Infiltration Stormwater Control Measures

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Overview of Presentation

- NCDENR Infiltration Devices
- Infiltration and the SHWT
- Innovative infiltration systems
- Future look at infiltration

Infiltration Devices

- Infiltration trenches
- Infiltration basins

Adelphi Road, Maryland (Credit: Low Impact Development Center

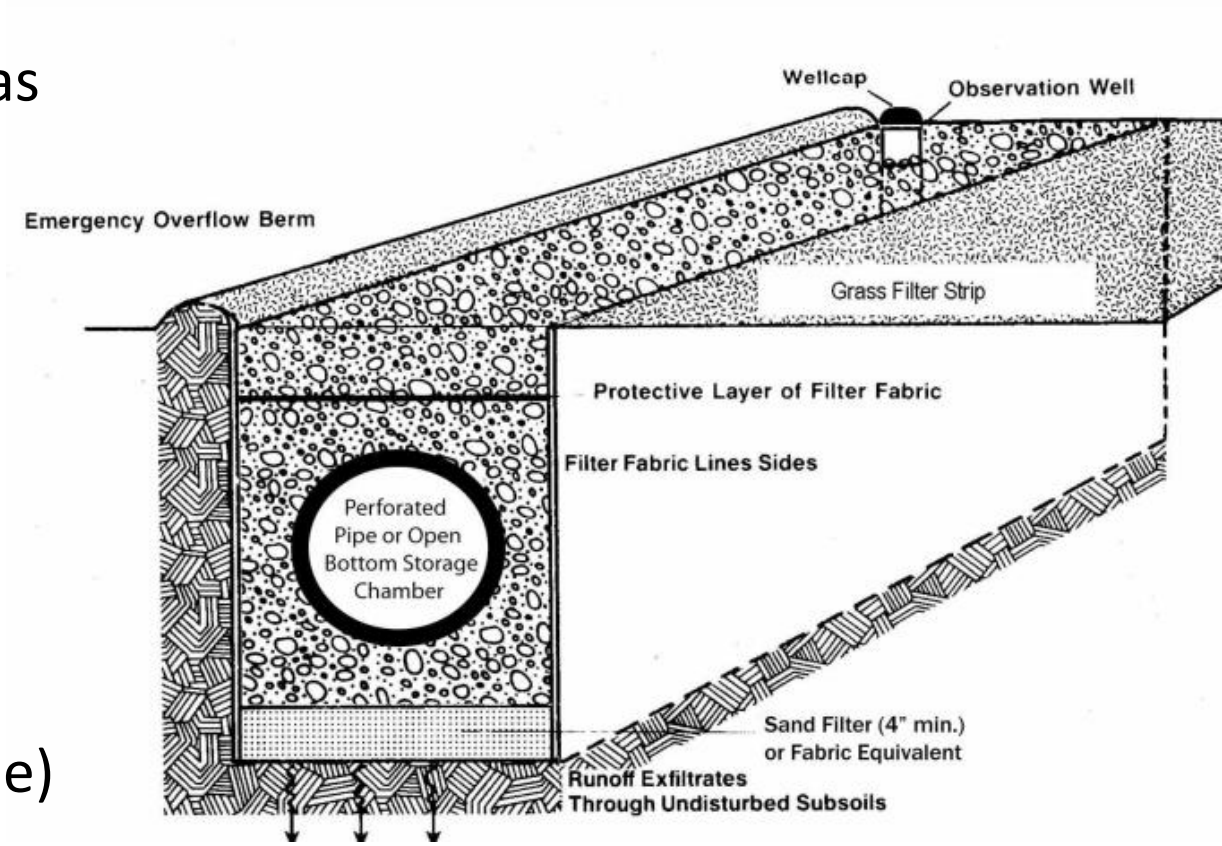
University of Minnesota

- **ADVANTAGES**
  - Reduce frequency of flooding by reducing volume and through detention
  - Groundwater recharge
  - Maintain stream recharge
  - Pollutant removal is generally good
- **DISADVANTAGES**
  - Tend to clog if not maintained
  - Requires relatively quick-draining soils (0.52 in/hr)
  - Potential nasty pollutants: groundwater contamination?

Like all infiltration BMPs…

Infiltration trench

- Large crushed stone as storage media, or concrete vaults
- Pre-treatment
- Parking lot common
- 4” (typ) clean sand
- 1-2’ Undisturbed, **unsatured** *in-situ* soil
- ~Level (0-0.05% grade)
- No outlet

