



# Tree Roots and Sewers

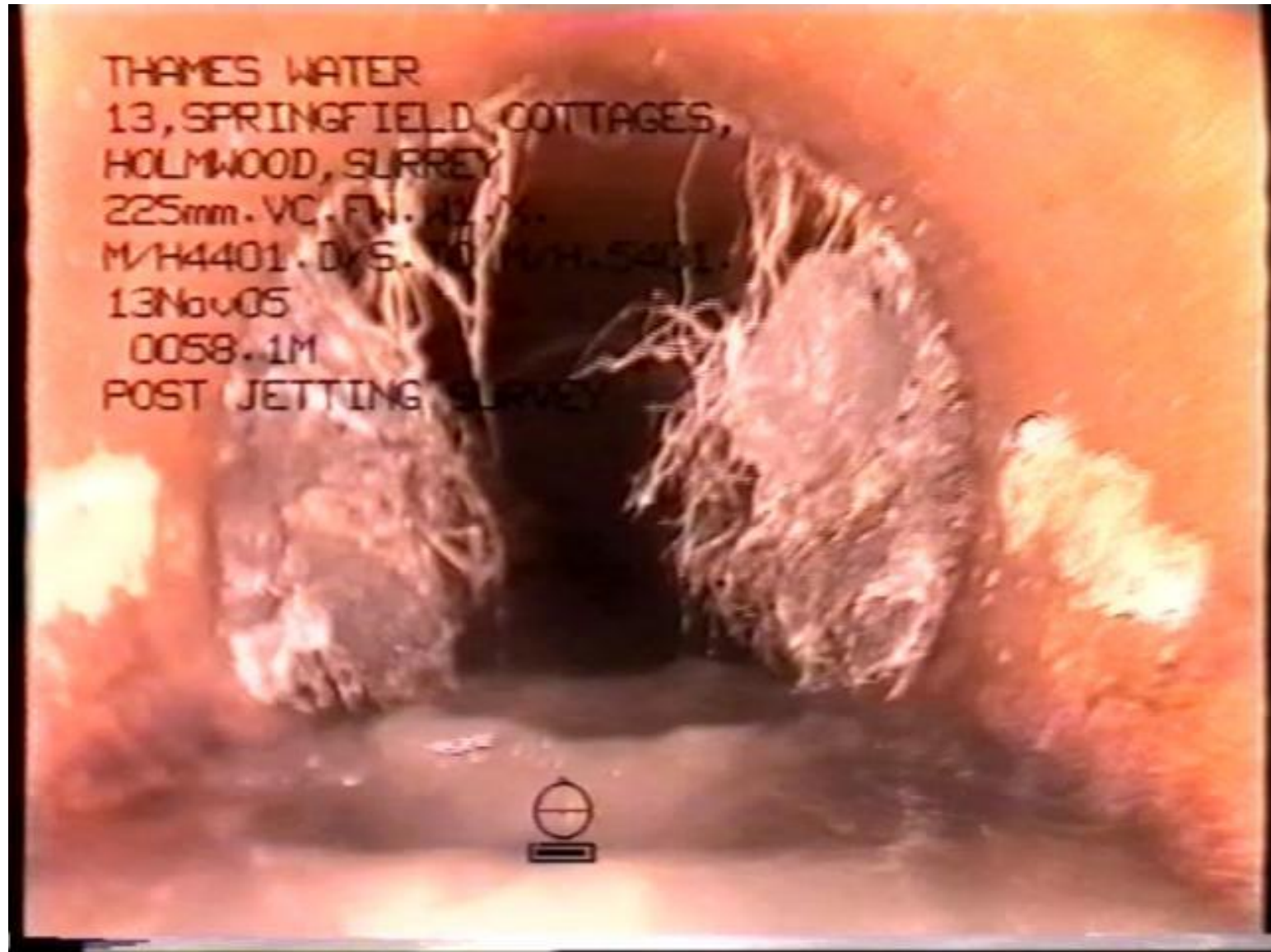
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# Negative impact for trees

