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# Implementation of Vegetative Source Control Practices in the Calgary area

**TRIECA**

**March 25, 2015**



[www.calgary.ca](http://www.calgary.ca) call 3-1-1



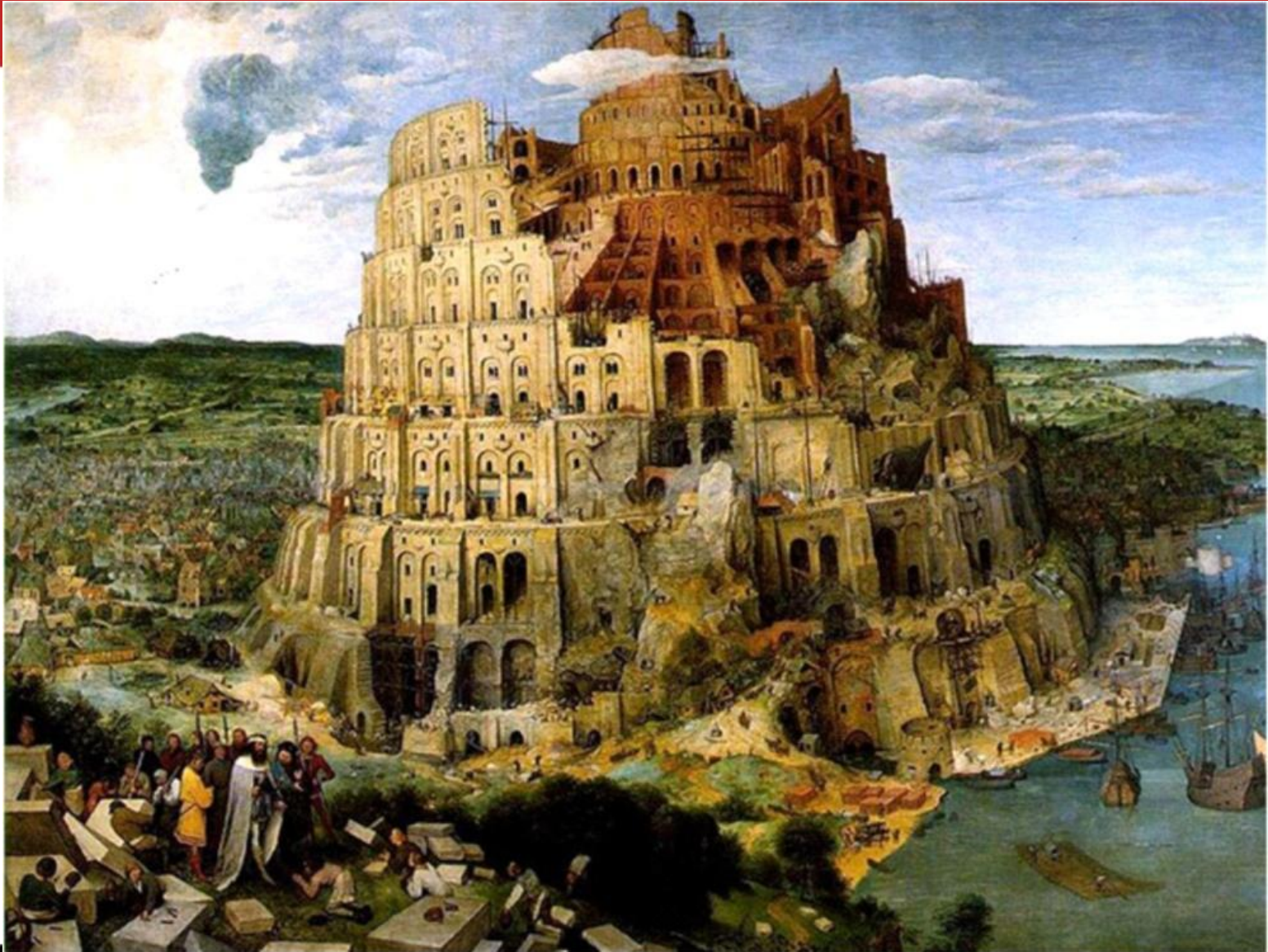
THE CITY OF  
**CALGARY**

# This morning's agenda

- Cross-section of some the Lessons Learned:
  - Babylonian confusion among disciplines
  - Green field vs. redevelopment re LID
  - Oh my, the operation & maintenance challenges
  - Design Specifics: the Devil is in the Details
- Most important Lesson:
  - We are still actively learning
- However, we do have some success stories too!



