

# SUDS: Innovation or a Tried and Tested Practice?

- ◆ **Anthony Kirby**
- ◆ Entered in ICE Papers Competition 2003
- ◆ Winner of James Forrest Medal in Nov 2004



# Scope of Presentation

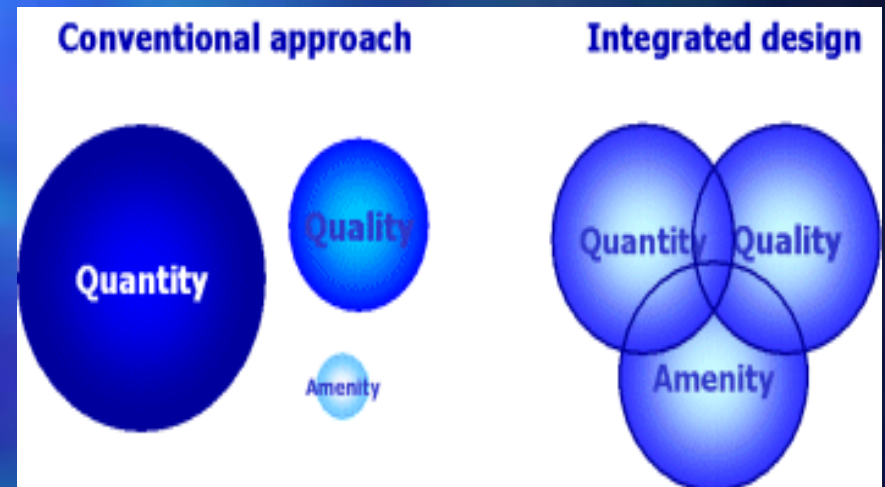
- 💧 SUDS principles
- 💧 SUDS overview
- 💧 SUDS: The Issues
- 💧 Recent Progress
- 💧 SUDS in Scotland
- 💧 Comparisons to ancient water harvesting
- 💧 Summary: Are SUDS really innovative solutions?