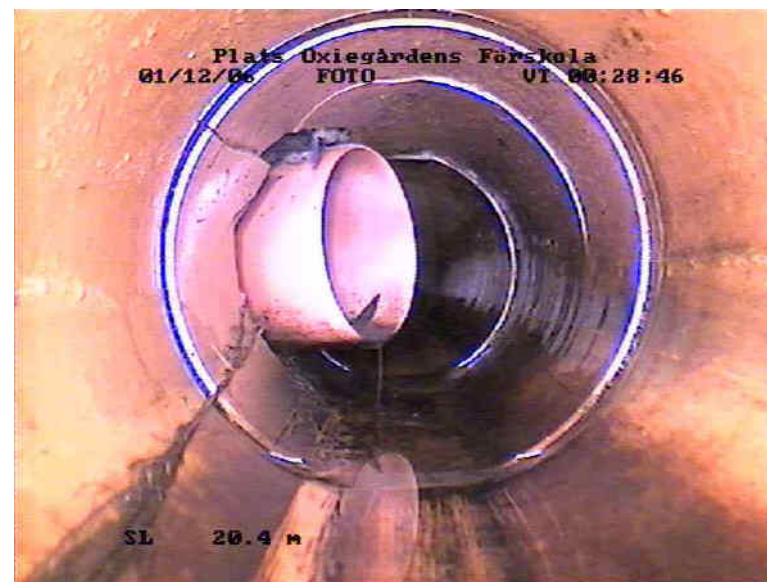
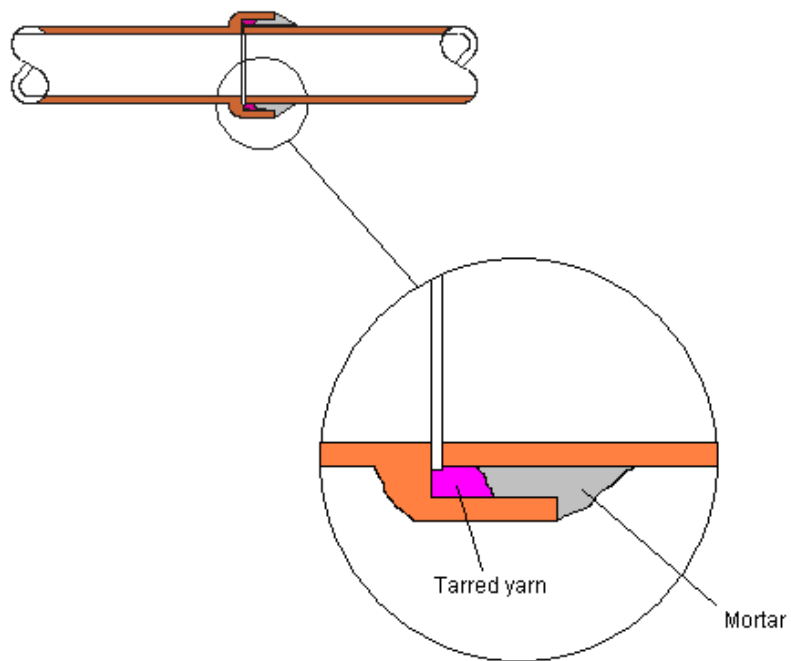


# Negative impact for pipes



Preface;  
Historic understanding of the reasons for root  
penetration into pipes?

- Inadequate leak tightness
- Poor installation
- Pipe damage



# The long term experiment at Alnarp Sweden 1993 - 2004





## Roots in modern PVC pipe

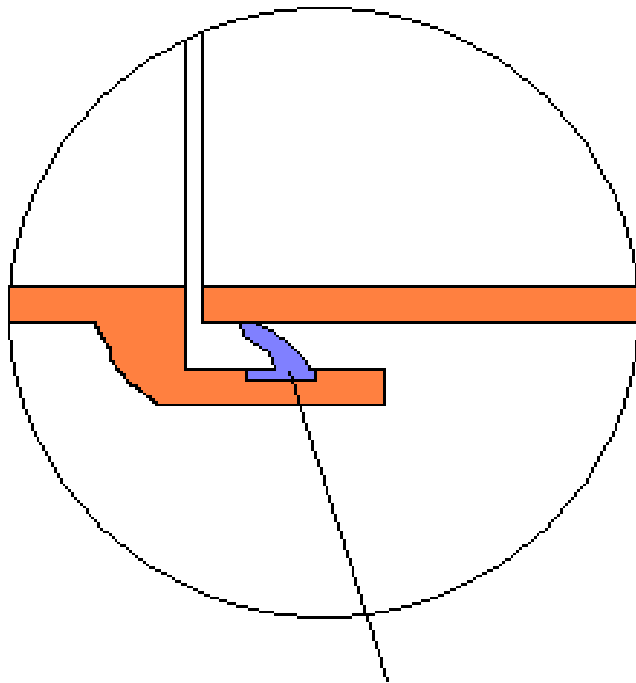




## Roots in modern Concrete Pipe



2006 D, Ridgers, K, Rolf and Ö, Stål  
Management and planning solutions to modern PVC- and concrete  
sewer pipes' lack of resistance to root penetration. Arboriculture Journal 2006