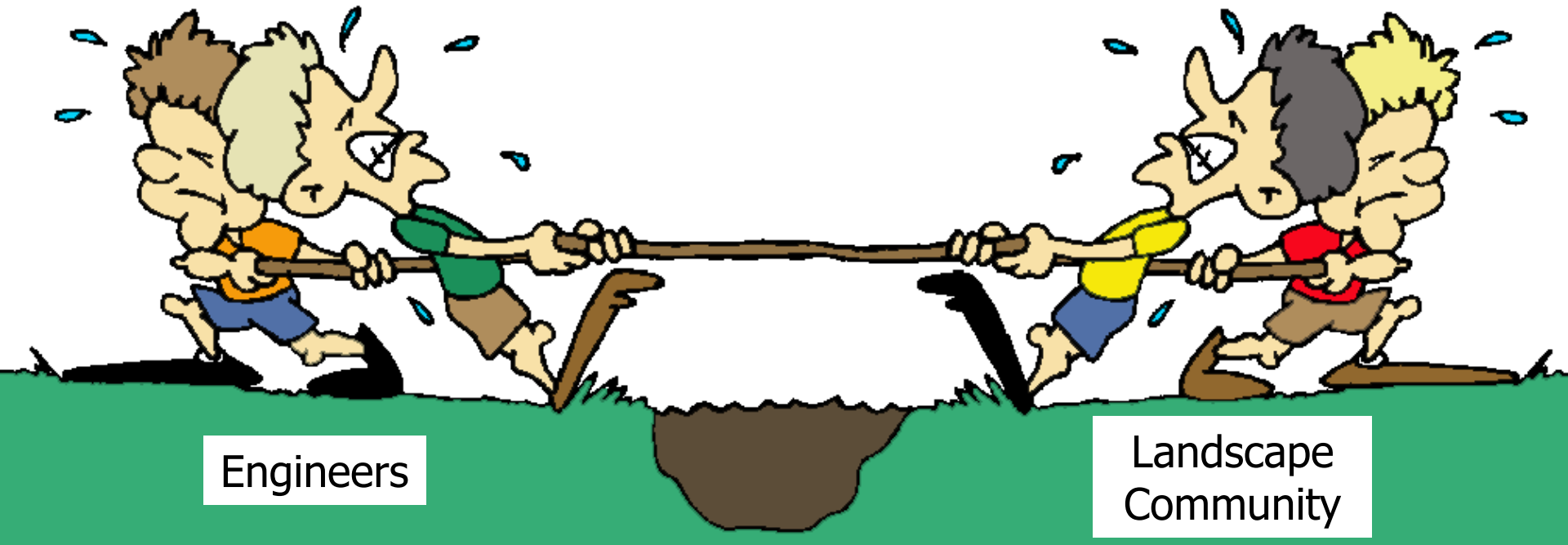
# Babylonian Confusion among disciplines





# Babylonian Confusion among disciplines

## Sand vs. clay in soils or growing media



Engineers want high permeability so the media drain properly so that (a) the capacity is restored for the next event, and (b) we won't have problems with mosquitoes

The landscape community wants moisture retention to make the vegetation survive/thrive. Plus, sand is an expensive resource while clays provide better water quality performance

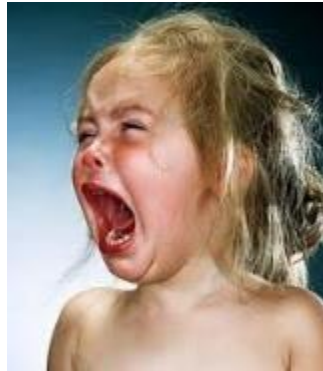
# The Media Dilemma?

Contact Time for  
Water Quality

Flow  
Through Rate  
(Infiltration)

