streets:	Watershed:
Name of Creek, Stream, or area into which the basin discharges:	Property Owner / Tax Parcel Block & Lot:
Contact information:	
STRUCTURAL COMPONENTS	
Basin description, size and depth:	Is the basin accessible to maintain? Yes / No Is it maintained: Mowed, clear of woody plants, inlet/outlet blockages?
Number of inlets:	Outlet diameter:

GENERAL OBSERVATIONS	YES	NO	NOTES/REMARKS
1) Any reports on the basin not functioning?			
2) Are there any unauthorized or malfunctioning structures in the basin?			
3) Are there concrete low flow channels. Is the water entering the basin directly exiting the basin outlet without coming in contact with the basin bottom soil and vegetation?			
4) Is there standing water or evidence of standing water in the basin?			
INLET/S			
1) Signs of breakage, damage, corrosion or rusting of inlet structure/pipe?			
2) Debris or sediment accumulation in or around the inlet clogging the inlet opening/pipe?			
3) Signs of erosion, scour or gullies; rock or vegetation above or around the inlet structure?			
4) Tree roots, woody vegetation growing close to or through the inlet structure or a situation impacting the structure's integrity?			
5) If the inlet has a pretreatment structure (trash rack, forebay) is it filled w/ debris or sediment?			
BASIN			
1) Accumulation of debris or litter within basin?			
2) Exposed dirt or earth visible, are there areas without vegetation or where turf is damaged?			
3) Excess sediment accumulation in the basin?			
4) Basin walls/embankment eroded, slumping, caved or being undermined?			

Hamilton Township Stormwater Infrastructure
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Stormwater Basin Inspection Checklist

OUTLET	YES	NO	NOTES/REMARKS
1) Breakage, damage, corrosion or rusting to outlet pipe or conveyance?			
2) Signs of erosion, scour or gullies; rock or vegetation above or around the outlet structure?			
3) Debris or sediment accumulation in or around the outlet pipe (i.e. debris or sediment)?			
4) Accumulation of debris or litter in or around outlet?			
5) Tree roots or woody vegetation impacting the outlet or causing potential damage to the structure?			
SECONDARY/EMERGENCY OVERFLOW SPILLWAY			
1) Are pipes, conduits, or conveyances free of debris, clogs and in good condition? (i.e. no visible cracks, breakage slumping)			
2) Large tree or root growth close to pipes or conveyances with the potential to crack structure or impede flow?			
3) Signs of erosion, scour or gullies; rock or vegetation above or around the spillway?			
BASIN OUTFALL AREA			
1) Signs of stormwater exiting the basin in an uncontrolled manner over or through wall or berm?			
2) Signs of erosion, scour or gullies; rock or vegetation at or down slope of the outfall?			

RECOMMENDATIONS FOR WATER QUALITY IMPROVEMENTS	
1) Reduce mowing 2) Plant buffers 3) Establish meadows 4) Retrofit with infiltration structures or other strategies 5) Other	

SUMMARY AND NOTES: Identify unique characteristics and/or opportunities

GENERAL INFORMATION	Site ID:
Name(s) person inspecting the basin:	Date:
Location Address and Cross Streets:	Watershed:
Name of Creek, Stream, or area into which the basin discharges:	Property Owner / Tax Parcel Block & Lot:
Contact information:	
STRUCTURAL COMPONENTS	
Basin description, size and depth:	Is the basin accessible to maintain? Yes/No Is it maintained: Mowed, clear of woody plants, inlet/outlet blockages?
Number of inlets:	Outlet diameter:

GENERAL OBSERVATIONS	YES	NO	NOTES/REMARKS
1) Any reports on the basin not functioning?			
2) Are there any unauthorized or malfunctioning structures in the basin?			
3) Are there concrete low flow channels. Is the water entering the basin directly exiting the basin outlet without coming in contact with the basin bottom soil and vegetation?			
4) Is there standing water or evidence of standing water in the basin?			