EPDM elastomeric seal



Investigation of which pressure a root tip can develop has been carried out in Germany by the following researches:

- Dr.-Ing. Bert Bosseler, IKT - Institute for Underground Infrastructure, Gelsenkirchen
- Prof. Dr. Thomas Stützel – Systematic Botany, Faculty for Biology, Ruhr-University Bochum
- Dipl.-Ing. Christoph Bennerscheidt – IKT - Institute for Underground Infrastructure, Gelsenkirchen

# Investigations of root intrusion in new pipes

- Institute for Underground Infrastructure, Gelsenkirchen, Germany
- Systematic Botany, Faculty for Biology, Ruhr-University Bochum, Germany
- Thames Water Utilities, Great Brittan.
- CSIRO Australia
- Swedish University of Agricultural Sciences

A tree root tipp can develop a preasure of >12 bars







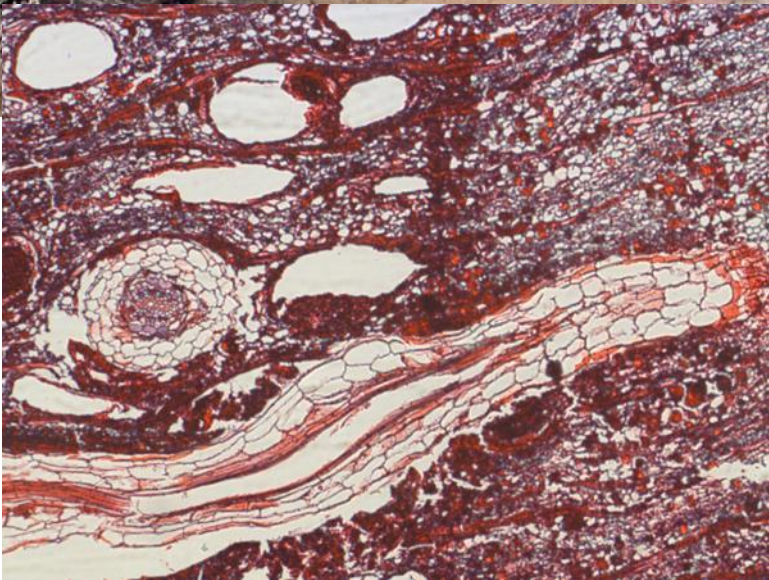
## **Information and pictures;**

Dipl.-Ing. Christoph  
Bennerscheidt

IKT - Institute for  
Underground Infrastructure,  
Gelsenkirchen  
Germany

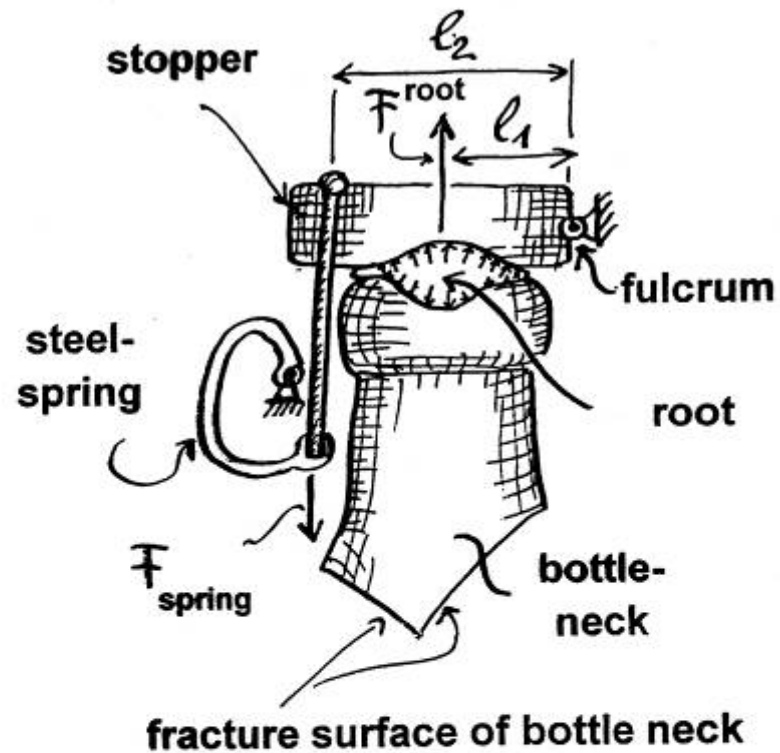








# Mattheck, C., Bethge, K. & Stål, Ö. 1996



this case:  $l_2 / l_1 \approx 1.7$   
 $F_{root} = 1.7 * F_{spring}$   
 $F_{root} = 114 \text{ N}$

Fig. 3: Simplified mechanical situation at the stopper.

# Conclusions from recent research concerning root intrusion!

- Fast growing trees species (willow poplar, birch etc) are more likely to cause damage to pipes!
