Post-Construction Infiltration Practices Table 4b

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Table 4b Infiltration Post-Construction Practices with Maximum Drain Times

Infiltration Practices	**Maximum Drain Time of WQv**
Bioretention Area/Cell[1,2]	24 hours
Infiltration Basin[2]	24 hours
Infiltration Trench[3]	48 hours
Permeable Pavement – Infiltration[3]	48 hours
Underground Storage – Infiltration[3,4]	48 hours

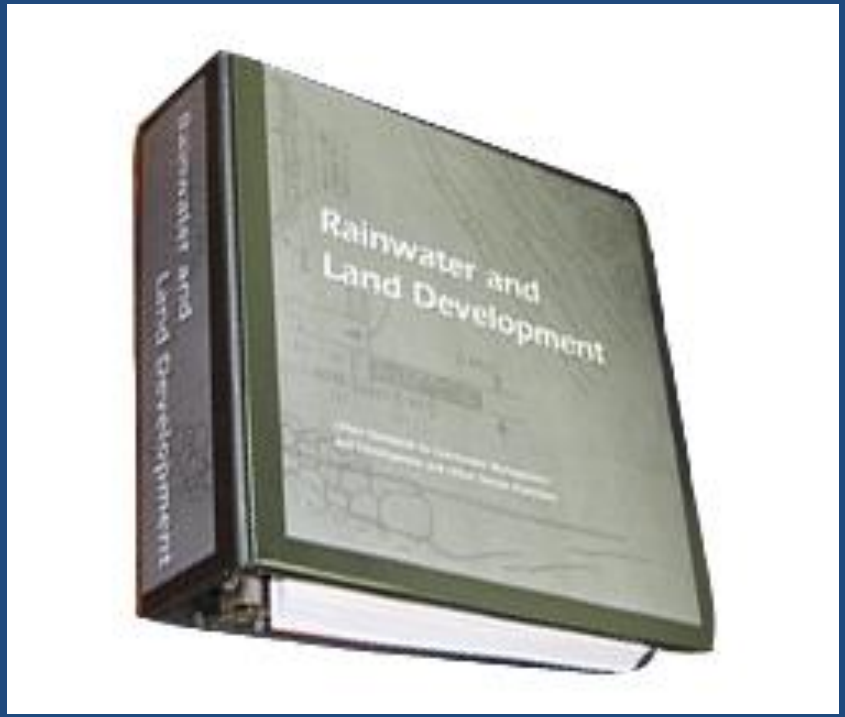
- What did the Construction General Permit change?
- What changed in the ***Rainwater*** manual?
- Key design considerations
- Common issues/challenges

What did the permit change ?

- Underground infiltration system added as pre-approved post-construction WQv treatment practice
- Updated criteria for maximum WQv drain time
  - Practices (bioretention, infiltration basin) with surface storage of WQv must drain within 24 hours
  - Practices (infiltration trench, permeable pavement, underground infiltration system) with subsurface storage of WQv must drain within 48 hours

Rainwater Manual

For brevity the ***Rainwater and Land Development Manual*** will be referred to as the ***Rainwater*** manual