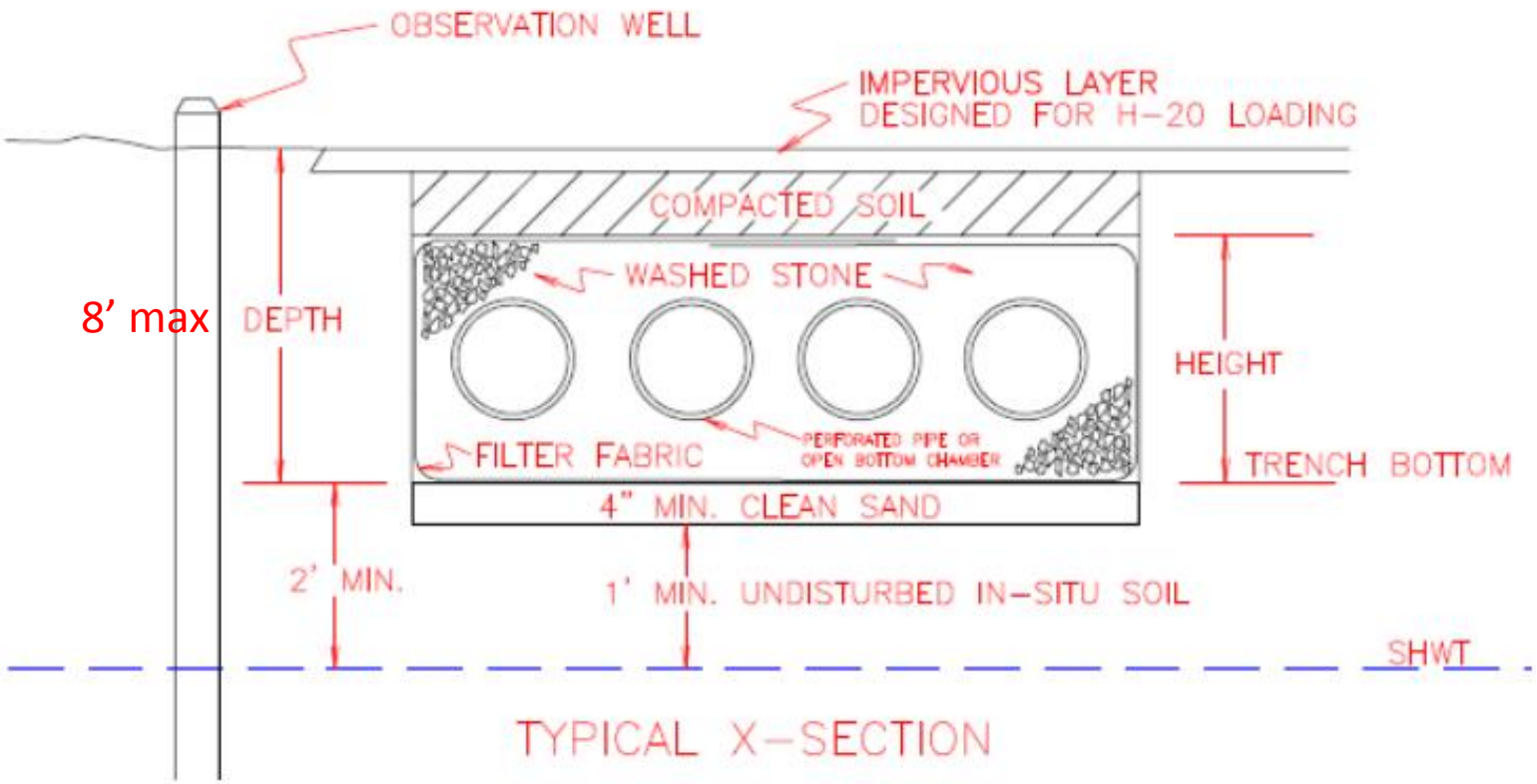


Adapted from Schueler *et al.*, 1992)

Infiltration basins are offline

- Flow splitting, only design storm goes to system
- No primary overflow structure
- Vegetated filter strip as emergency bypass

Infiltration trench



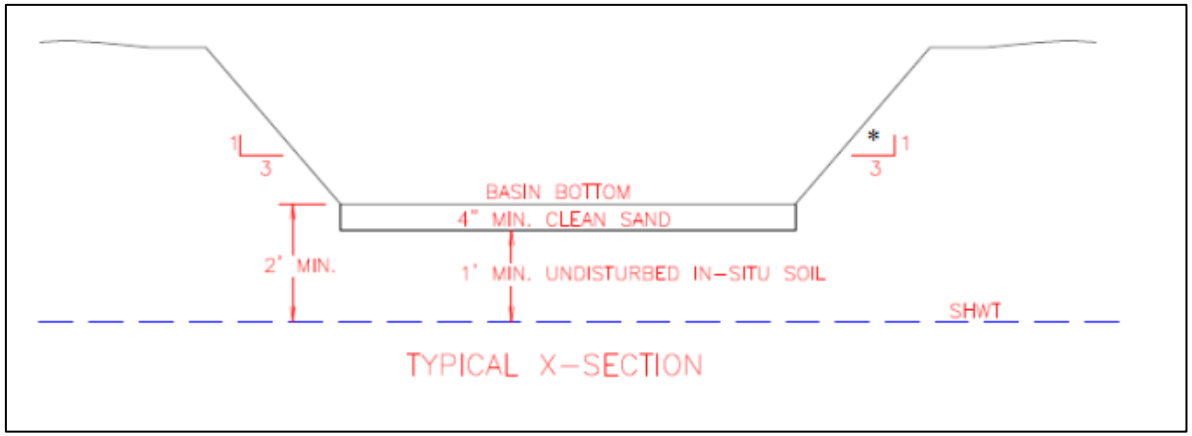
Infiltration trench

Parking lot infiltration trench (Courtesy: EPA)

http://stormwater.files.wordpress.com/2007/05/infiltration-trench

Infiltration Basin

- Designed with bypass (unless they infiltrate exceptionally well)
- Shall not receive more than 2.0 acre-inches of runoff
- >0.52 in/hr *in-situ* infiltration rate



Infiltration Accreditation

- TSS – 85%
- Total Nitrogen – 30%
- Total Phosphorus – 35%
- Compare to wet pond…
  - 25% Nitrogen
  - 40% Phosphorus
- Big difference… Volume reduction

Infiltration Devices

- From the NCDENR Stormwater BMP Manual (Ch. 16):

SELECT MAJOR DESIGN ELEMENTS
Design shall be located a minimum of 30 feet from surface waters, and 50 feet from Class SA waers
The design shall be located a minimum of 100 feet from water supply wells
The bottom shall be a minimum of 2 feet above the seasonal high water table
Volume in excess of the treatment volume, as determined from the design storm, shall be evenly distributed across a minimum 30 feet long vegetated filter strip (50-ft in some locations)
Storage volume must completely draw down to the seasonally high water table under SHWT conditions within 5 days
Soils must have a minimum infiltration rate of 0.52 inches per hour to be suitable for infiltration
Device must not be sited on fill
BMP shall not be used on industrial sites or designated contaminated land uses or activities such as areas subject to frequent oil or other petroleum contamination