Texture

Structure



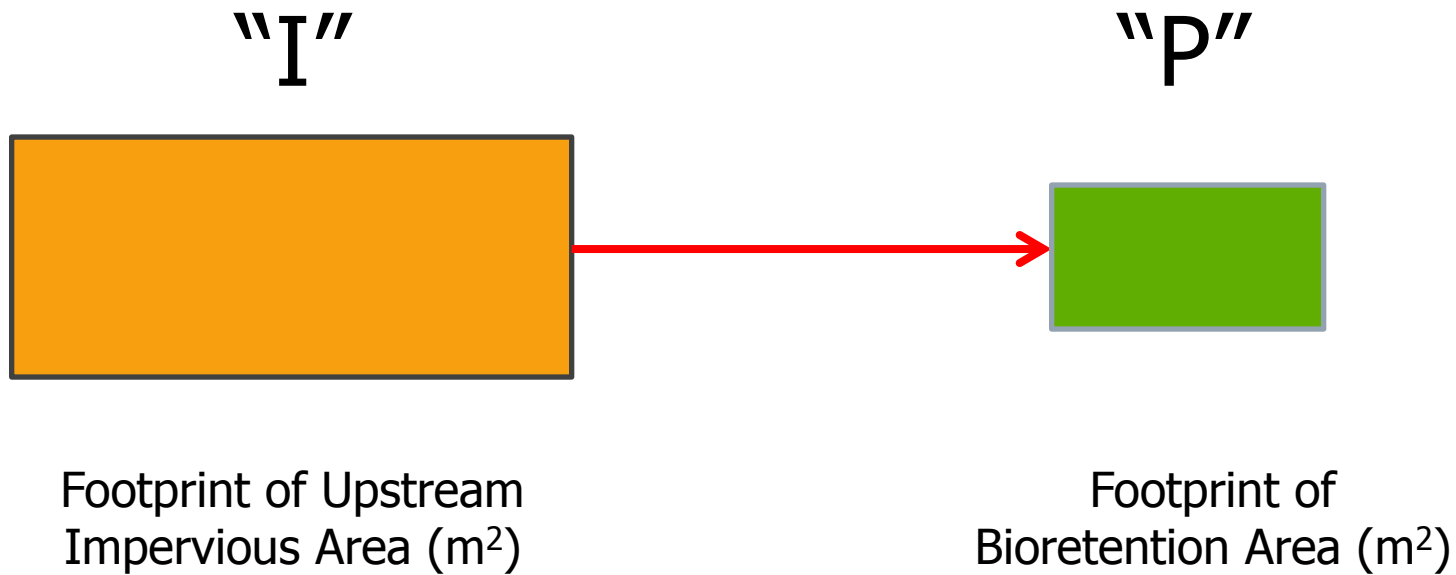
Clogging and  
Site Saturation  
(Longevity)

Moisture Retention  
for  
Vegetation Survival

Adapted from  
Scott Struck,  
Geosyntec

# Babylonian Confusion among disciplines

## I/P Ratio



The larger the I/P ratio, the greater the volumes of runoff and sediment loadings directed to the bioretention area