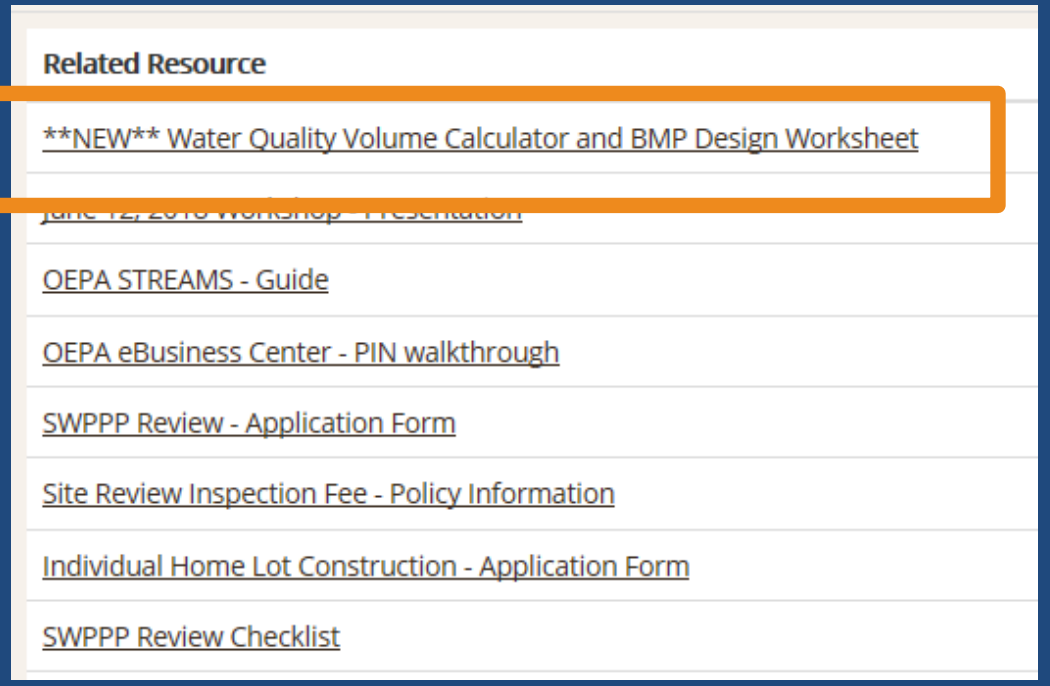


http://epa.ohio.gov/dsw/storm/technical_guidance

WQv Compliance Spreadsheet

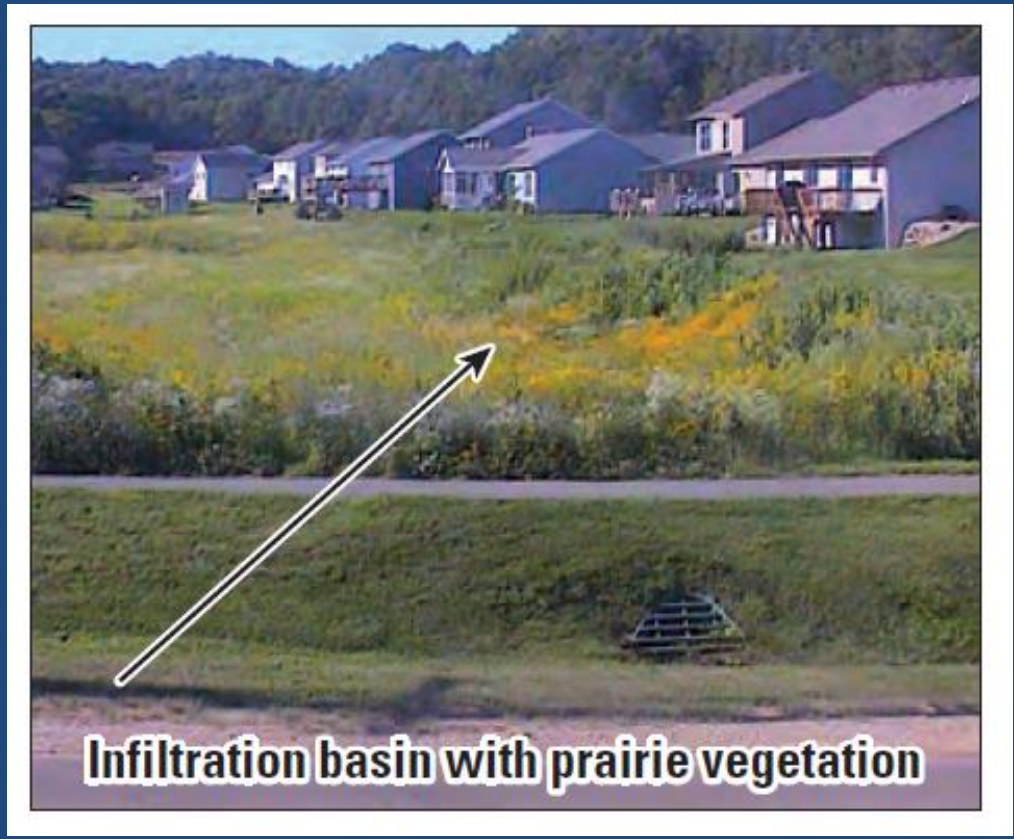
Available for download at Summit SWCD website:

https://sswcd.summitoh.net/



Infiltration Basin

Source: Minnesota Pollution Control Agency



Source: Selbig and Bannerman, 2008

Infiltration Basin

What did the permit change?

- BMPs with WQv stored aboveground must fully drain within 24 hours (48 hours in previous permit)

What is changing in the Rainwater manual?

- Practice will be added to Rainwater manual - provisional practice available

Infiltration Basin

Key Design Considerations

- Soil infiltration rate (Ksat) $\geq$ 0.50 in/hr
  - Sites with gravelly soils or coarse sands (e.g., glacial outwash soils; typically Ksat $\geq$ 4 in/hr) will not provide adequate runoff treatment to prevent groundwater contamination. These sites require placement of a 12” (minimum) bioretention media filter on the infiltration bed to provide the necessary water quality treatment.