# SUDS: An Overview

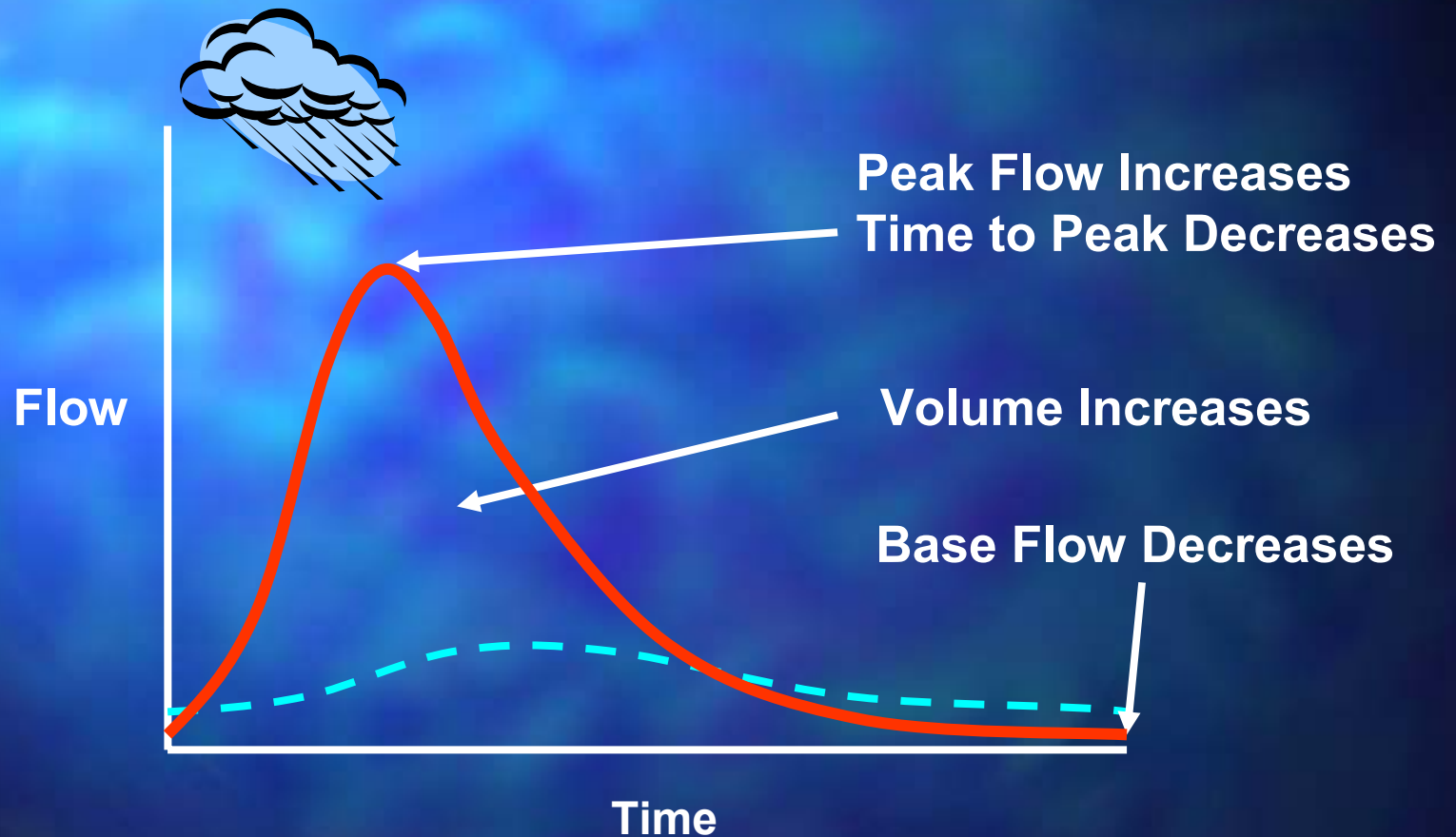
## Principles

- ◆ **Sustainable Drainage Systems**
- ◆ Mimic natural drainage processes
- ◆ Protect or enhance water quality
- ◆ Sympathetic to the environmental setting
- ◆ Equal consideration to:
  - ◆ **Quantity**
  - ◆ **Quality**
  - ◆ **Amenity**