  - This is not really true - root intrusion has occurred over a range of species!*
- Trees of species with an unfavorable root development pattern are growing or are planted too close to pipes!
  - This seems correct in most of the cases!*
- Sufficient soil structure and soil status avoids trees to develop a root system that penetrates the pipes!
  - No! vigorous trees are likely to flourish in a random and wide area.*
- Tree roots do not damage pipes on a deeper depth than 3 meters.
  - No! Given the right conditions, tree roots can grow very deep. Most common root intrusion cases in Sweden are deeper than 3 m and not seldom down to 10 meters.*
- Plastic pipes have less problem with root penetration!
  - No! even modern plastic pipe have problems to avoid root intrusion.*

# There are No Good or Bad Trees!

Lind



Pil

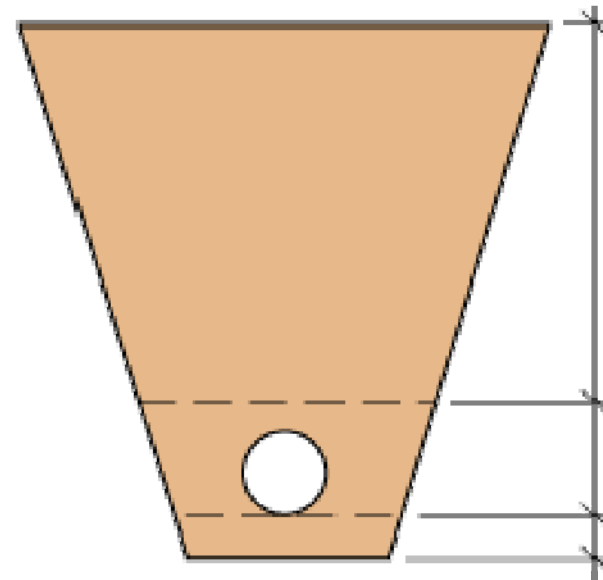
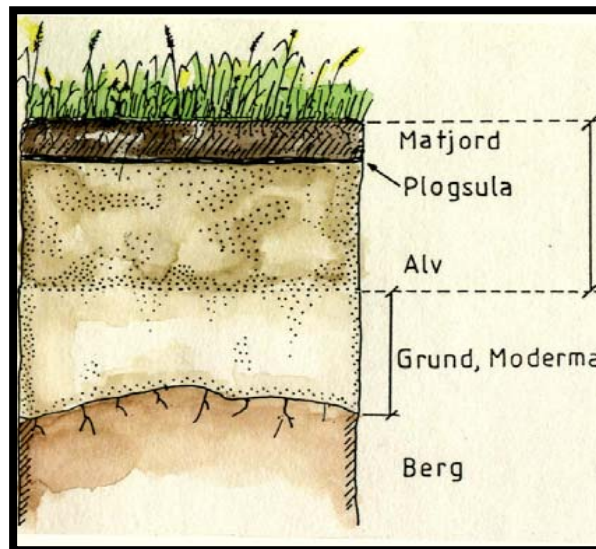


Are the soils we use for trees in urban environments

really the optimal substrate ??

...when roots seem to prefer the condition in pipe trenches

and other building materials existing below ground!



The environment for root growth seems very favourable in the filling material in pipe trenches and in railway embankments



Few roots in native soil !