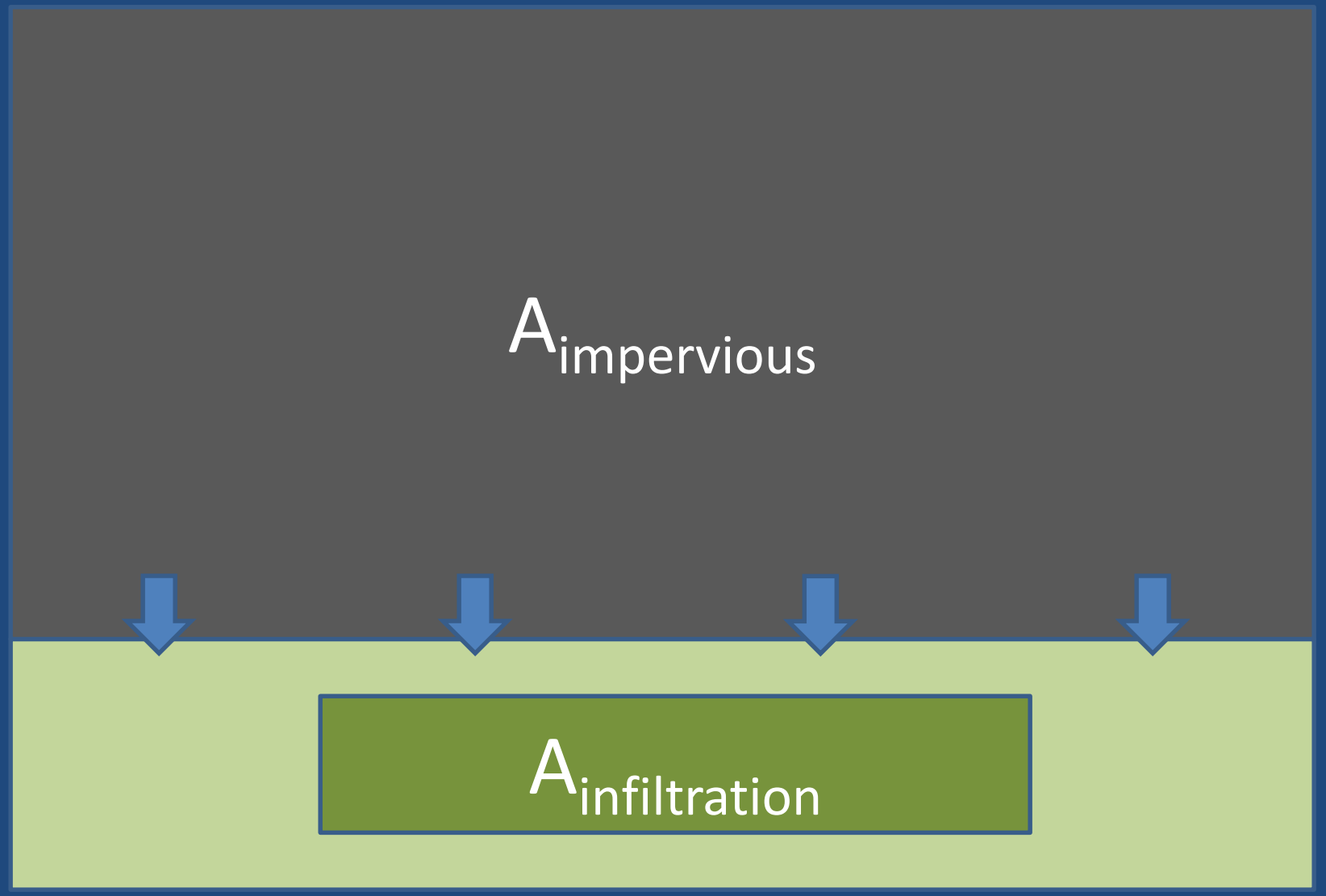
Infiltration Basin

Key Design Considerations

- Soil infiltration rate (Ksat) $\geq$ 0.50 in/hr
- Minimum infiltration area ($A_{infiltration} > 0.05 * A_{impervious}$)

Minimum Infiltration Area

$A_{infiltration} > 0.05 * A_{impervious}$



Infiltration Basin

Key Design Considerations

- Soil infiltration rate (Ksat) $\geq$ 0.50 in/hr
- Minimum infiltration area ($A_{infiltration} > 0.05 * A_{impervious}$)
- Pretreatment

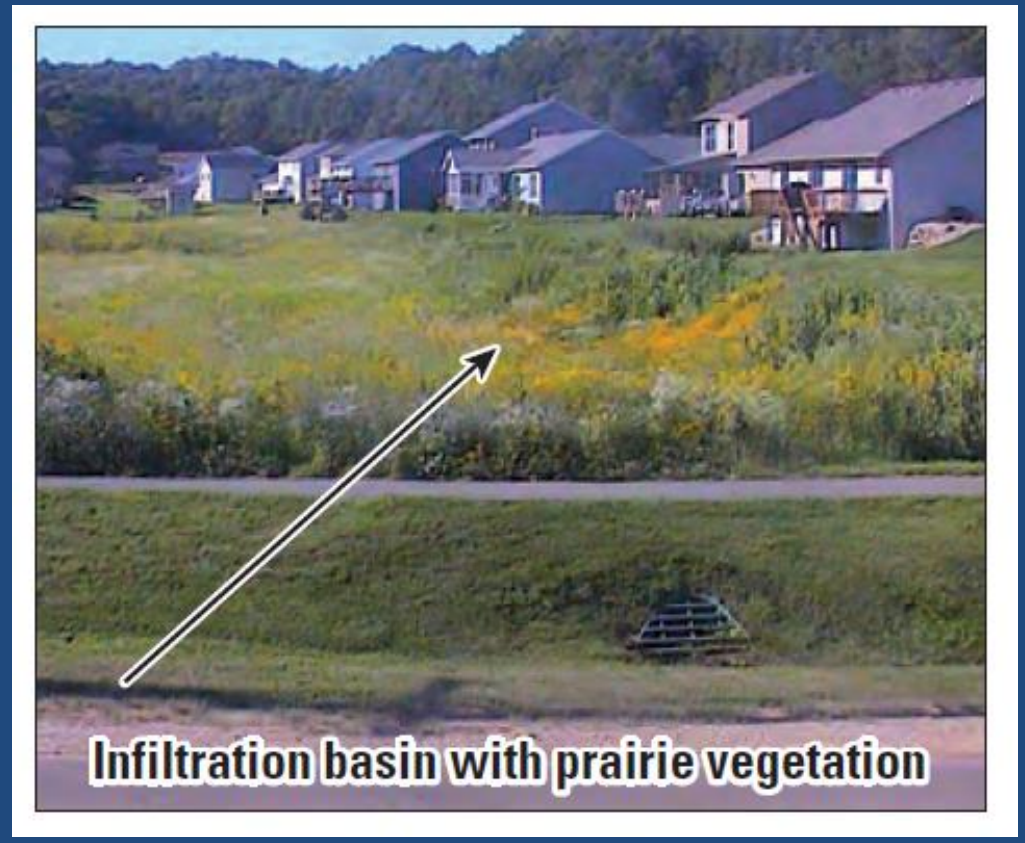
Infiltration Basin

Key Design Considerations

- Soil infiltration rate (Ksat) $\geq$ 0.50 in/hr
- Minimum infiltration area ($A_{infiltration} > 0.05 * A_{impervious}$)
- Pretreatment
- Vegetation selection

Vegetation Selection

Source: Minnesota Pollution Control Agency



Source: Selbig and Bannerman, 2008

Infiltration Basin

Common Issues and Challenges

- Grading
- Clogging due to sediment
  - Construction phasing

Clogging Due to Sediment

Source: Brian Prunty, Summit SWCD

Infiltration Basin

Common Issues and Challenges

- Grading
- Clogging due to sediment
- Maintenance
  - Vegetation management

Maintenance

Vegetation Maintenance

Source: Minnesota Pollution Control Agency

Source: Hydro International

Infiltration Trench

Source: Scott Sonnenberg

Infiltration Trench

What did the permit change ?