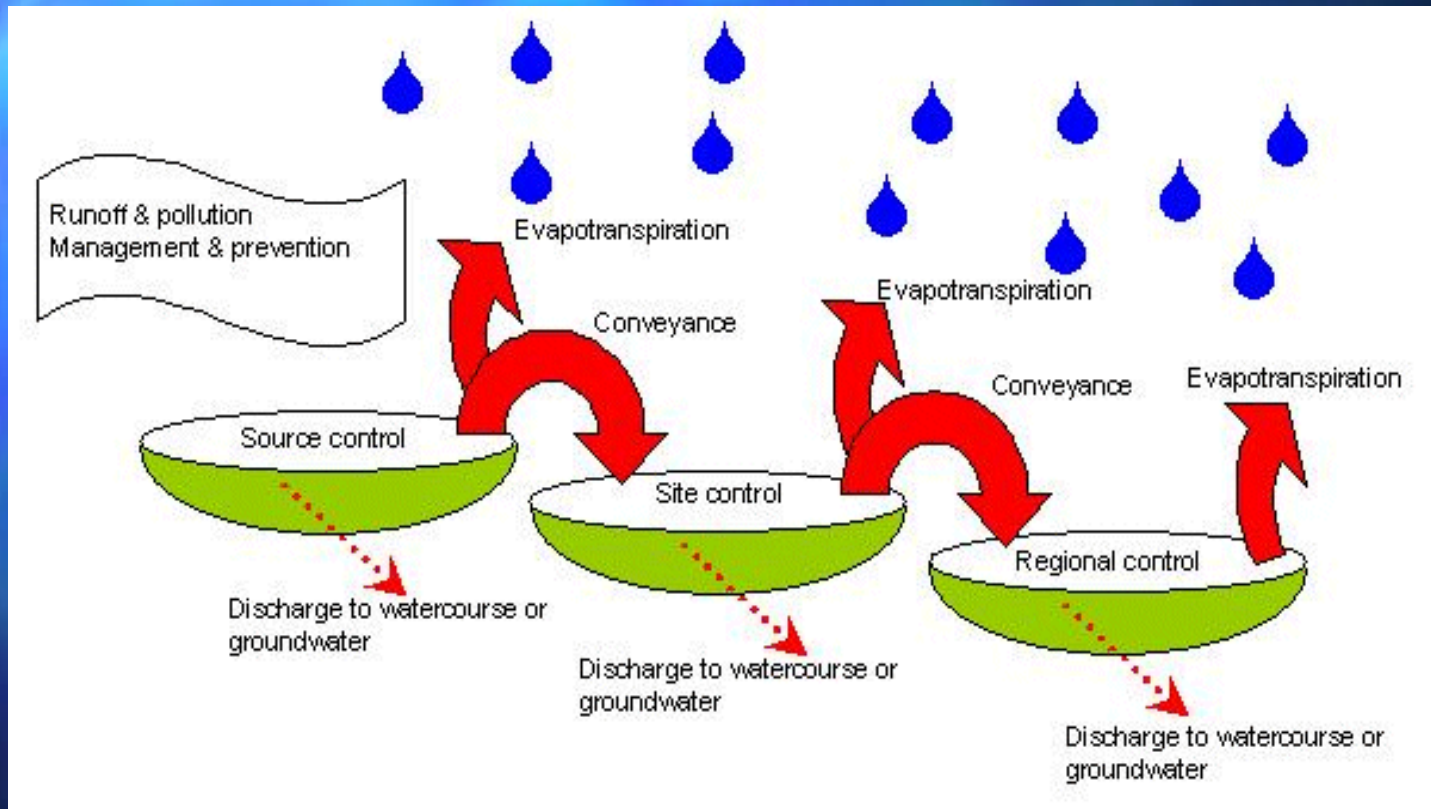
# SUDS: An Overview

## Effect of Urbanisation on Storm Hydrograph



# SUDS: An Overview

## Surface Water Management Train



# SUDS: An Overview

## Devices

- ◆ Swales
  - ◆ Conveyance
- ◆ Basins and ponds
  - ◆ Attenuation basins
  - ◆ Retention Ponds
- ◆ Infiltration devices
  - ◆ Soakaways
  - ◆ Infiltration Basins
- ◆ Permeable surfaces
  - ◆ Grass
  - ◆ Permeable paving



# SUDS: The Issues

## Design Criteria and Guidance

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- ◆ Selection and suitability
- ◆ Source control techniques generally preferred
- ◆ Solution should be inspired by the natural drainage pattern of catchment
- ◆ Water companies actively encouraging SUDS where appropriate, but responsibility does not stop with them
- ◆ Mind set still focused on conventional pipe systems in England and Wales

# SUDS: The Issues

## Adoption

- ◆ Main stumbling block to implementation of SuDS in England and Wales
- ◆ Legislative framework phrased around conventional systems
- ◆ Not easily interpreted to include SuDS type solutions
- ◆ No "SuDS For Adoption" document.....yet!
  - ◆ **SUDS Matrix in Wales**
- ◆ Operation and maintenance risks
- ◆ Responsibility
  - ◆ Water Companies?
  - ◆ Local Authorities?
  - ◆ Environment Agency?
  - ◆ Developers/Owners?