If  $I = 500 \text{ m}^2$  and  $P = 50 \text{ m}^2$ , then  $I/P = 10$



# Babylonian Confusion among disciplines

## Absorbent Landscaping vs. Rain Gardens vs. Bioretention

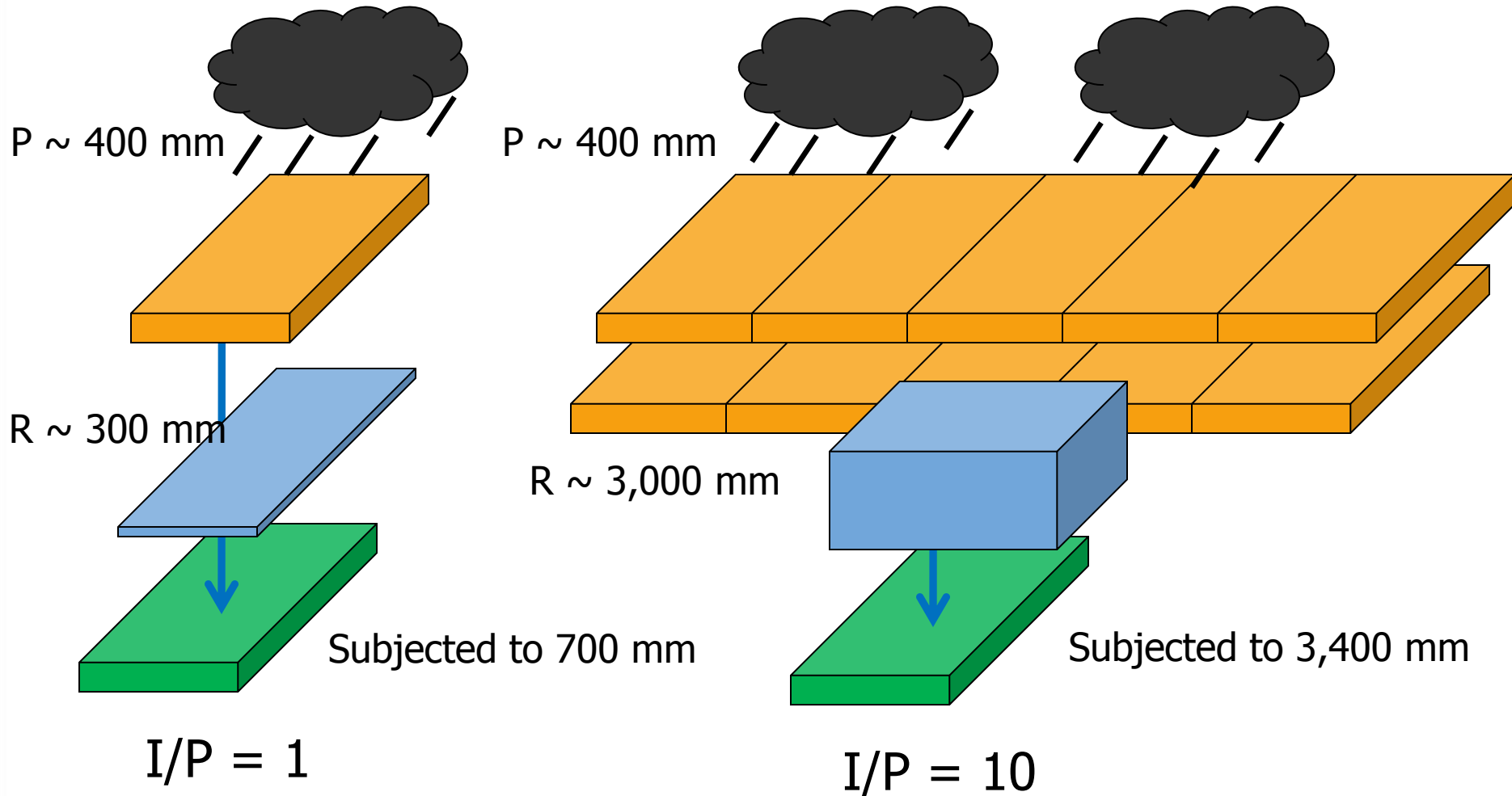


Low I/P



High I/P

# Landscape community does not appreciate how much moisture bioretention may be exposed to





# Another consequence of all of this runoff

The higher I/P ratio also  
means more sediment from  
winter sanding or  
atmospheric deposition in  
the runoff





# Growing consensus that sediment retention and other functions should be separated

- Analogy: in wastewater treatment, unit processes are separated
- If one wants to implement something that operates like a sand filter, why not implement one?
- Vegetation needs appropriate moisture supply
- Concerns about clogging due to sediment loadings are legitimate, so provide better treatment so that bioretention can naturally accommodate sediment load



What is appropriate pre-treatment?





# What is appropriate pre-treatment?





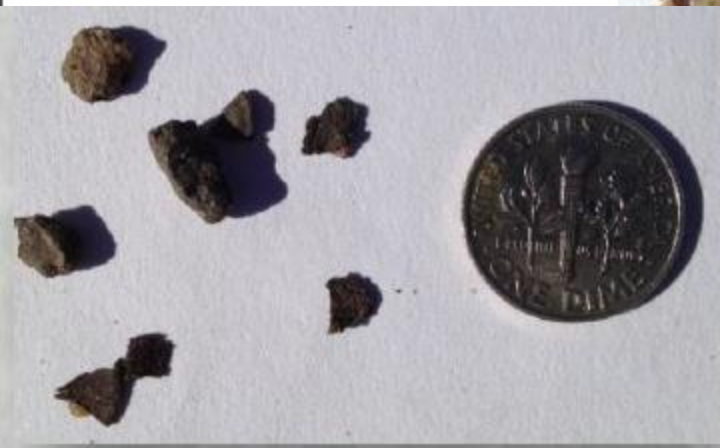
# What is appropriate pre-treatment?