INLET/S	YES	NO	NOTES/REMARKS
1) Signs of breakage, damage, corrosion or rusting of inlet structure/pipe?			
2) Debris or sediment accumulation in or around the inlet clogging the inlet opening/pipe?			
3) Signs of erosion, scour or gullies; rock or vegetation above or around the inlet structure?			
4) Tree roots, woody vegetation growing close to or through the inlet structure or a situation impacting the structure's integrity?			
5) If the inlet has a pretreatment structure (trash rack, forebay) is it filled w/ debris or sediment?			

BASIN	YES	NO	NOTES/REMARKS
1) Accumulation of debris or litter within basin?			
2) Exposed dirt or earth visible, are there areas without vegetation or where turf is damaged?			
3) Excess sediment accumulation in the basin?			
4) Basin walls/embankment eroded, slumping, caved or being undermined?			

OUTLET	YES	NO	NOTES/REMARKS
1) Breakage, damage, corrosion or rusting to outlet pipe or conveyance?			
2) Signs of erosion, scour or gullies; rock or vegetation above or around the outlet structure?			
3) Debris or sediment accumulation in or around the outlet pipe (i.e. debris or sediment)?			
4) Accumulation of debris or litter in or around outlet?			
5) Tree roots or woody vegetation impacting the outlet or causing potential damage to the structure?			

SECONDARY/EMERGENCY OVERFLOW SPILLWAY	YES	NO	NOTES/REMARKS
1) Are pipes, conduits, or conveyances free of debris, clogs and in good condition? (i.e. no visible cracks, breakage slumping)			
2) Large tree or root growth close to pipes or conveyances with the potential to crack structure or impede flow?			
3) Signs of erosion, scour or gullies; rock or vegetation above or around the spillway?			

BASIN OUTFALL AREA	YES	NO	NOTES/REMARKS
1) Signs of stormwater exiting the basin in an uncontrolled manner over or through wall or berm?			
2) Signs of erosion, scour or gullies; rock or vegetation at or down slope of the outfall?			

RECOMMENDATIONS FOR WATER QUALITY IMPROVEMENTS	
1) Reduce mowing 2) Plant buffers 3) Establish meadows 4) Retrofit with infiltration structures or other strategies 5) Other	
SUMMARY AND NOTES: Identify unique characteristics and/or opportunities	

Types of Maintenance

- Routine Maintenance
  - Vegetation management
  - Debris and litter removal
  - Mechanical components maintenance
- Non-Routine Maintenance
  - Stabilization and erosion control repairs
  - Sediment removal
  - Outlet repair or replacement

Routine Maintenance

Routine Maintenance Requirements

- Vegetation management
  - Mowing should be done where/when it is needed (traditionally, 10-14 times per year)
  - Effective groundcovers must be kept healthy to prevent erosion and damage to the system
- Debris and litter removal
  - Inlets and outlets should be regularly cleared of debris and litter to prevent obstructions and reduced efficiency of the system
- Mechanical components maintenance
  - All mechanical equipment, such as gates, valves, locks, or other components must be kept in working order should an emergency arise

Routine Maintenance

Routine Maintenance for Mechanical Components

- Regular inspections will reduce need for major replacements

Reducing Routine Maintenance

- Vegetation management
  - Reduce need for mowing
  - Eliminate any use of commercial fertilizers and pesticides in stormwater management facilities

- Debris and litter removal
  - Install simple low-cost retrofits or catch basins near the discharge the detention system

- Mechanical components maintenance
  - Regular inspections and immediate repairs will reduce need for major replacements

Non-Routine Maintenance

Non-Routine Maintenance

- Stabilization and erosion control repairs
  - If vegetation fails on embankments or in the basin, soil replacement, reseeding and stabilization should occur immediately
- Sediment removal
  - During the establishment of a new basin, the basin should be inspected for excessive sedimentation. After establishment, the basin should be inspected twice a year and excessive sediment accumulated in the basin should be removed.
- Outlet repair or replacement
  - Should the system stop functioning as designed the outlet structure may require repair or replacement