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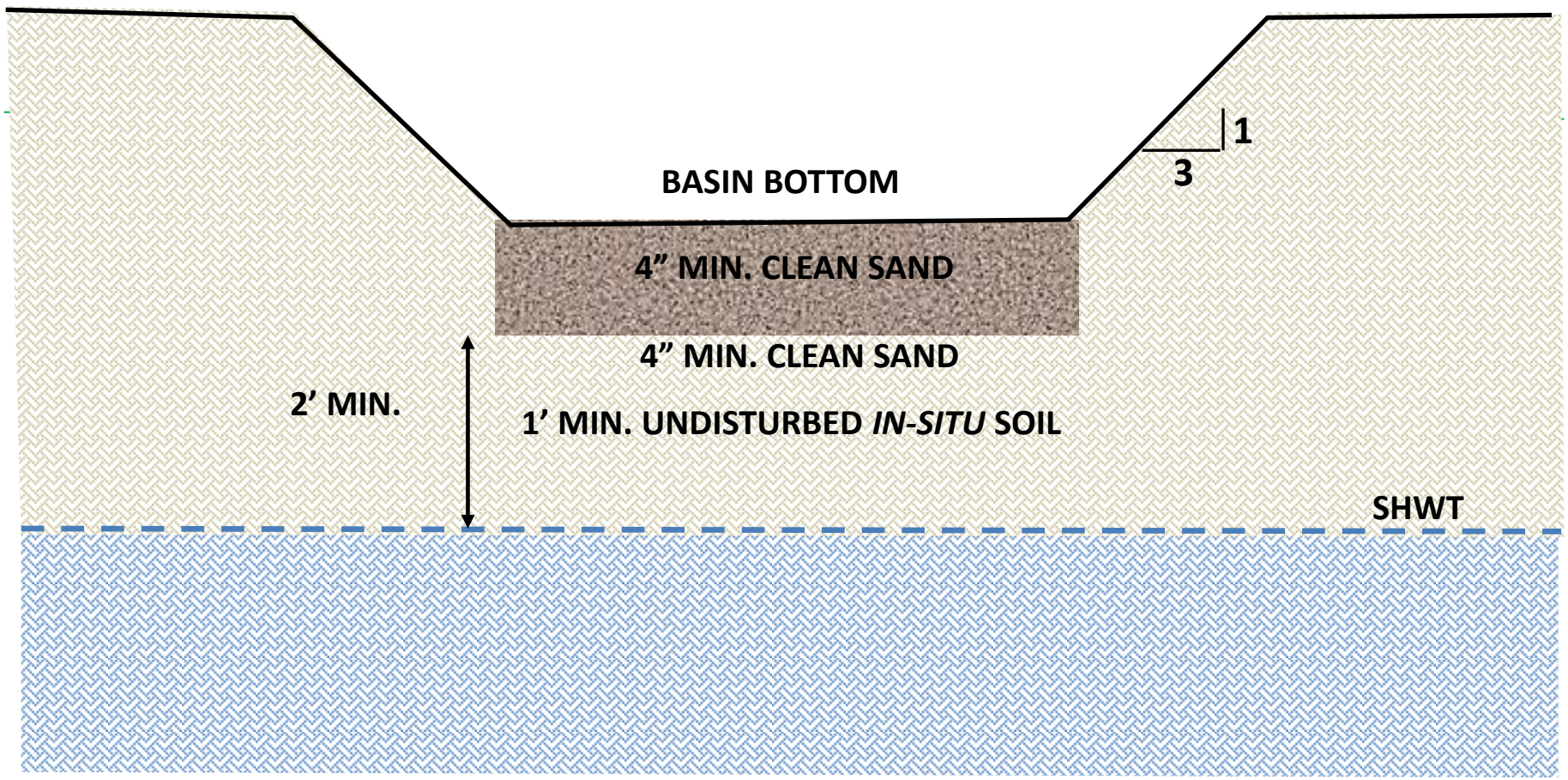