Photos courtesy of Kevin Lewis, Denver Public Works



# Amendments will be needed to counteract leaching



Photos courtesy of Kevin Lewis, Denver Public Works

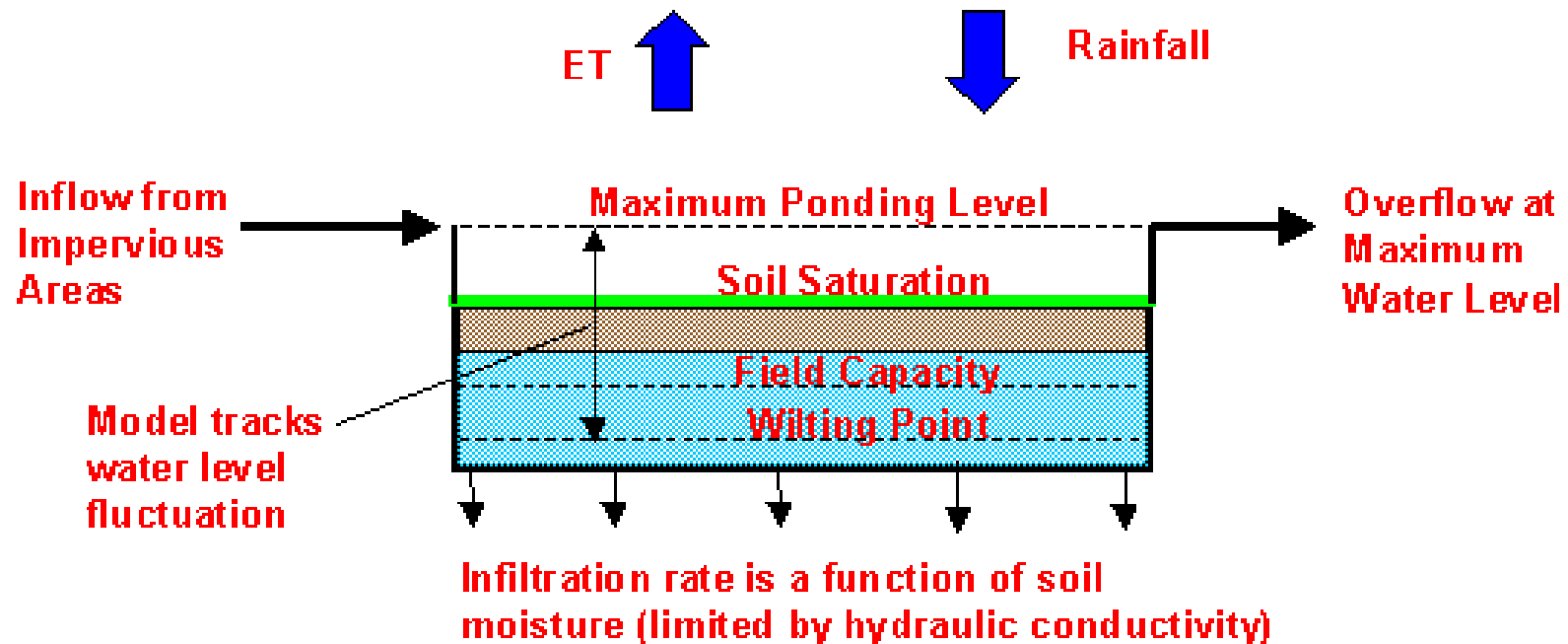
# Amendments will be needed to counteract leaching



