Porosity Models for Stormwater Filters

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Hydro International

- Formed as "Hydro Research and Development" in 1980
- Floated on LSE in 1994 as Hydro PLC
- $\sim$ 120 employees; 5 offices in UK, US, Ireland
- Turnover $\sim \$30M$ in 2008

Involved in development and supply of products for urban water management – SUDS, Stormwater management, drainage control, water quality/processing, wastewater processing

Previous involvement: KTP project developing CFD techniques for modelling existing range of Vortex Flow Controls – Dan Jarman (KTP associate). 4th year project on Vortex Flow Controls (2010-11)

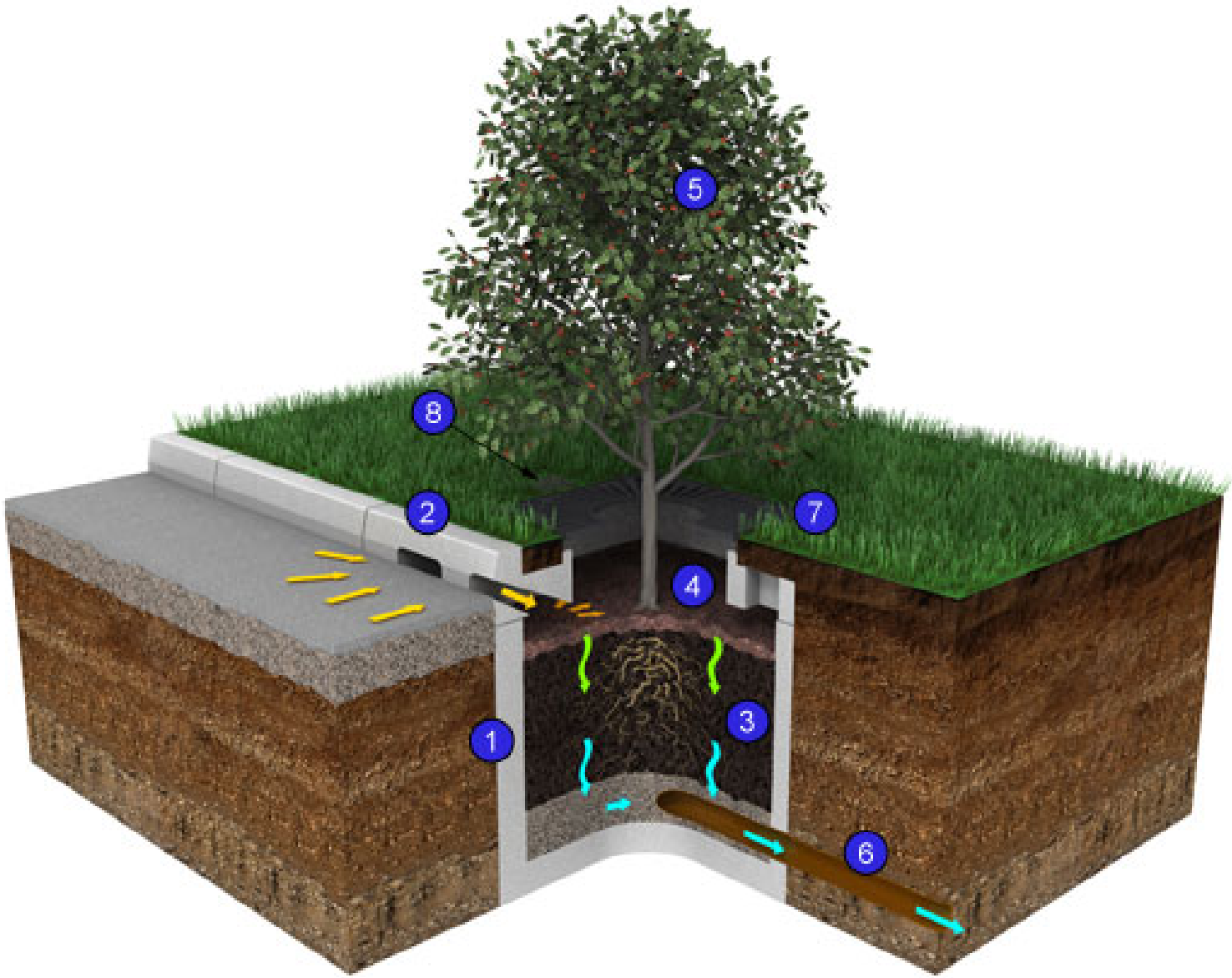
Stormwater filtration

Surface water runoff is a major factor in urban flooding. Environmental/legislative factors push developers to consider upstream end of drainage network.

Need to filter out debris/polutants from urban runoff – trash, sediments, nutrients, metals, hydrocarbons :

- Hydro Up-flo filtration system – mechanical filtration (fluidized bed)
- Hydro Filterra Bioretention system - biomechanical system

Hydro Filterra unit



CFD modelling of typical units of interest to Hydro :

$$\frac{\partial u}{\partial t} + \nabla . uu = -\frac{1}{\rho}\nabla p + \nabla^2 u + f$$

But what is f?

Usually take

$$f = Au + Bu^2$$

– need to determine A and B

Project Aims

Aim of project: to investigate modelling of filtration flow

Project will involve;

- Laboratory experiments on flow through packed beds
- Micro-CT imaging of microscale structure (gravel, soil, root systems)
- CFD modelling of microscale flow in packed beds
- Macro-scale modelling of flow through Hydro Filterra system
- Urban Drainage modelling - InfoWorks ICM

Interdisciplinary group involving Civil/Mechanical/E&M students.