- Nothing

What changed or will be changing in the Rainwater Manual ?

- Established minimum infiltration area Ainf > 0.05*Aimp
- Adjusted Ksat range (0.5 in/hr to 4.0 in/hr)

Infiltration Trench

Key Design Considerations

- Soil infiltration rate (Ksat) $\geq$ 0.50 in/hr
- Minimum infiltration area ($A_{infiltration} > 0.05 * A_{impervious}$)
- Pretreatment

Pretreatment

Source: Scott Sonnenberg

Pretreatment

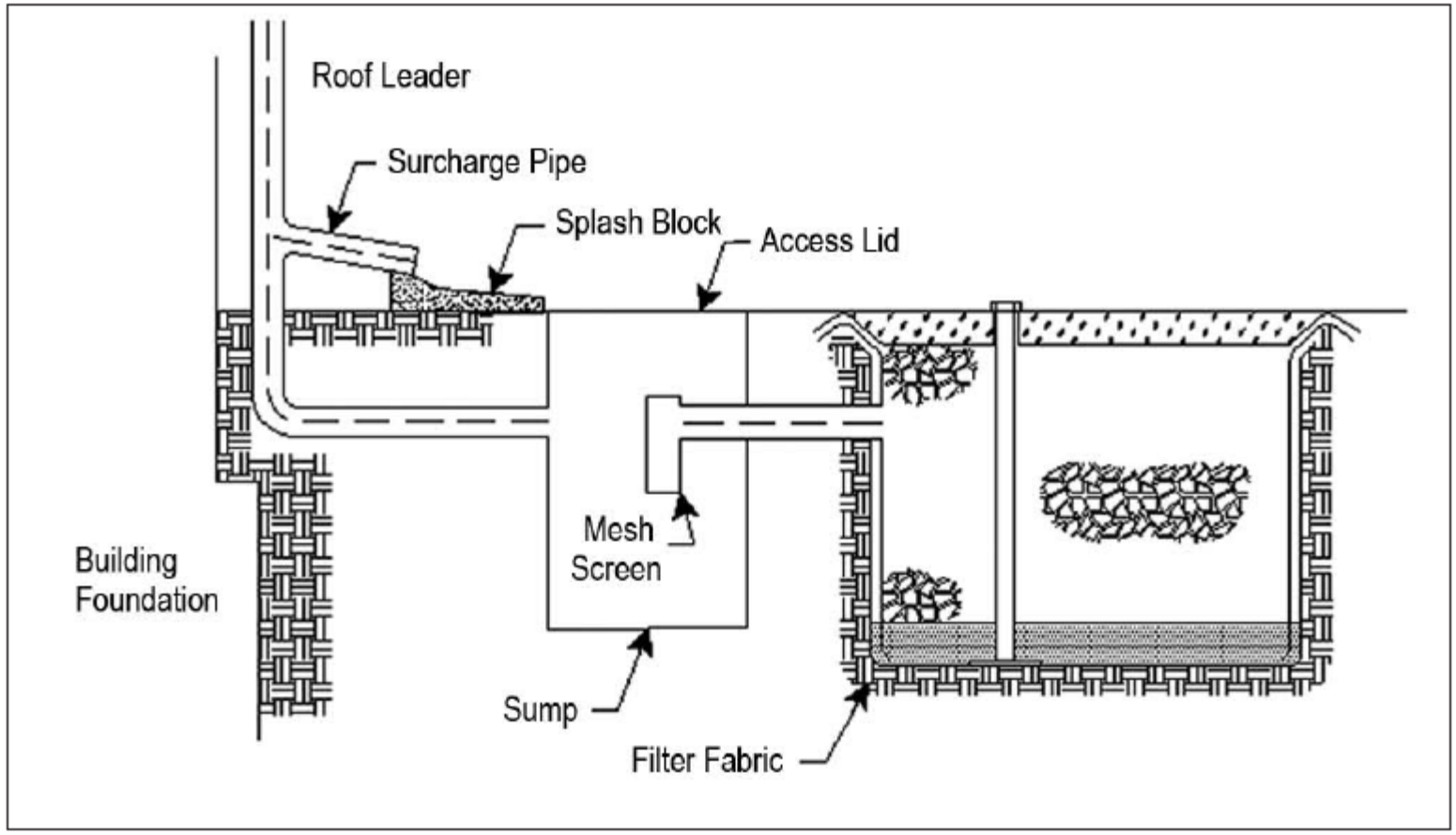


Figure 2.7.1 Underground pretreatment facility and infiltration trench for treating rooftop runoff.

Infiltration Trench

Common Issues and Challenges

- Installed in soils with low infiltration capacity – trenches do not de-water and by-pass WQv

Infiltration Trench

Common Issues and Challenges

- Installed in soils with low infiltration capacity – trenches do not de-water and by-pass WQv
- Clogging due to sediment

Bioretention

What did the permit change?

- BMPs with WQv stored aboveground must fully drain within 24 hours
- Set Ksat range of 1 – 4 in/hr – assumed to be met if the bioretention soil media meets specifications in the Rainwater manual
- Underdrain required for most situations

What changed or will be changing in the Rainwater manual?