Photo courtesy of Bob Pitt, University of Alabama



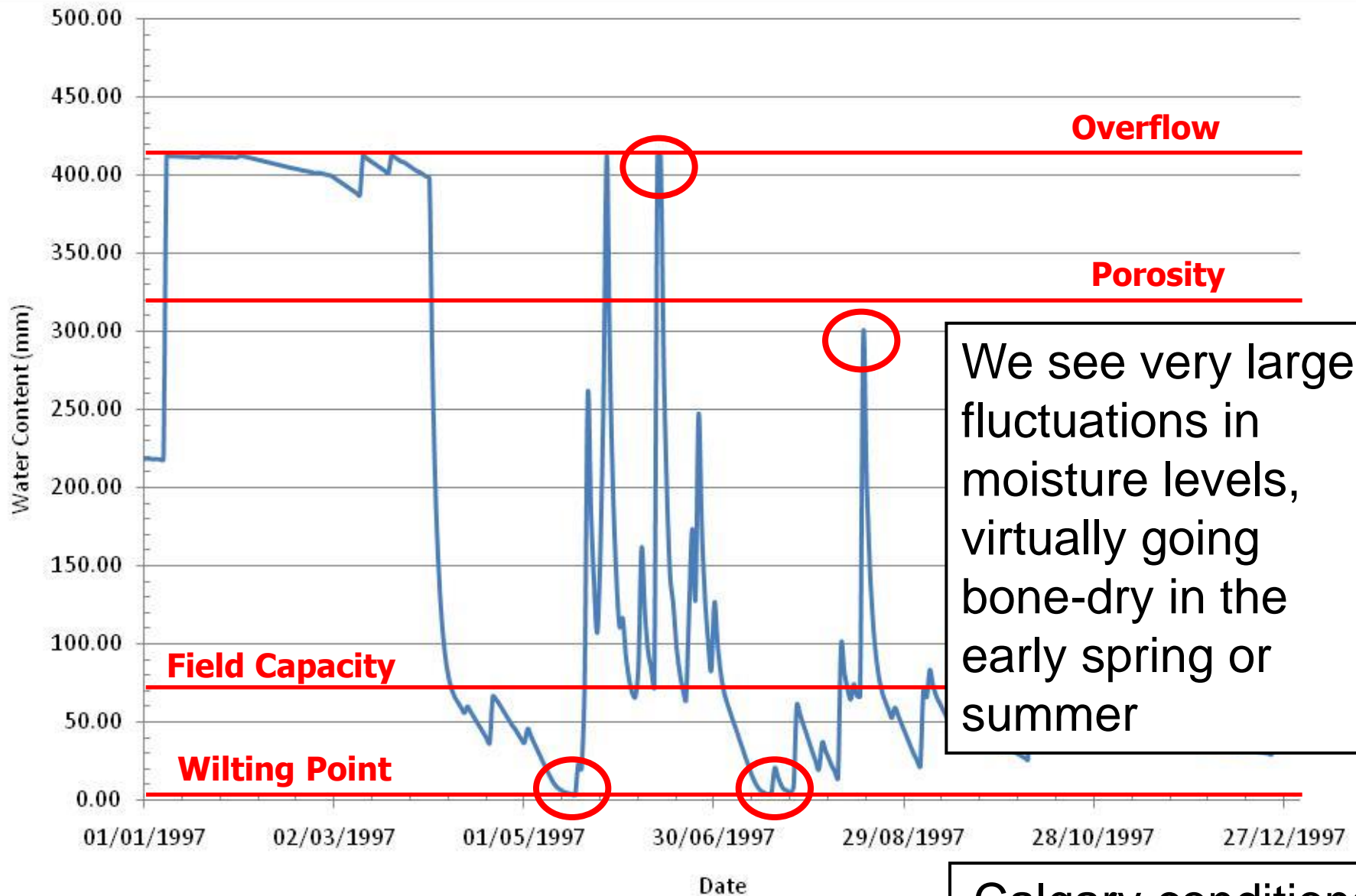
# Need for Water Balance analyses



Source: [www.waterbalance.ca](http://www.waterbalance.ca)

British Columbia InterGovernmental Partnership

# Sample Moisture Levels in Bioretention Area



We see very large fluctuations in moisture levels, virtually going bone-dry in the early spring or summer

Calgary conditions

# Need for Water Balance analyses





# Green field vs. Redevelopment Challenges with lack of ESC



High visibility of vegetative practices has illustrated the shortfalls of our current ESC process and practices



# Green field vs. Redevelopment Consequences of poor ESC





# Operation and Maintenance

## Lack of expertise among disciplines

- LID is being implemented for drainage reasons; however, drainage staff only has expertise in hard infrastructure

*"Vegetation is acceptable as long as it is concrete"*
- Parks staff is often seasonal and displays high turnover rates



# Operation and Maintenance Natural Evolution of Vegetation





# Operation and Maintenance

## Weed infestations

- Vegetation tends to be more vigorous than listed in plant summaries
- Open space between immature plantings ideal for weed infestations
- Gap in maintenance responsibilities when turned over to municipality





# Lot 10 University of Calgary Story of Evolution





A lot of thought went  
into the layout





And then, it was left to its own devices – and it was abused at that

2014



2012



Natives were found to perform best

# Design Specifics

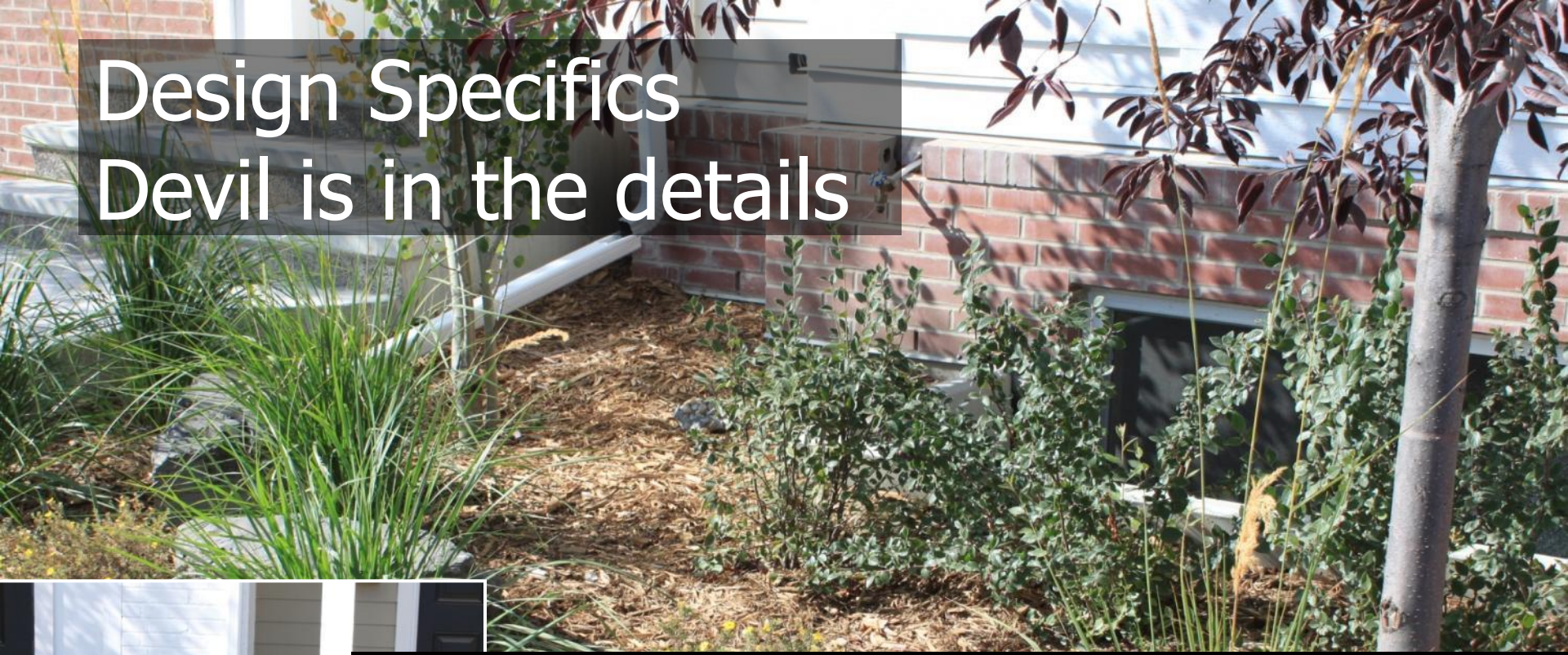
## Guidelines, standards & specifications