Non-Routine Maintenance

Reducing Costs for Non-Routine Maintenance

- Stabilization and erosion control repairs
  - Ensure basin designs do not incorporate steep embankments (greater than 3:1)
  - Maintain healthy groundcovers by not mowing basin areas to less than 4 inches in height
- Sediment removal
  - Install manufactured pre-treatment device prior to stormwater discharging to basins
  - Install a settling forebay near inlets where access can be provided and reached with available excavation equipment
- Outlet repair or replacement
  - Conduct regular inspections to ensure system is functioning properly and debris and litter are not clogging the outlet
  - Provide and maintain clear access to all structures of the system

Stabilization and Erosion Control Repairs

- Ensure basin designs due not incorporate steep embankments (greater than 3:1)
- Maintain healthy groundcovers by not mowing basin areas to less than 4 inches in height

Sediment Removal

Manufactured Pre-Treatment Systems

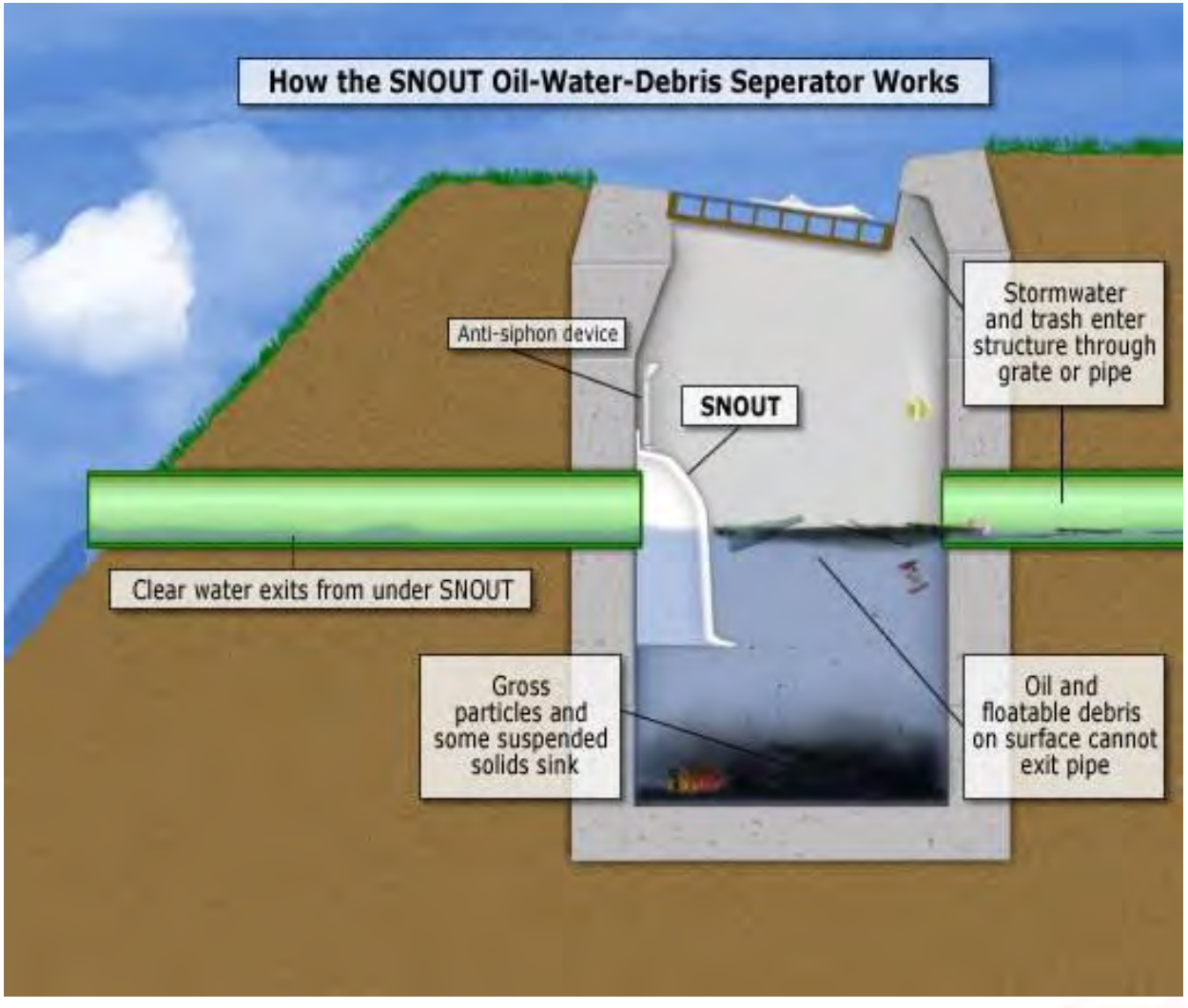
- Intended to capture sediments, metals, hydrocarbons, floatables, and/or other pollutants in stormwater runoff before being conveyed to a storm sewer system, additional stormwater quality treatment facility, or waterbody.