- Will be minor tweaks to soil specification, outlet configurations

Bioretention

Key Design Considerations

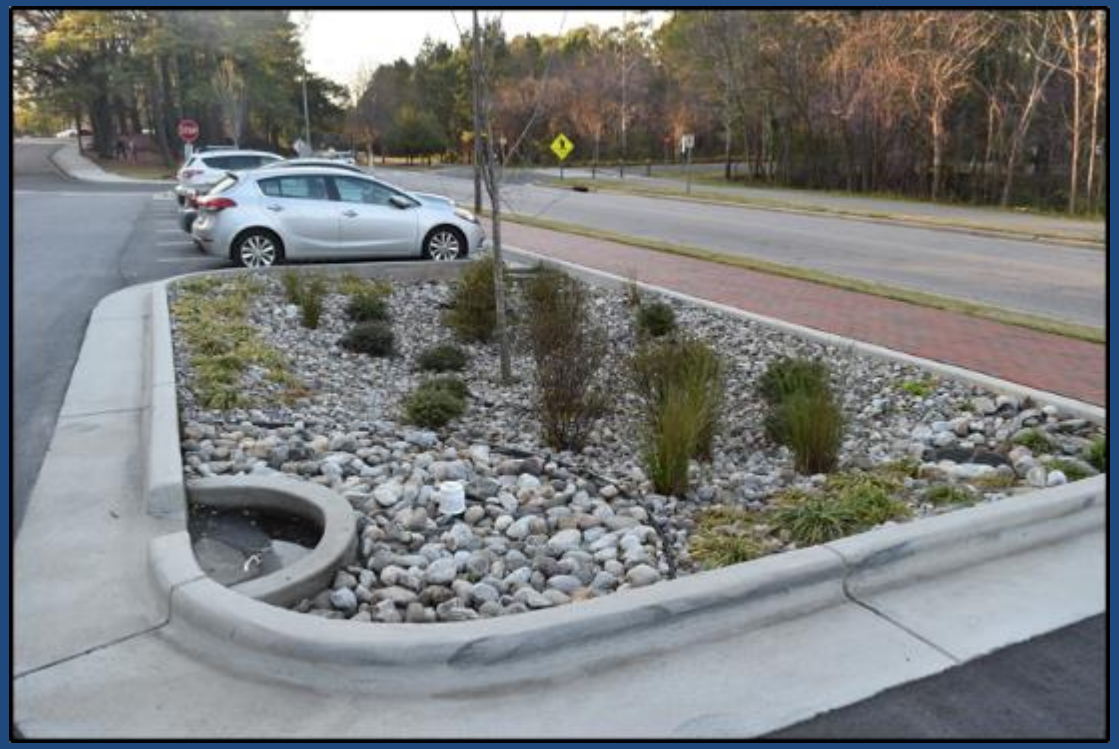
- Minimum infiltration area ($A_{infiltration} > 0.05 * A_{impervious}$)
- Pretreatment
- Stable discharge of runoff to bioretention cell surface
- Internal water storage
- Soil media specification
- Vegetation selection

Bioretention

Key Design Considerations

- Minimum infiltration area ($A_{infiltration} > 0.05 * A_{impervious}$)
- **Pretreatment**
- **Stable discharge of runoff to bioretention cell surface**
- Internal water storage
- Soil media specification
- Vegetation selection