- Many designers desire a degree of freedom when designing LID features
- However, municipalities don't have the resources to accommodate too many scenarios from a logistics perspective



# Design Specifics

## Devil is in the details

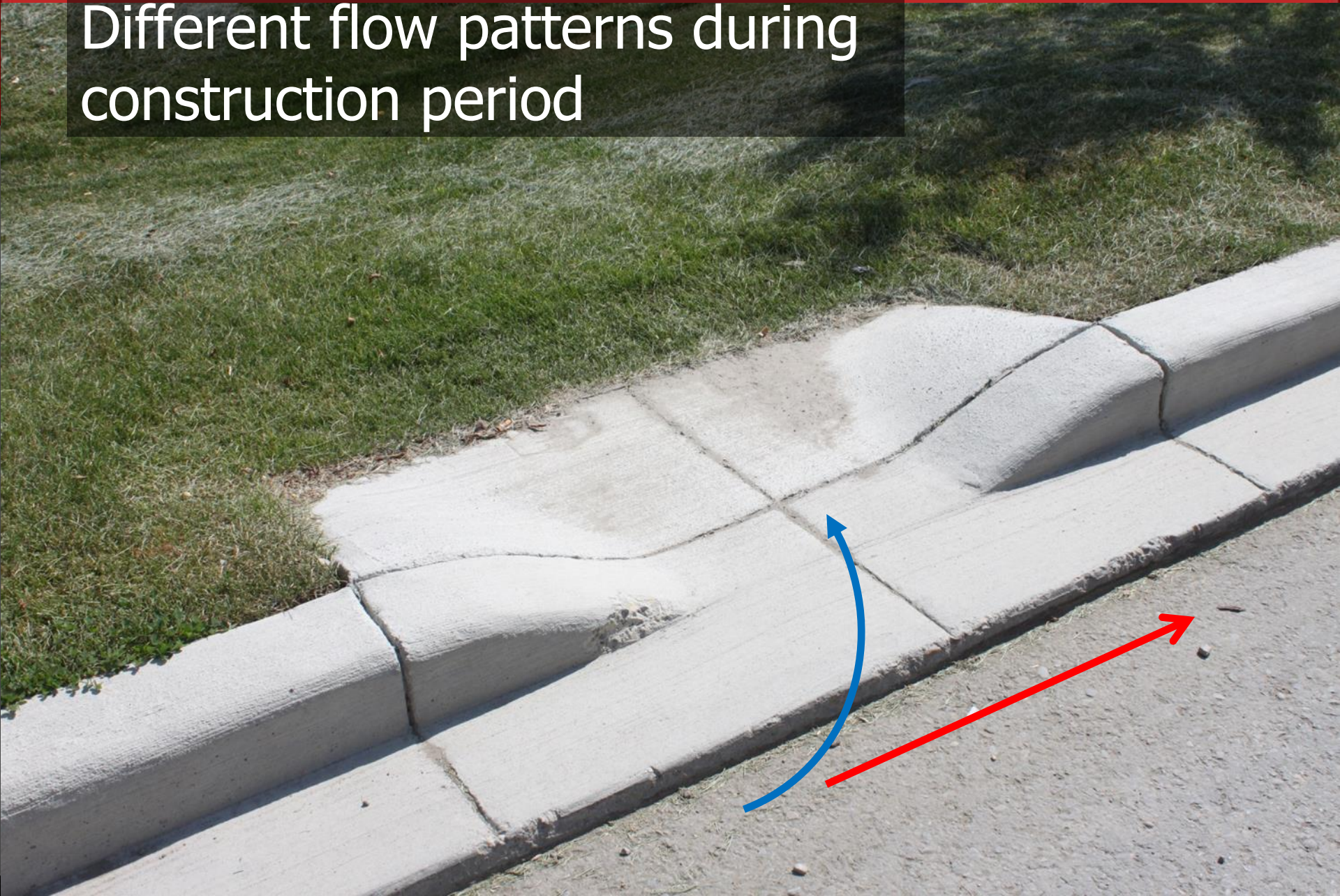


- High risk of icing of sidewalks and runoff entering window wells
- The feasibility of bioretention is challenging due to the presence of utilities within this narrow strip
- I/P ratio may be too high for absorbent landscaping
- Consider soil cells or redirect downspouts to the back