- Adequate for small drainage areas that contain a predominance of impervious cover that is likely to contribute high hydrocarbon and sediment loadings, such as small parking lots and gas stations. For larger sites, multiple devices may be necessary.

- Devices are normally used for pre-treatment of runoff before discharging to other, more effective stormwater quality treatment facilities.

Debris and Litter Removal

Low Cost “Snout” Debris Separator



Debris and Litter Removal

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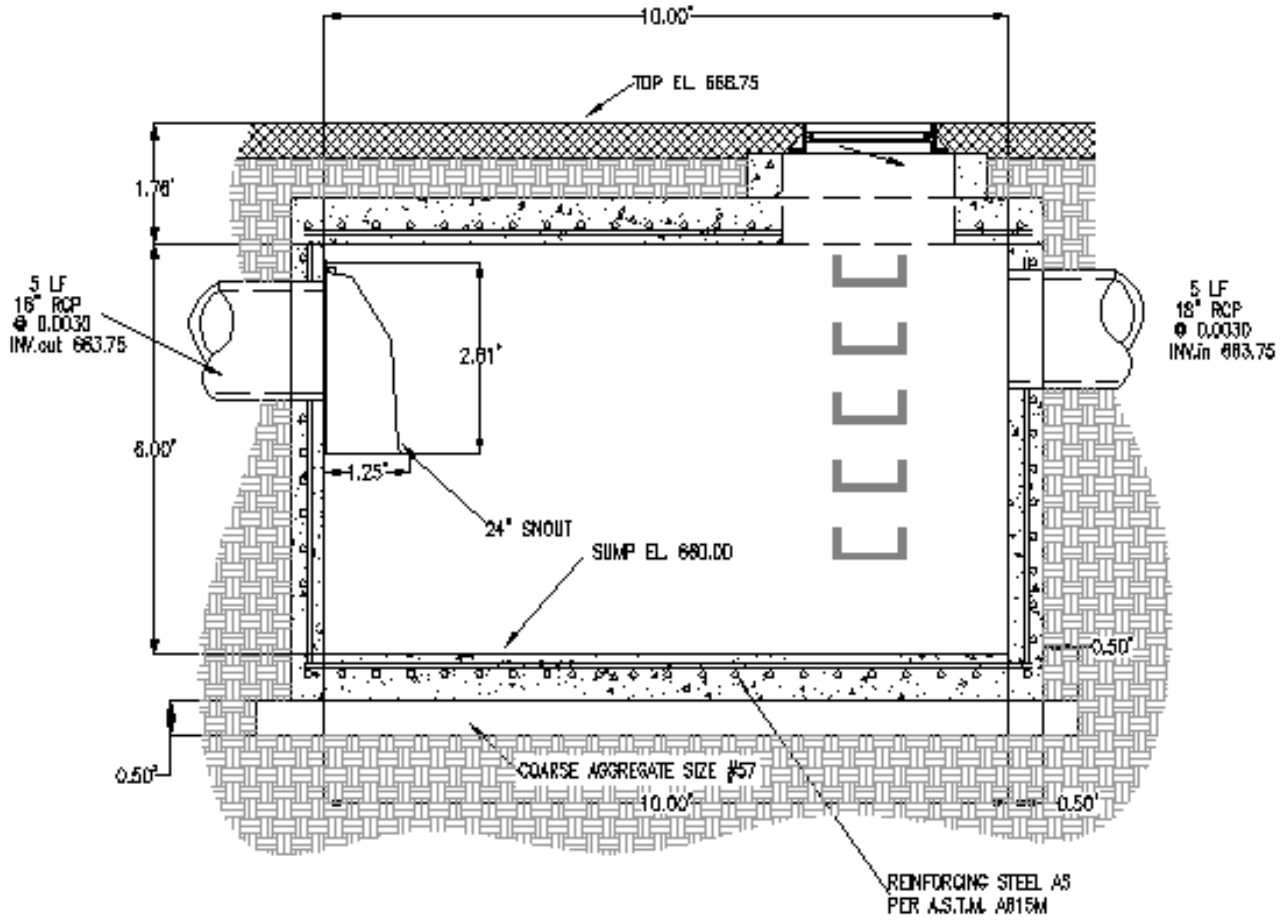
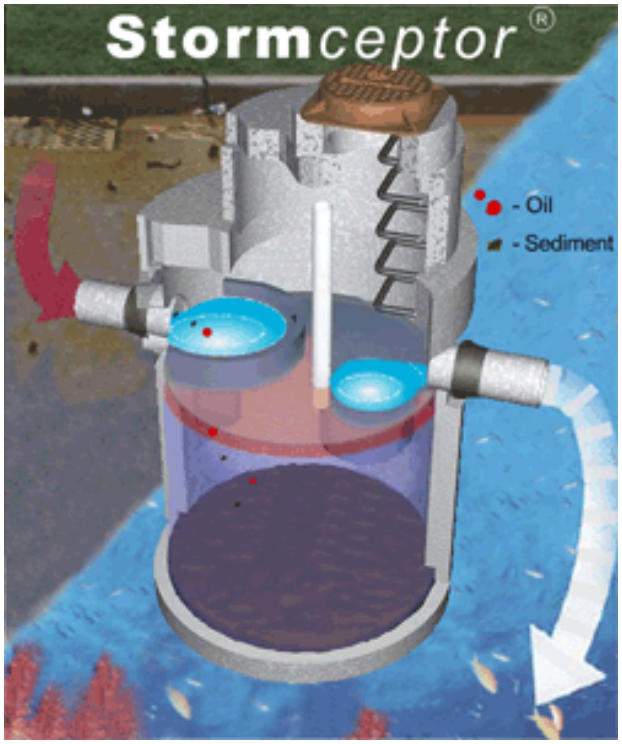
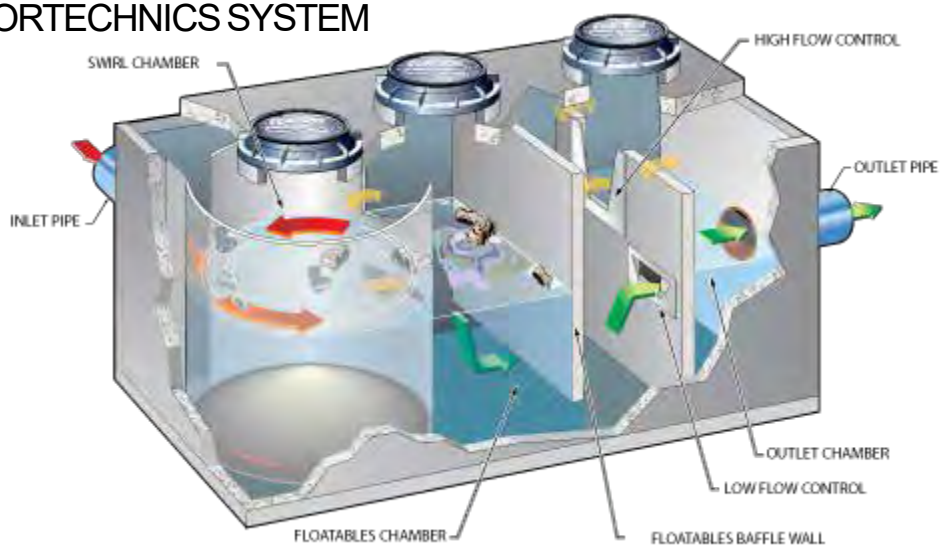