Lots of roots in pipe trench







# Tree nursery growing method Missouri pea gravel bed

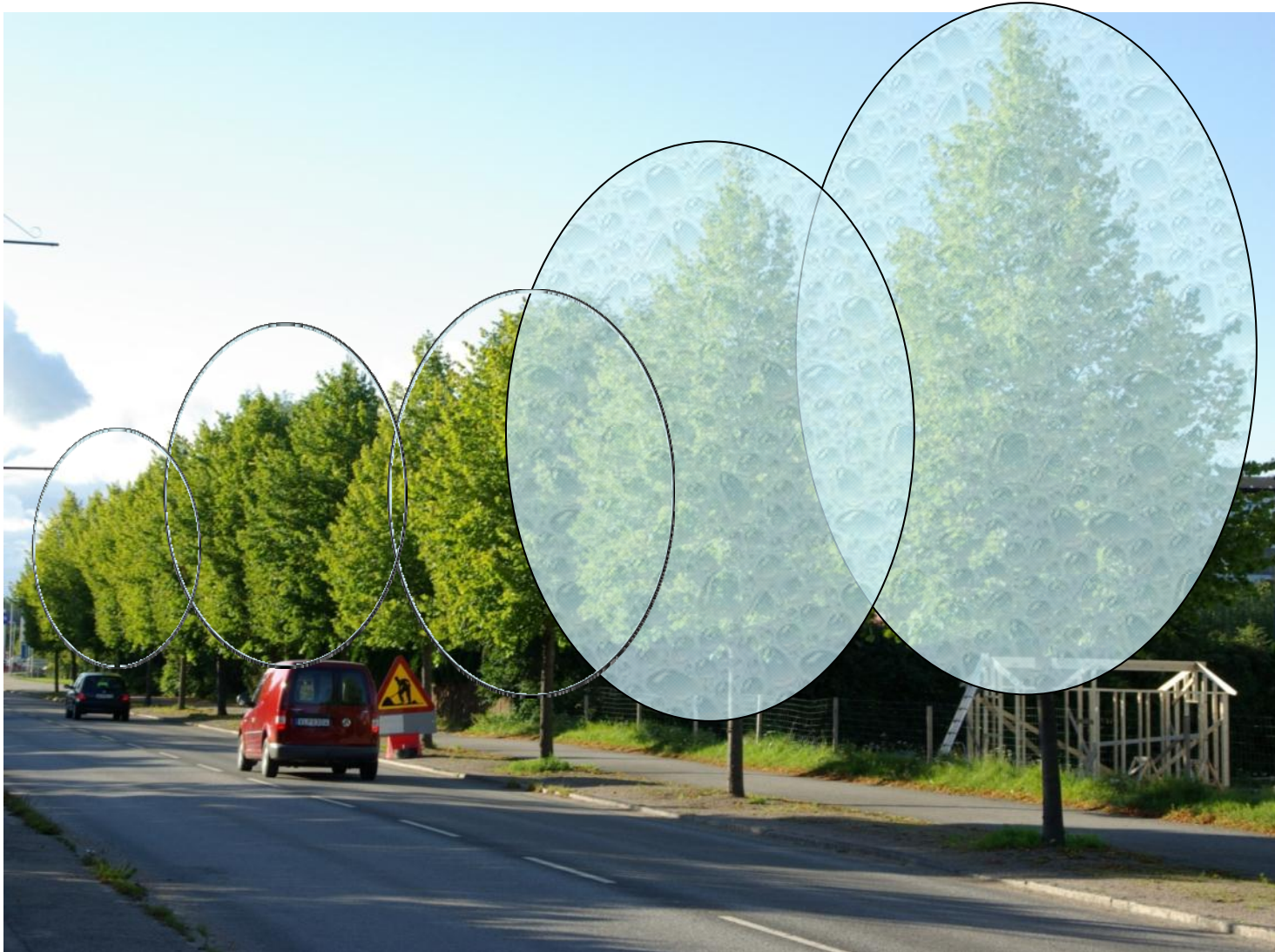