Concentrated Flow Inlets

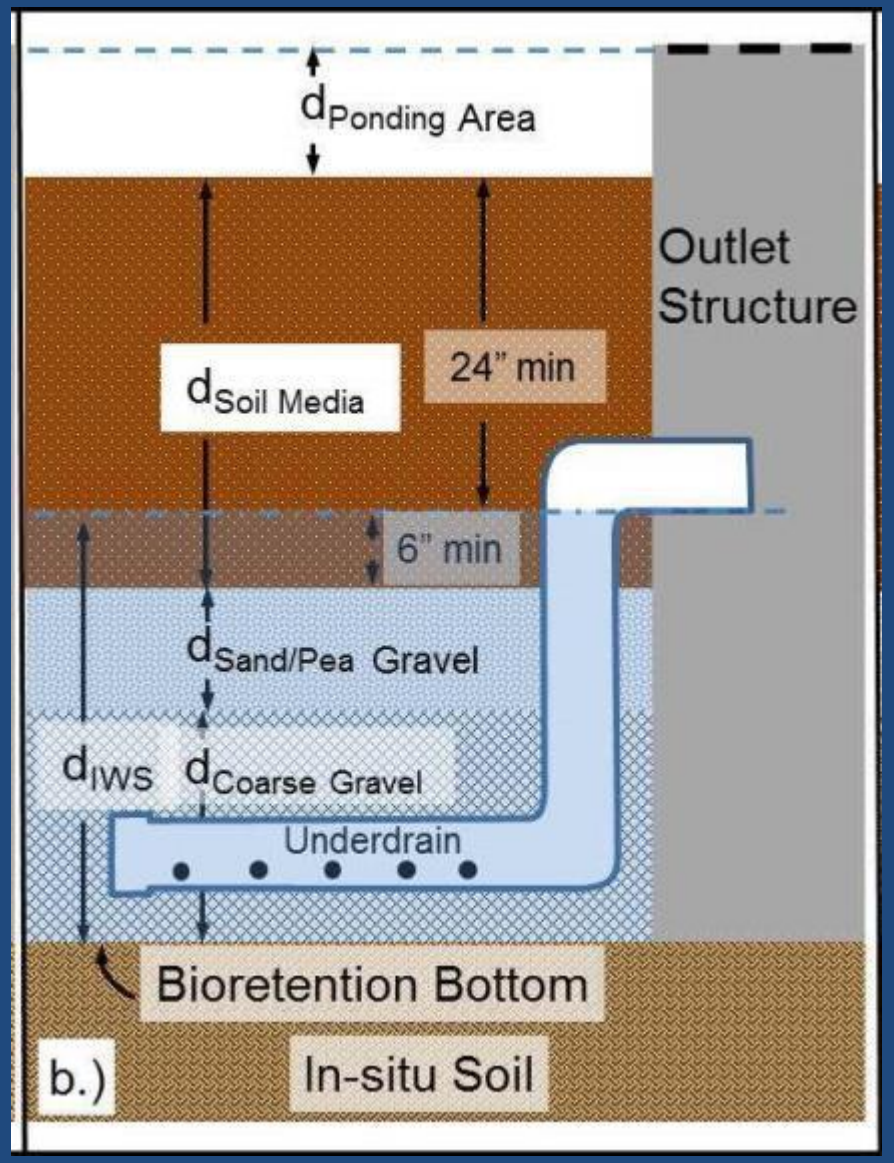


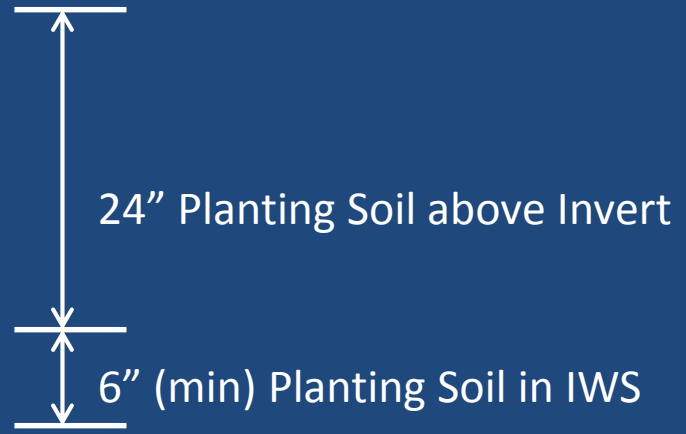
Bioretention

Key Design Considerations

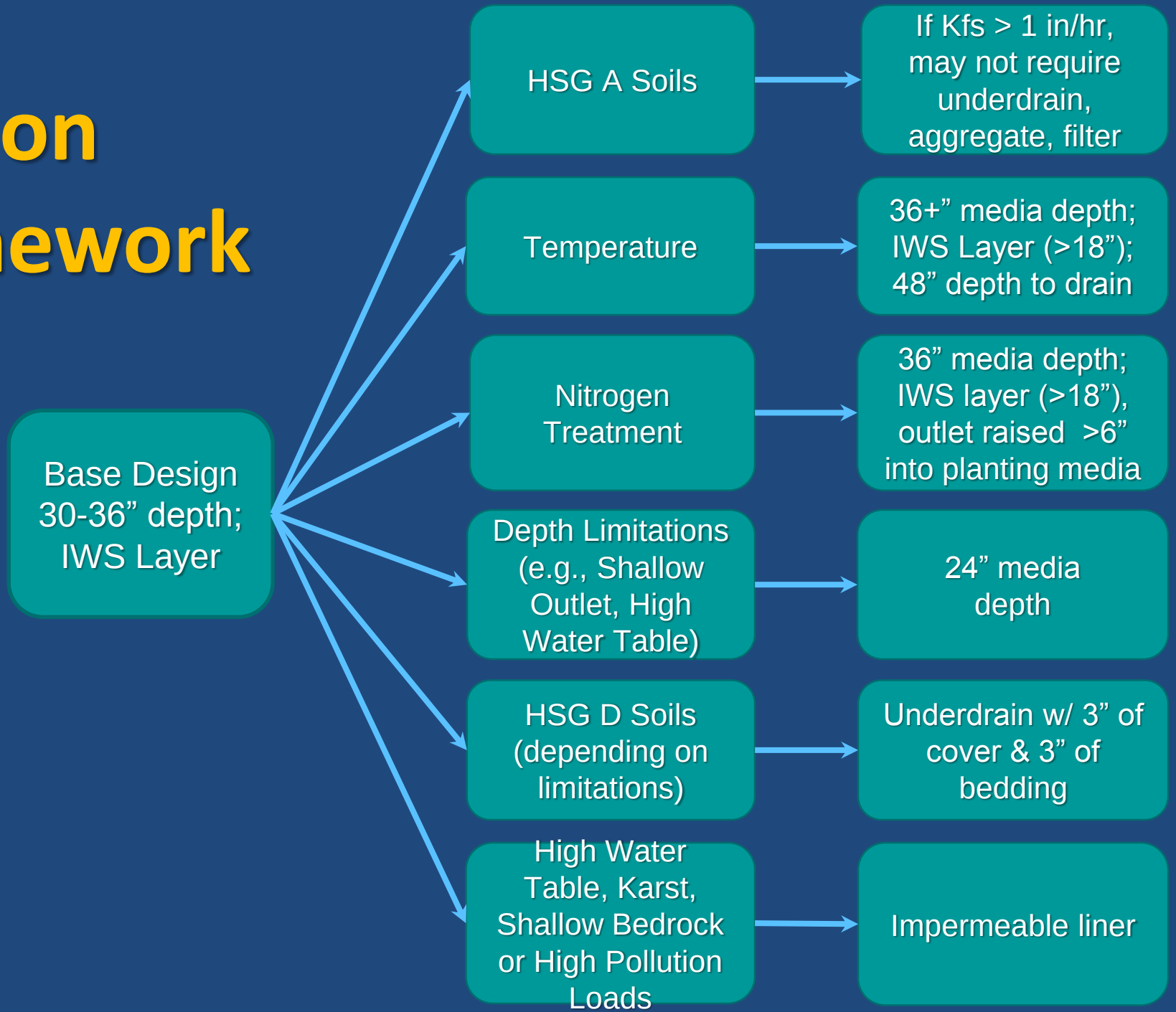
- Minimum infiltration area ($A_{infiltration} > 0.05 * A_{impervious}$)
- Pretreatment
- Stable discharge of runoff to bioretention cell surface
- **Internal water storage**
- Soil media specification
- Vegetation selection