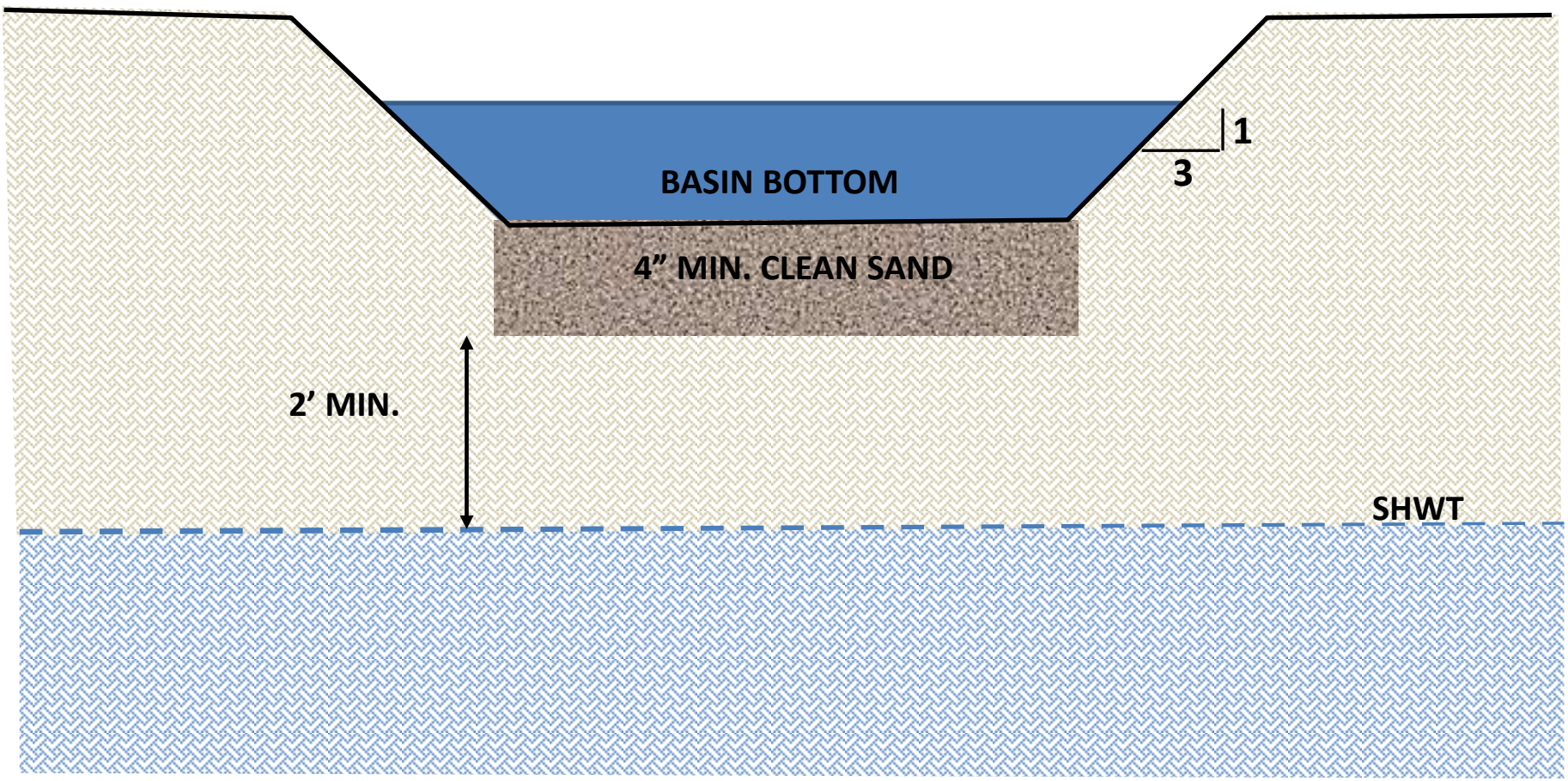
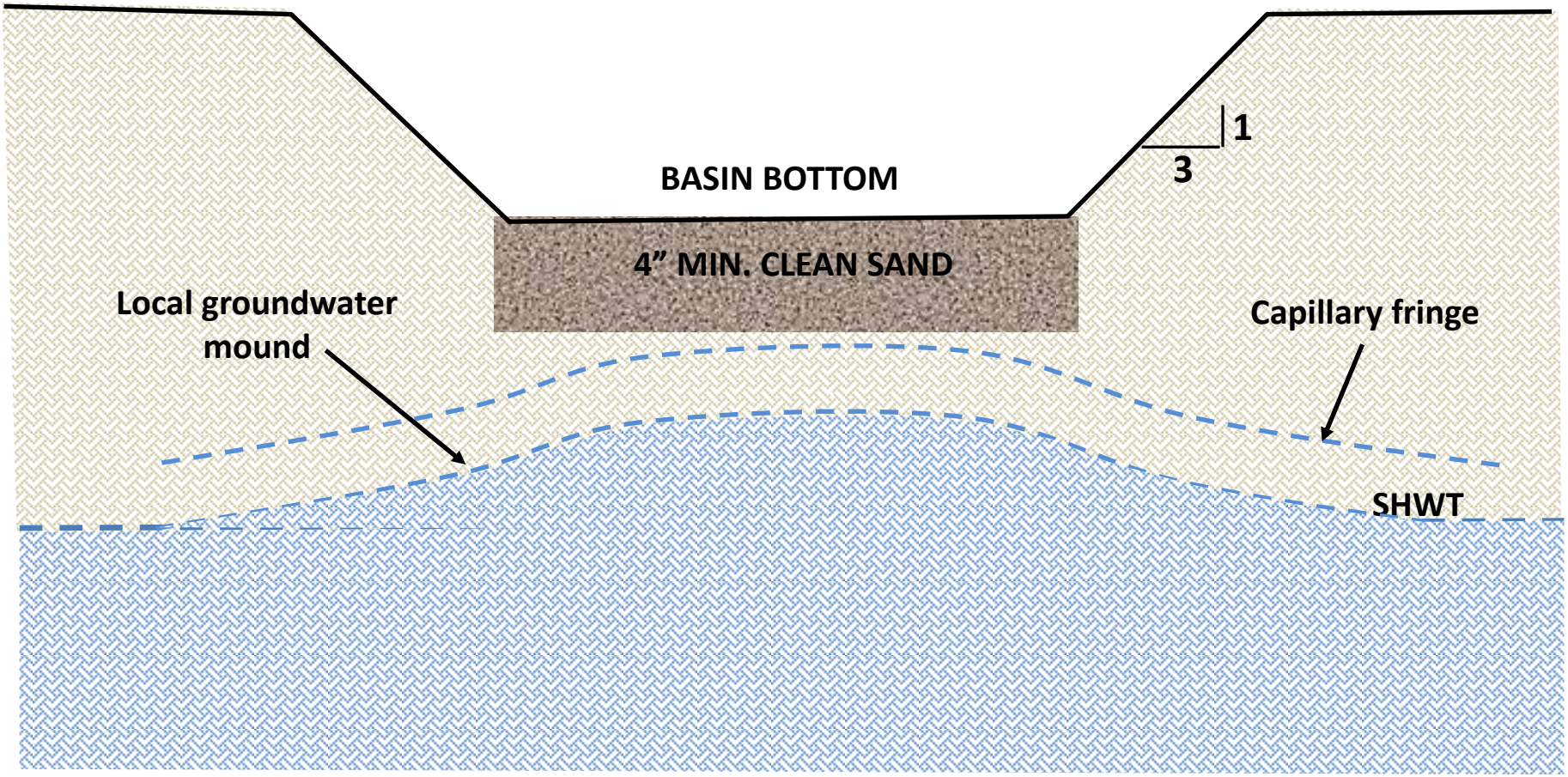
Infiltration basin