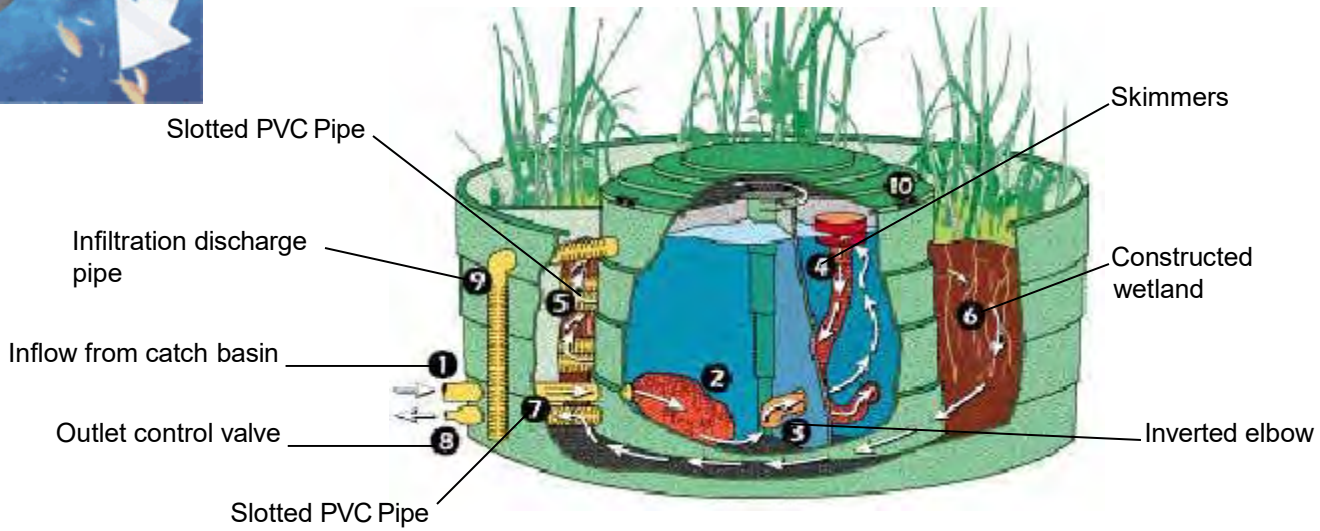


Manufactured Pre-Treatment Systems



VORTECHNICS SYSTEM





Outlet Repair or Replacement

- Conduct regular inspections to ensure system is functioning properly and debris and litter are not clogging the outlet
- Provide and maintain clear access to all structures of the system

Review

- Catch basin **inlet grates** should be inspected annually to ensure function.

- **Catch basins** themselves need to be inspected once every five years and maintained as needed. This data should be collected digitally and submitted to the Engineering Department.

- **Detention/Retention/Infiltration Basins** need to be inspected and certified to be working annually based on Maintenance Manual. Forms should be compiled and submitted to the Engineering Department.

- Other stormwater infrastructure also needs to be inspected and certified functioning as needed
  - Outfalls are currently being inspected by Rutgers WRP. These also need to be inspected every five years for structural integrity, erosion control, and illicit discharge connections. Repairs need to be scheduled and completely in a timeline approved by DEP.
  - Storm sewer piping should be regularly inspected (not specifically defined) and effort should be made to resolve any issues with the storm sewer system.

QUESTIONS?

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