# Design Specifics

Different flow patterns during construction period





# Design Specifics Expectations at Assumption

Challenge: it is easy to cover up sediment deposition with some fresh mulch before a visual inspection is done



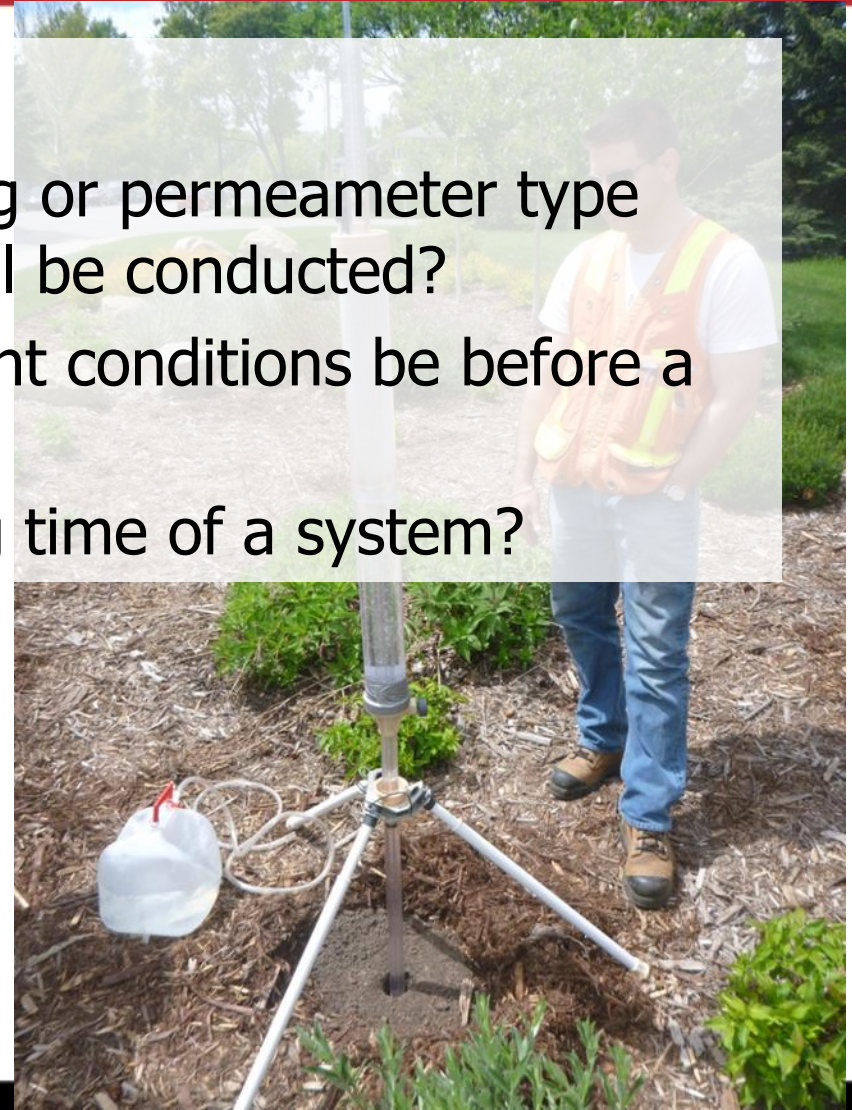


# Design Specifics

## Expectations at Assumption

### Questions:

- When doing infiltration ring or permeameter type tests, how many tests shall be conducted?
- What should the antecedent conditions be before a test is conducted?
- What constitutes emptying time of a system?





# Success Stories Pilot Projects





# Success Stories

- Success story of infiltration trench
- Rainwater harvesting may be acceptable too





# Success Stories





# Success Stories

A photograph of a residential construction site. In the foreground, a dry river bed approach is being constructed with gravel and black corrugated pipes. The pipes are laid out in a series of parallel lines, creating a channel. The gravel is piled up on either side of the pipes. In the background, there are several houses with brick and siding. Some houses have white trim and others have red brick. There are also some construction materials and equipment visible in the background.

Next phase had dry river bed approach with gravel to the top



Final Comment  
Want to learn about your LID?



Go out there when it rains ...



# Thank You

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