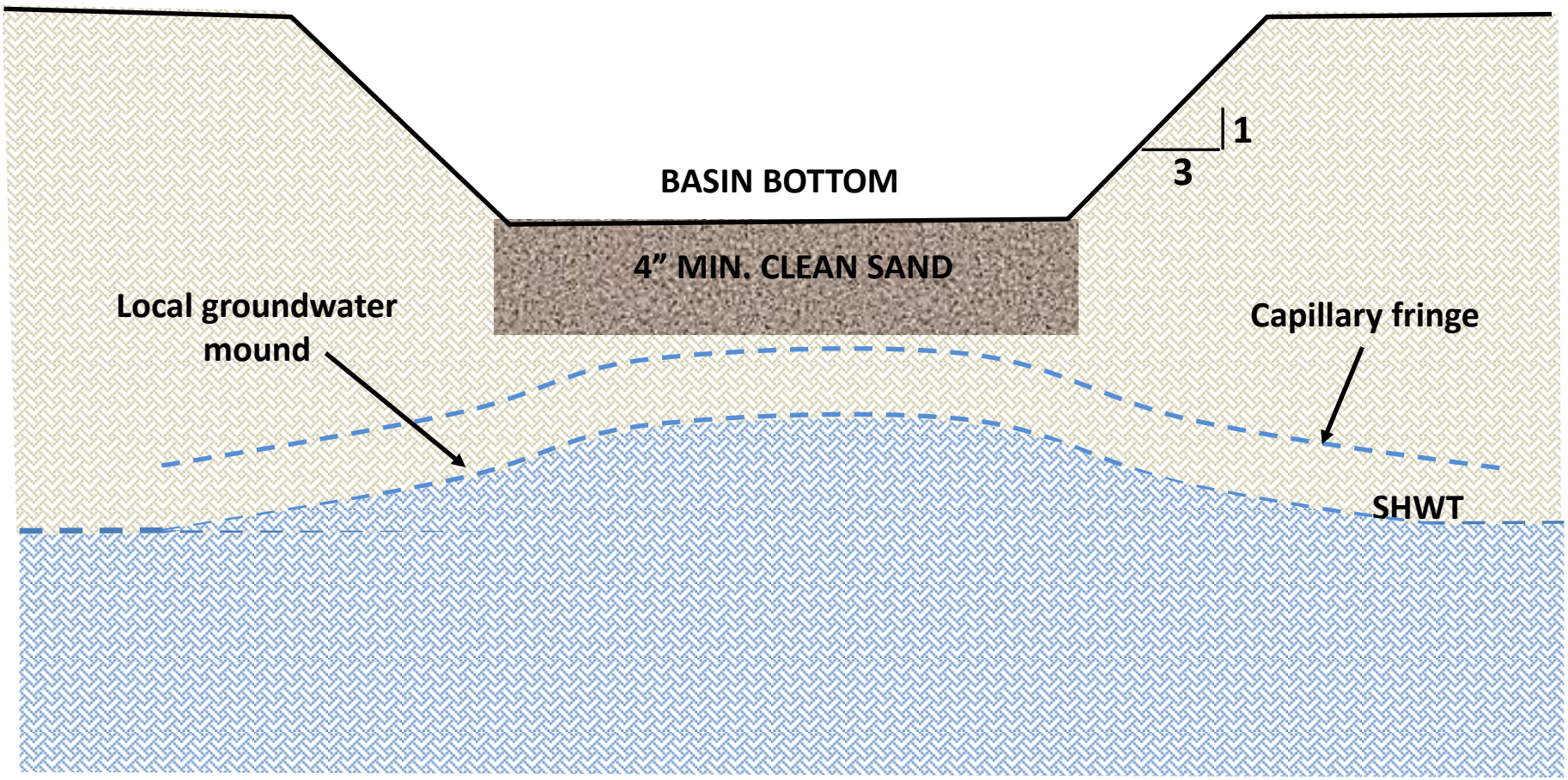
Infiltration basin



Infiltration basin



Infiltration basin



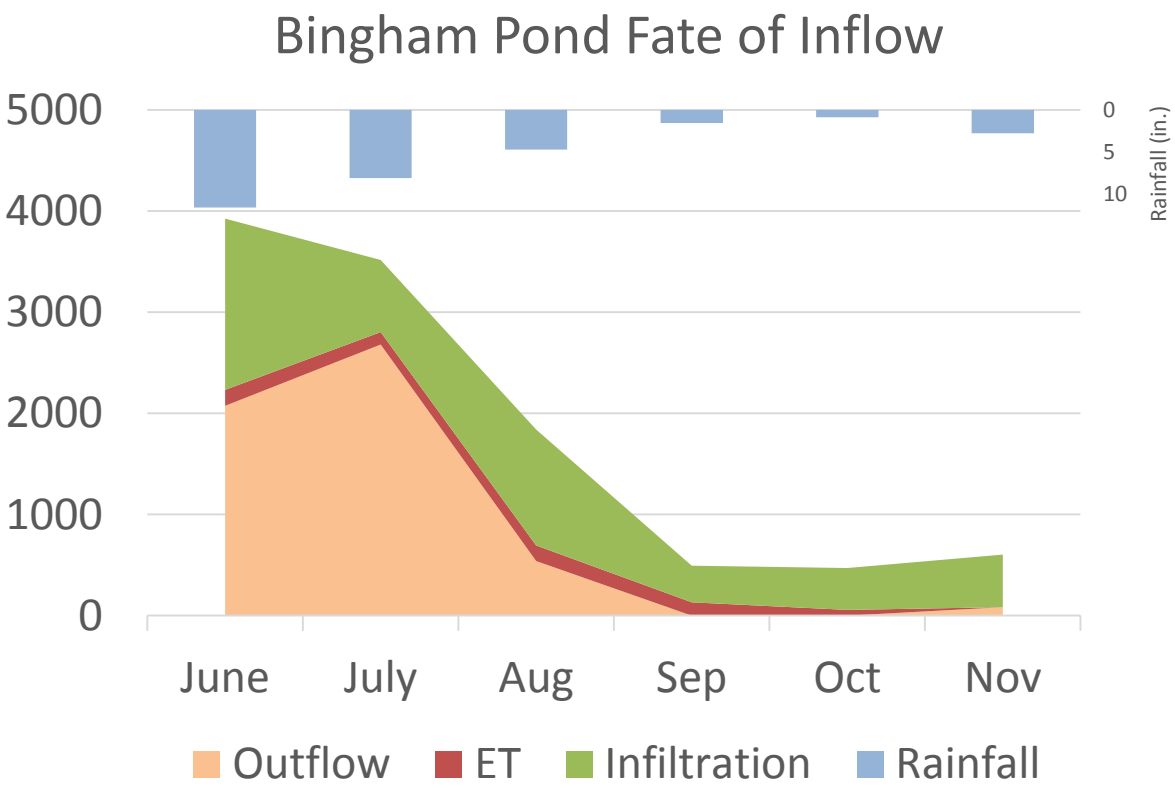
State Technical Review Workgroup: *Why the 2-ft separation is staying*

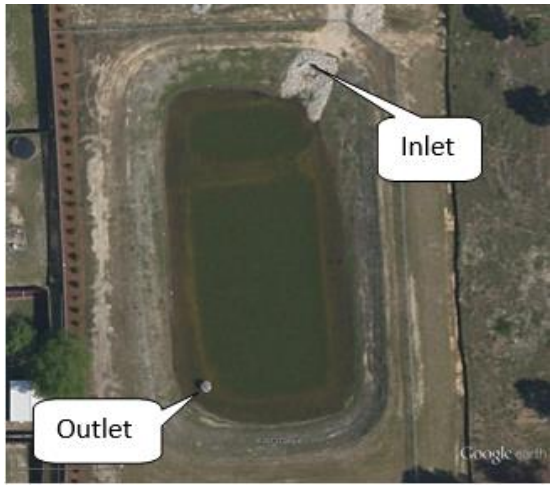
1. Existence of capillary fringe above the SHWT can reduce the depth of unsaturated soil zone to
2. Local water table mounding effects can prevent infiltration from occurring in time for the next storm
3. No evidence or precedent exists to suggest a smaller water table requirement will meet infiltration basin function.

Leaky Wet Retention Ponds as Infiltration Basins?

- NCSU Study in Fayetteville on HSG A Soils
- Can wet ponds be credited with ET and infiltration hydrologic fates?
- Potential future study of water table/pond interaction

Leaky Wet Retention Ponds as Infiltration Basins





- 0.4– 1.9 inches per day
- 100% volume reduction in Sept, Oct 2013!

Innovative Infiltration:
Market at Colonnade (Raleigh, NC)

Why is this innovative…..?