# Missouri Pea Gravel Bed Tree Nursery

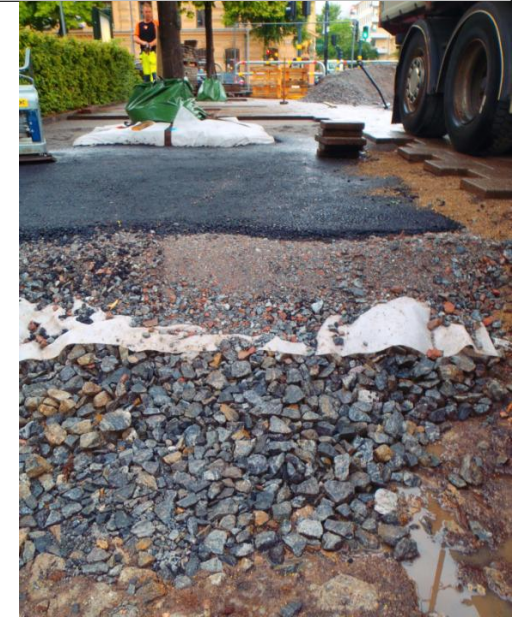
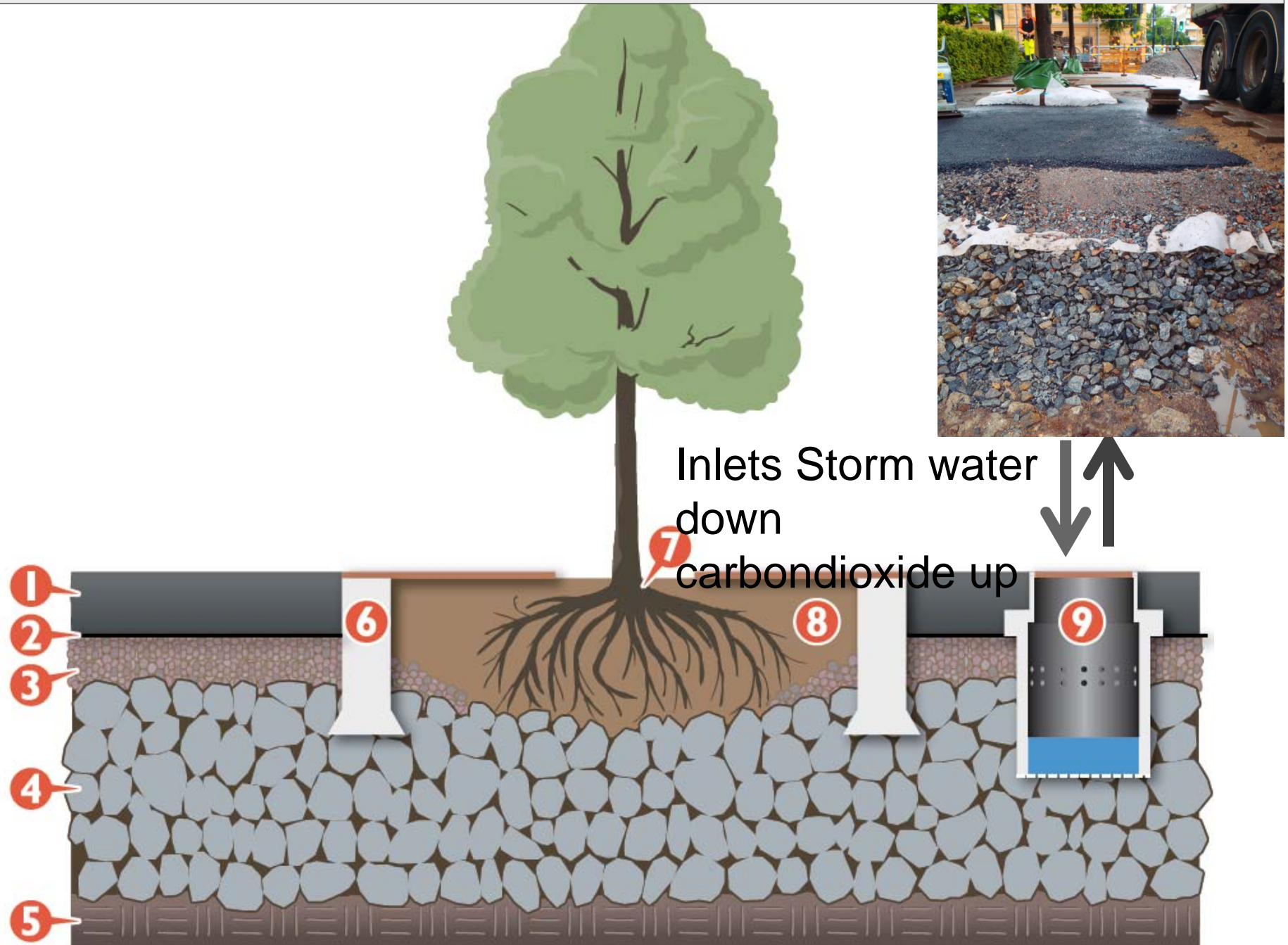