Base Bioretention Configuration with Internal Water Storage





Bioretention Decision Framework



Bioretention

Common Issues and Challenges

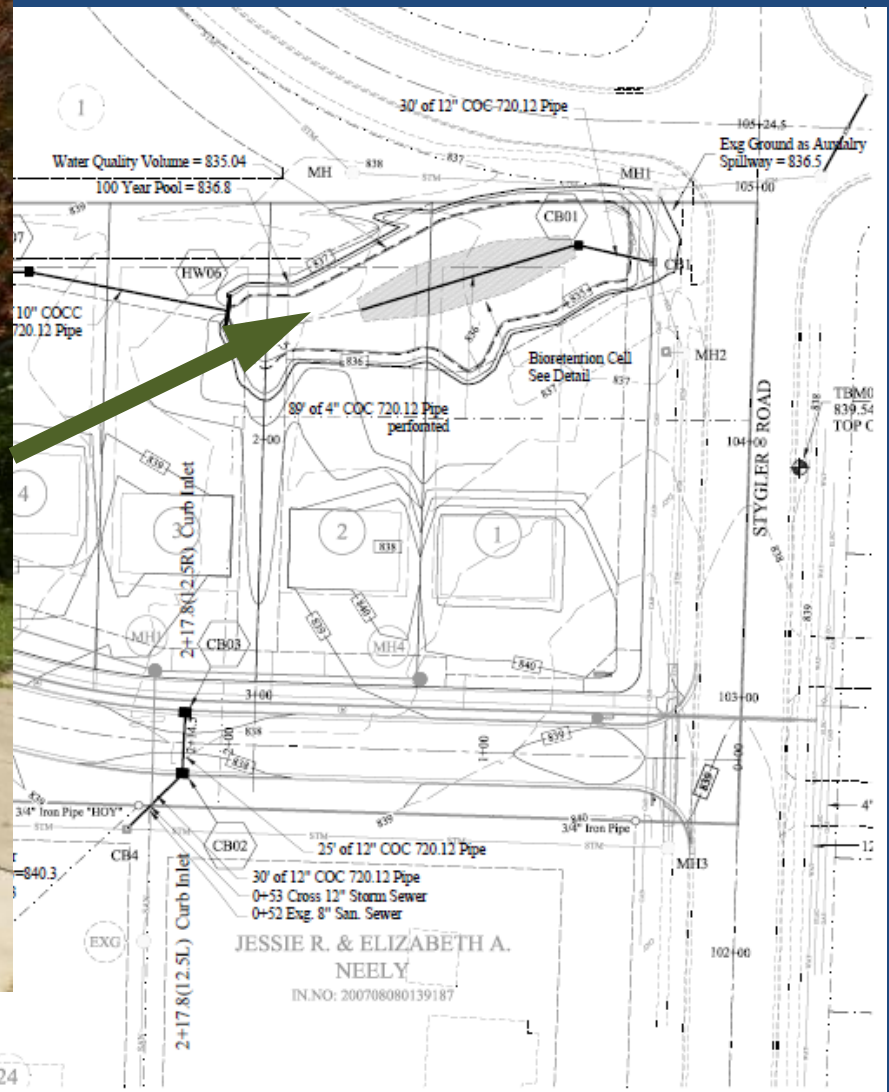
- Construction contractor unfamiliarity with purpose/key components
  - Construction oversight helps!

Bioretention

Common Issues and Challenges

- Construction contractor unfamiliarity with purpose/key components
- Bioretention soil doesn’t meet specifications
- Clogging due to sediment
- Maintenance
  - Unfamiliarity with bioretention plants
  - Overmulching

Bioretention in Peak Control Basin



Bioretention in Peak Control Basin

Oak Grove Subdivision, Columbus, Ohio
Engineer: Casey Elliot, Conservation Technologies

Underground Infiltration System

Source: Philadelphia Water Department

Underground Infiltration System

What did the permit change ?

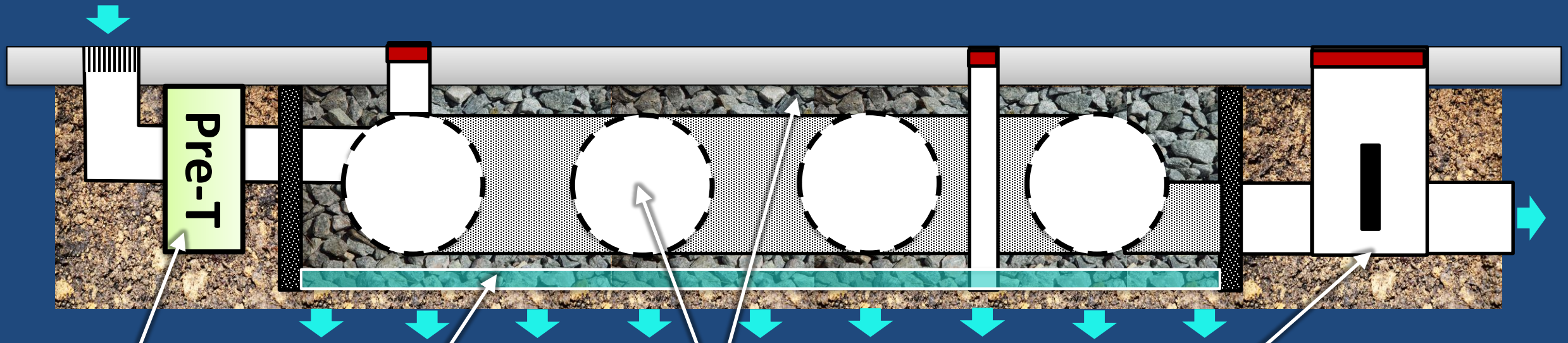
- Underground stormwater management systems (USMS) – both infiltrating and extended detention systems - are a standard practice pre-approved for general use
- Pretreatment required that is certified to provide 80% TSS removal for infiltrating USMS

What will be changing in the *Rainwater* manual ?