Underground infiltration gallery

Innovative Infiltration:
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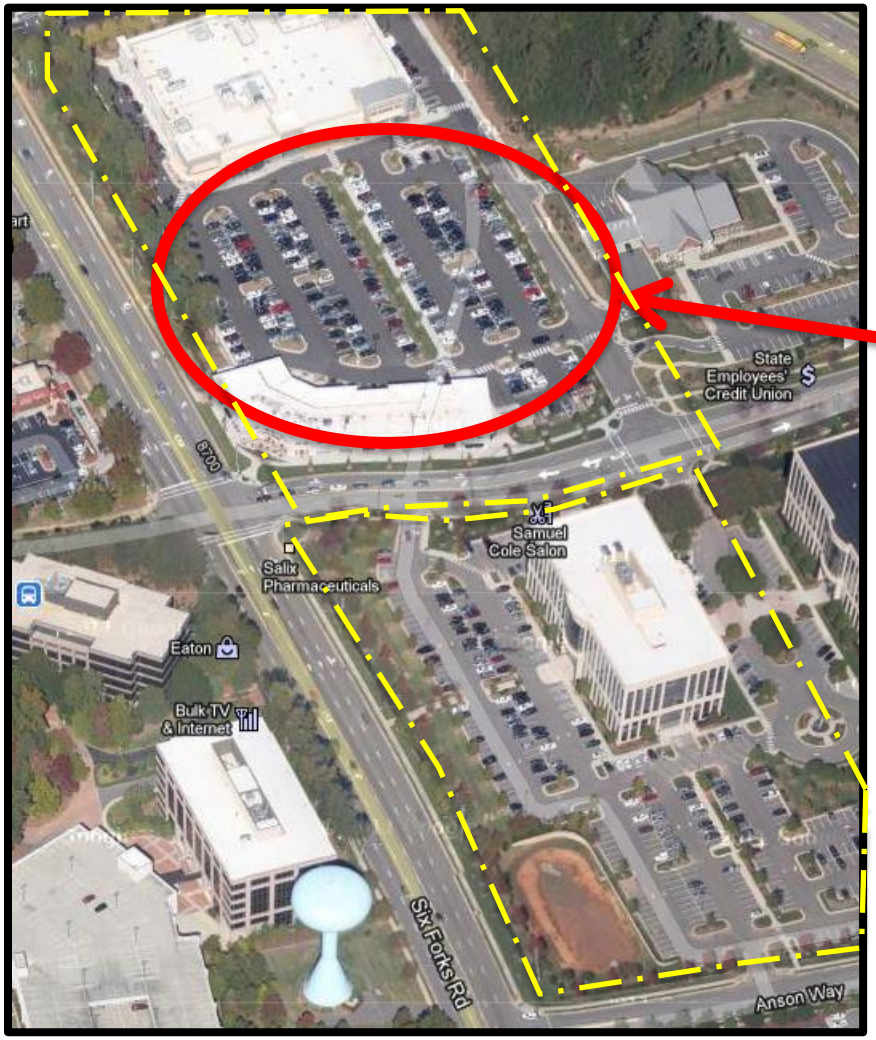

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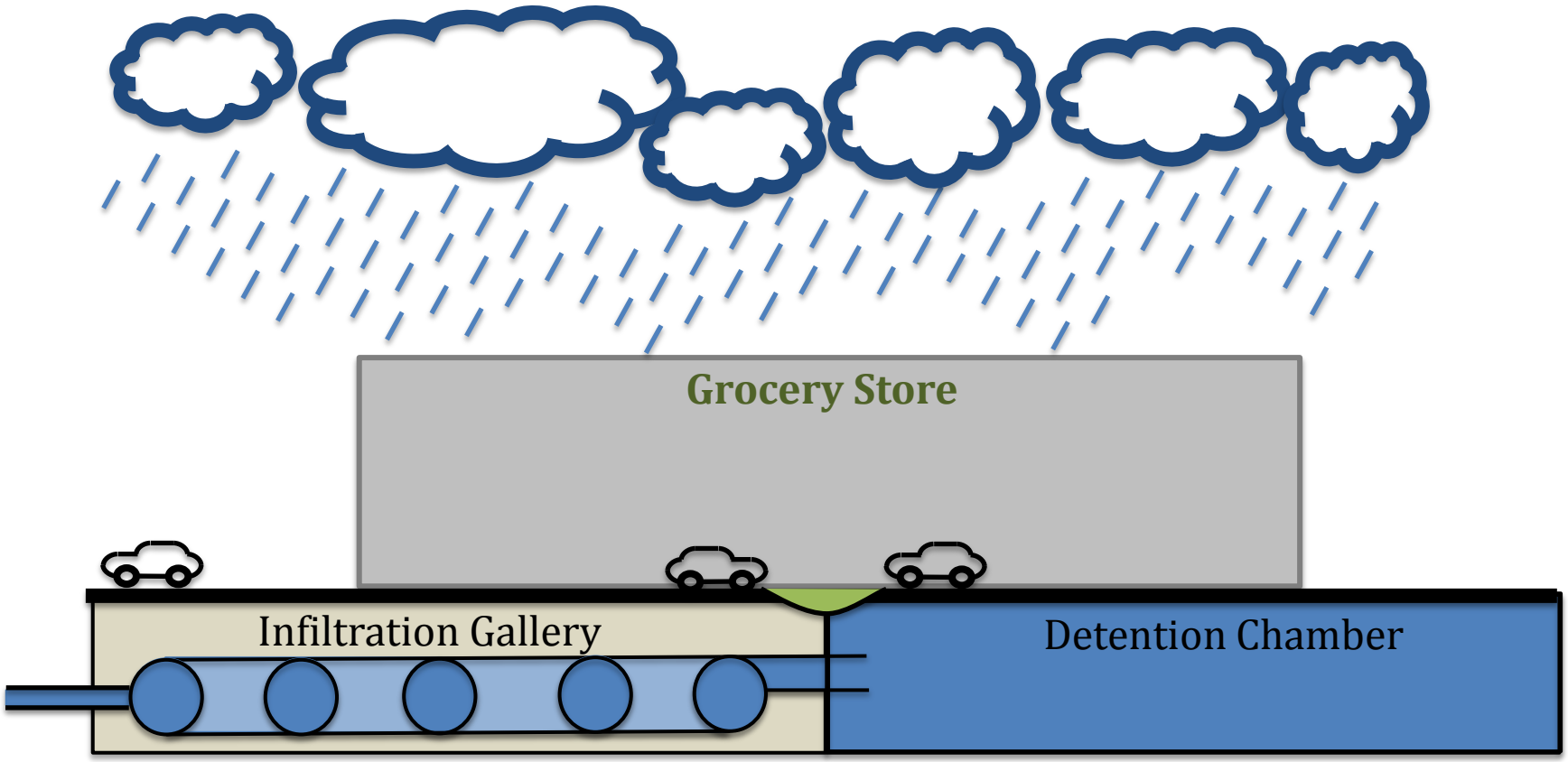