# Trees as an resource for stormwater management in the cities!



# How to create good growing conditions and taking care of the storm water

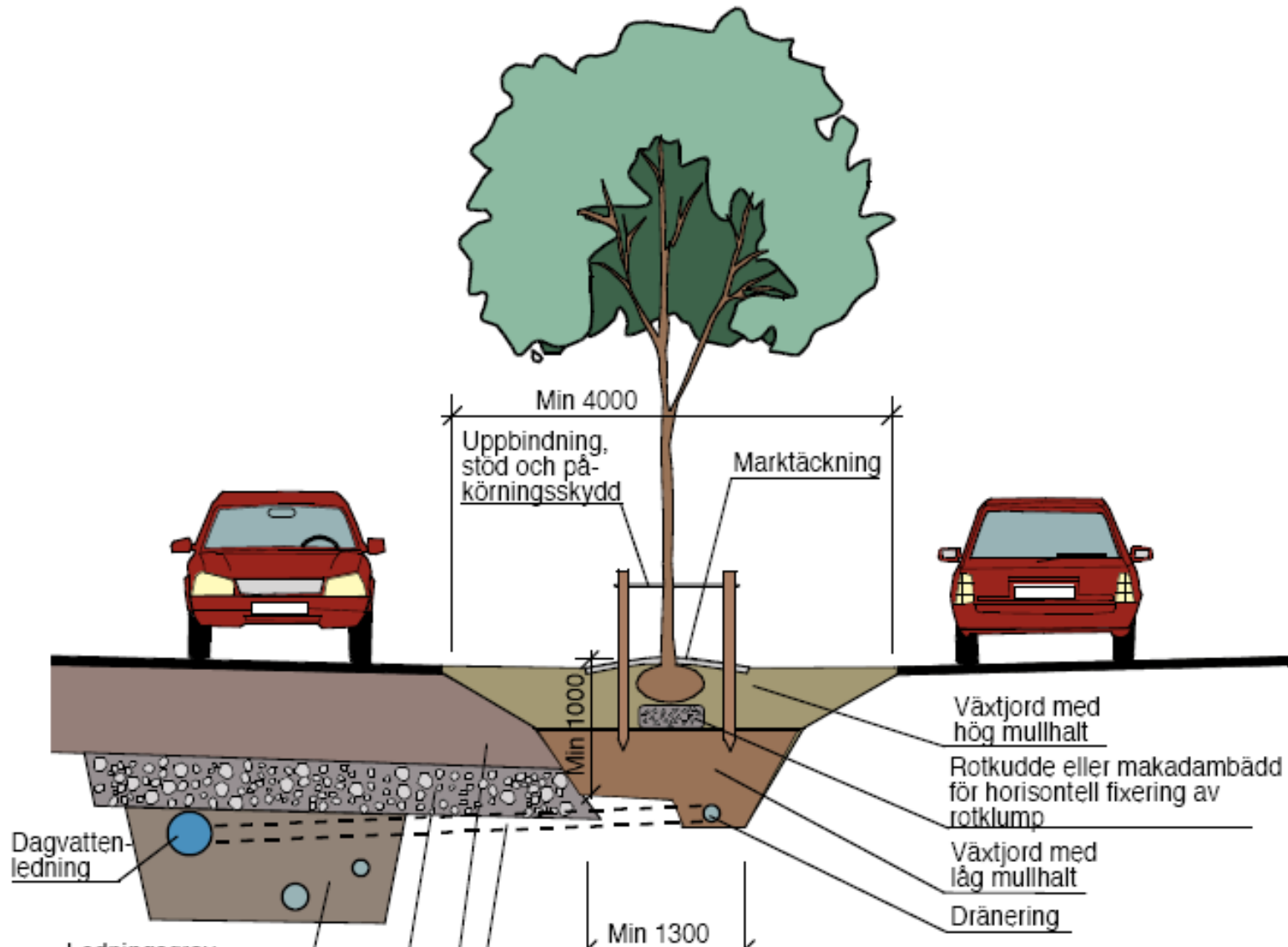




# Mykorrhiza



# How to create good growing conditions and avoid root intrusions







High compacted material between structural soil and the pipe trench







# New Boulevard with a Tree Alley at a University Campus



Tank You For Your Attention