- Practice will be added to *Rainwater* manual - provisional practice available

Underground Infiltration System

Open System



80% TSS @ WQF

WQv @ d ≤ IWS

No Sediment Storage

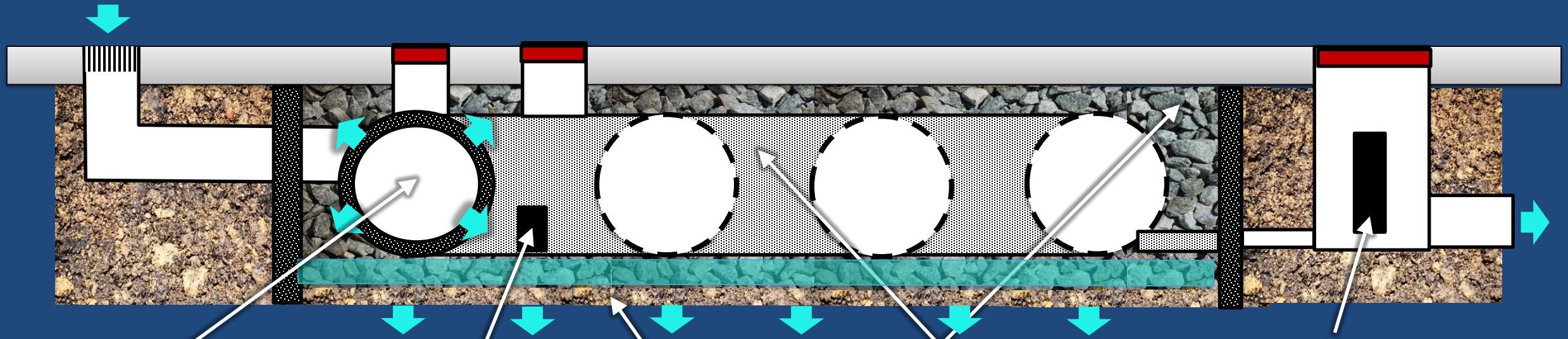
Flood Control Volume

Verified Infl. Rate

Flood Control Outlet

Underground Infiltration System

Pretreatment Chamber w/ Open System



Pretreatment Chamber 80% @ WQF & 20% Sediment Storage

WQf Diversion

WQv @ d ≤ IWS No Sediment Storage

Flood Control Vol.

Verified Infl. Rate

Flood Control & Overflow Outlets

Underground Infiltration System

Key Design Considerations

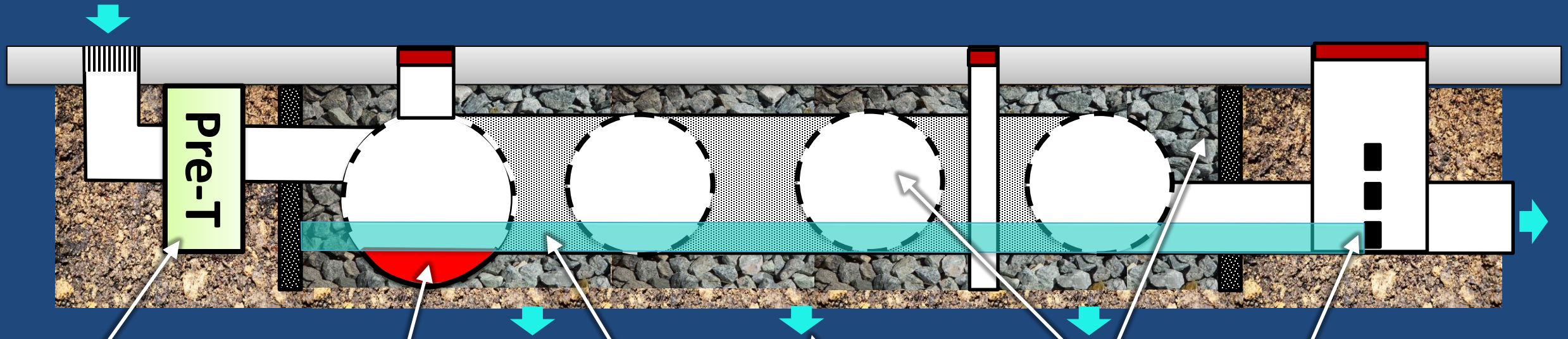
- Pretreatment

Pretreatment

- Pretreatment certified to achieve 80% TSS removal must be provided
- Certification of acceptable technologies can be found at www.njstormwater.org

Stormwater Management Manufactured Treatment Devices Certified by NJDEP	MTD Laboratory Test Certifications	Superseded Certifications	Certified TSS Removal Rate	Maintenance Plan
MTD #1	Certification		80%	Plan
MTD #2	Certification	Superseded	50%	Plan
MTD #3	Certification		80%	Plan

Infiltrating Extended Detention System



50% TSS @ WQF

Wet Sump (20% Sediment)

WQv above IWS

Infiltration

Flood Control Volume

Outlets

Infiltrating Extended Detention System

Underground Infiltration System

Key Design Considerations

- Pretreatment
- Access for inspection and maintenance
  - Access must be provided at inlet and outlet
  - Design/access must allow sediment removal from entire system without flushing to MS4

Inspection & Maintenance Access

- Access manholes at inlet, outlet and within storage as necessary for cleaning
- Observation wells

Should I consider an infiltration practice?

- What advantage or benefit to the project (or the developer) is provided by using a infiltration practice to meet the post-construction WQv requirement?
  - Cost reduction?
  - Reduce area or depth of practice?
  - Can it help address other site conditions or design challenges?
    - Infiltration practices, by design, should rarely have standing water
    - Infiltration practices may be viable edge of property BMPs

Which infiltration practice(s) to consider

- Soil infiltration capacity (saturated hydraulic conductivity)
- Site imperviousness
- Available surface area for basin(s)
- Distributed or concentrated open space
- Pretreatment requirement and options
  - Ability to reduce footprint of infiltration BMP by using runoff reduction credit provided by pretreatment practices
- Peak discharge control

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