(not to scale)

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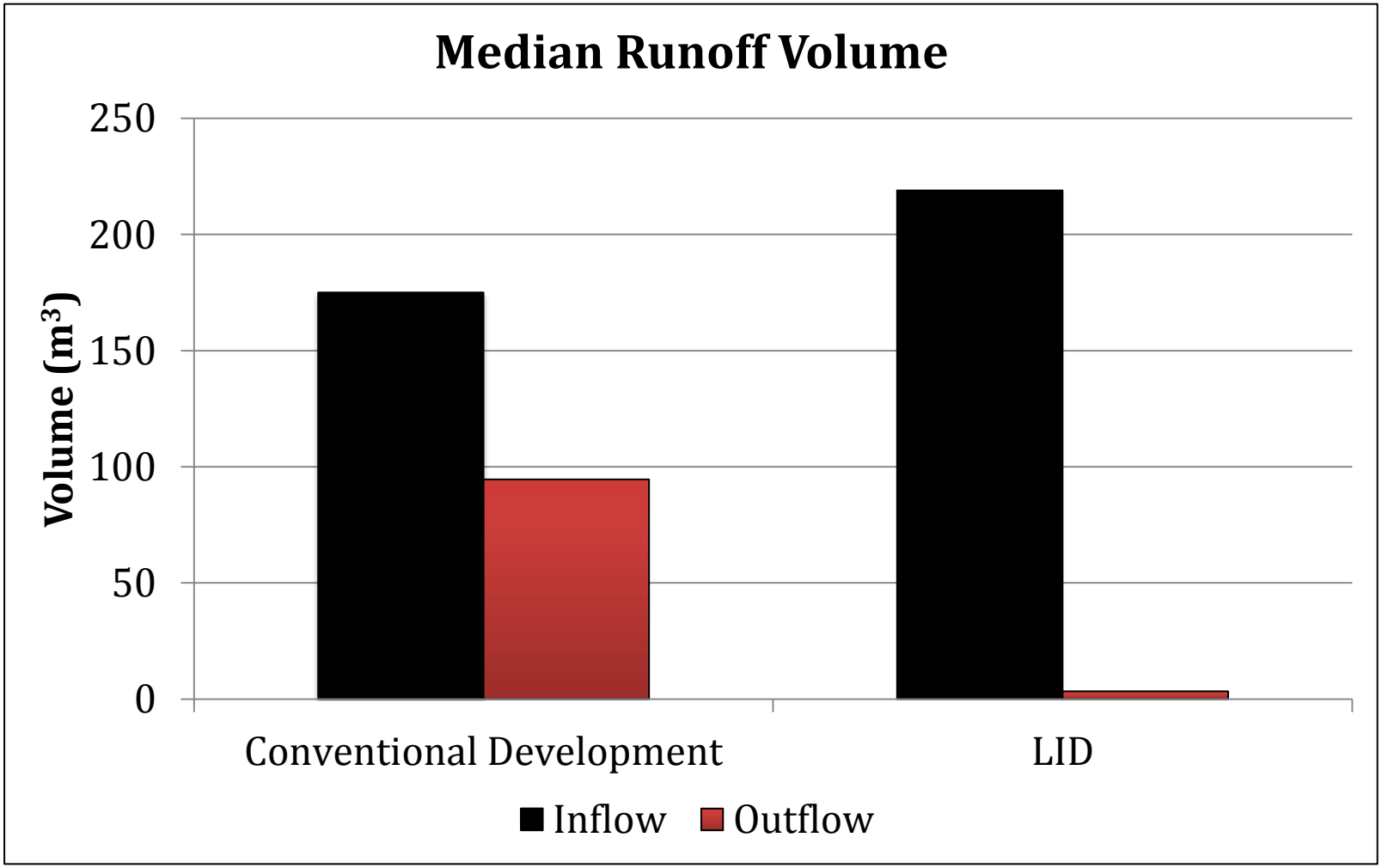

Includes rainwater harvesting,

Innovative Infiltration:
Dune Infiltration System (Kure Beach, NC)

- Reduce outfall discharge to ocean
- Use dunes as a sand filter
- Reduces exposure of swimmers to harmful bacteria

Diversion Vault in dunes

Chamber

Innovative Infiltration:
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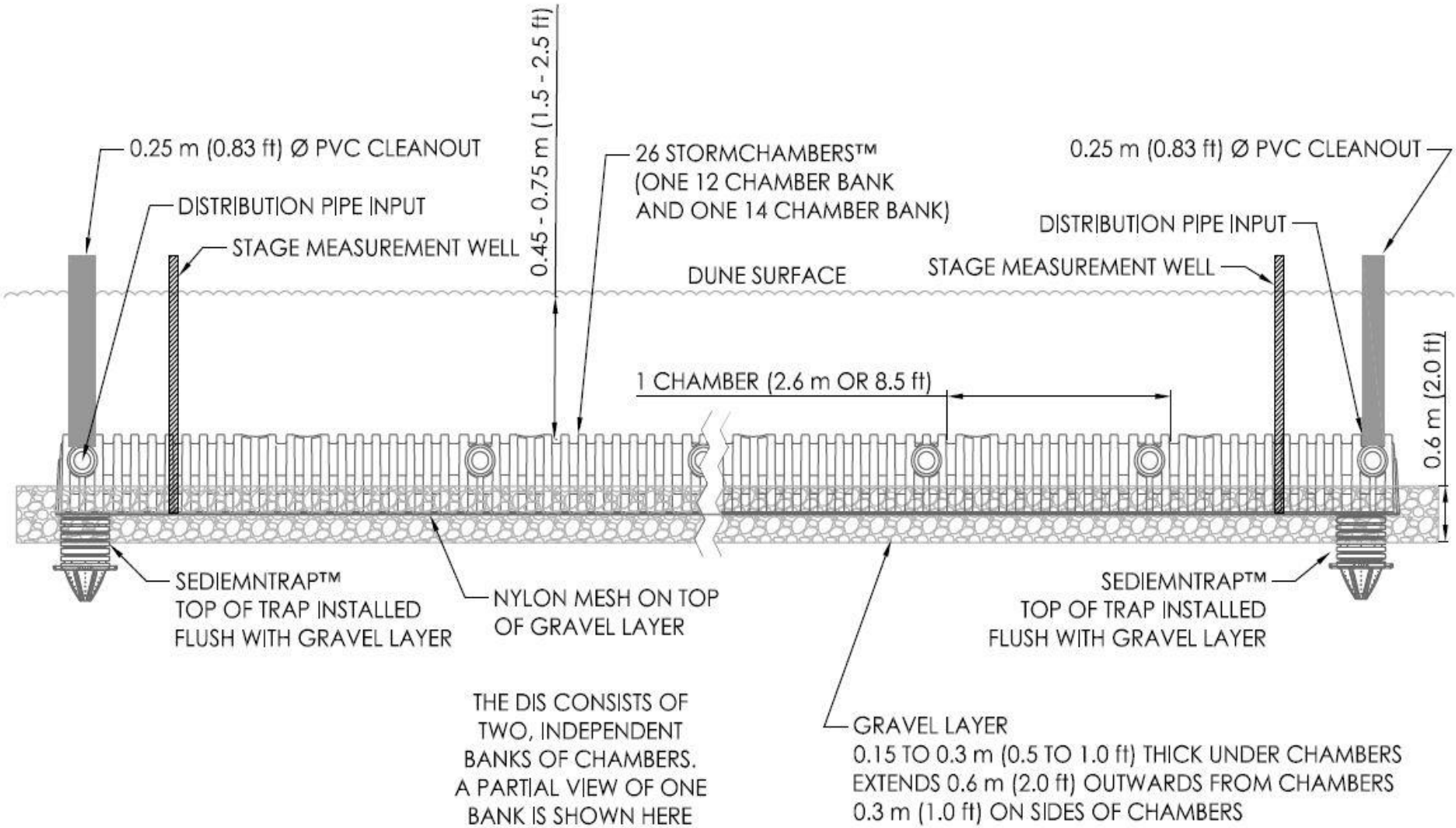

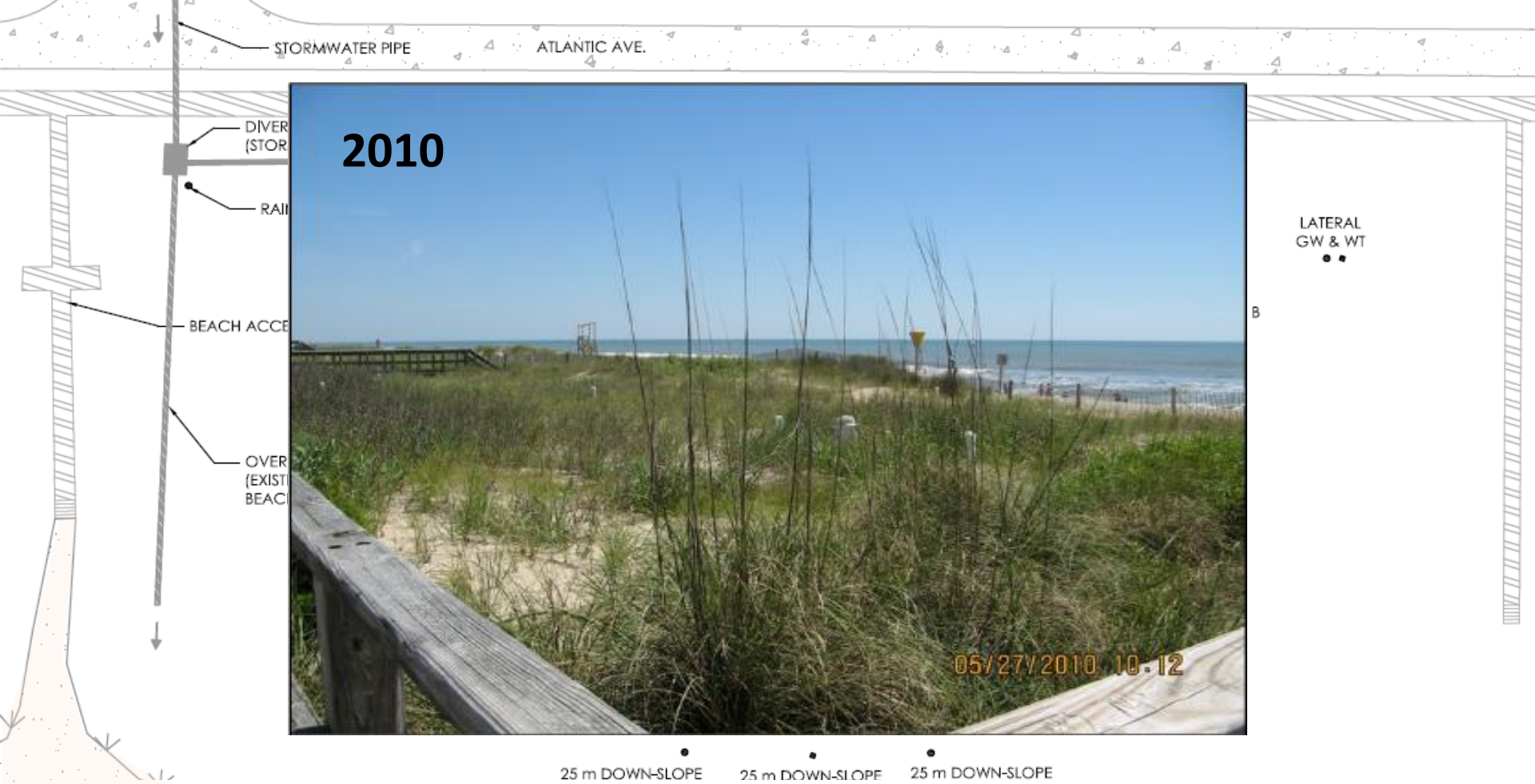

- Diverted **80%** of the stormwater away from the beach (roughly 3.8 million gallons in the first year)
- **Most importantly - GW concentrations similar to control at dune beach interface (6 MPN/100 mL)**

Infiltration in the Future

- Small-scale, distributed system benefits:
  - Cumulatively cheaper long-term cost
  - Reduced local mounding
- More use due to now due to hydrologic match accounting

Bellingham, WA

Summary

- Infiltration devices are one of many devices used to be compliant with state stormwater standards
- …but ALSO count as an LID practice! (Volume reduction)
- For the time being, still recommend at least 2-foot separation to SHWT
- Many innovative ways to create infiltration devices
- Benefits of smaller scale systems
- Future leniency?