# Recent Progress Guidance

- ◆ SUDS Interim Code of Practice supersedes 'Framework for SUDS' – National SUDS Working Group
- ◆ CIRIA 609 – advice on the design and construction of SUDS
- ◆ CIRIA 522 – Design Manual for England and Wales
- ◆ CIRIA 523 – SUDS Best Practice Manual
- ◆ CIRIA 625 – Model Agreements for SUDS
- ◆ SUDS Working Party for Wales – SUDS Matrix

SUDS Ownership / Maintenance Matrix for Wales (Draft)

Organisation responsible for SUDS ownership / maintenance	SUDS Technique <sup>1</sup>					
	Above Ground			Below Ground		
	Pervious surfaces (e.g. car parks) and filter drains	Filter strips and swales	Basins, ponds and wetlands	Soakaways	Infiltration trenches	Pipes
Local authority (with drainage, property, or open space interest)	Yes for own development <sup>2</sup> or where land ownership is taken under a S106 Agreement <sup>3</sup>	Yes for own development <sup>2</sup> or where land ownership is taken under a S106 Agreement <sup>3</sup>	Yes for own development <sup>2</sup> or where land ownership is taken under a S106 Agreement <sup>3</sup>	Yes for own development <sup>2</sup> or using highway infrastructure, or by agreement	Yes for own development <sup>2</sup> or using highway infrastructure, or by agreement	Yes for own development <sup>2</sup> or using highway infrastructure, or by agreement
Welsh Assembly Government Motorways and Major Trunk Roads	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>
Local authority (Highway) Other Roads <sup>4</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>	Yes for adopted highways or land owned <sup>1</sup>
Statutory sewerage undertaker <sup>5</sup> <small>(DCWW)</small>	DCWW do not adopt Car-Parks. Any Pervious surfaces are considered part of the Highway. Restrictions to Discharge are generally covered by S106 Agreement.	See Infiltration Trenches	These structures are not adopted. However DCWW will consider the pipe work to the Pond and the Head Wall. The contents of these structures would also be considered with assessments. The discharge downstream of these structures would be required to go to a watercourse. DCWW would prefer adoption of these structures by a recognised authority (e.g. Local Authority). DCWW will also need to consider the consent order of the maintaining authority.	DCWW would not consider these for adoption but are positive towards them as they would like to see a maintenance agreement drawn up either by LA or individual householders (e.g. within the bounds of ownership). DCWW often includes in Water Parks for the removal of Surface Water from their Combined Sewers. Proper consideration will be made to design and construction.	Trench Infiltration is considered as Land Drainage surface water. Water Companies are unable to adopt Land Drainage surface water. DCWW consider it to be a Local Authority or Environment Agency responsibility.	Yes if adopted as an accessory to a public sewer <sup>6</sup>
Major freeholder / developer, e.g. for motorway service area, supermarket	Yes for own development <sup>2</sup> or where S106 maintenance arrangements are in place	Yes for own development <sup>2</sup> or where S106 maintenance arrangements are in place	Yes for own development <sup>2</sup> or where S106 maintenance arrangements are in place	Yes for own development <sup>2</sup> or where S106 maintenance arrangements are in place	Yes for own development <sup>2</sup> or where S106 maintenance arrangements are in place	Yes for own development <sup>2</sup> or where S106 maintenance arrangements are in place
House owner <sup>7</sup>	Yes on own property <sup>8</sup>	Yes on own property <sup>8</sup>	Yes on own property <sup>8</sup>	Yes on own property <sup>8</sup>	Yes on own property <sup>8</sup>	Yes on own property <sup>8</sup>
Management company <sup>7</sup>	Yes as an alternative option where no other organisation maintains	Yes as an alternative option where no other organisation maintains	Yes as an alternative option where no other organisation maintains	Yes as an alternative option where no other organisation maintains	Yes as an alternative option where no other organisation maintains	Yes as an alternative option where no other organisation maintains
Environment Agency	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>
Internal drainage board	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>
Wildlife group	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes, where ownership for site of ecological value where no other organisation maintains	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>	Yes for own development <sup>2</sup>

**Draft**

Notes

1 Ground conditions must be suitable for the specified SUDS technique.

2 Own development is defined as a free standing development within its own infrastructure which is on land owned or controlled by the organisation in question, and which does not form part of a statutory requirement or adoption process.

3 Local authorities and highway authorities will need to arrange to fund adoption and maintenance of SUDS. The developer would provide an appropriate dedicated sum, and the relevant organisation accepting maintenance

# Project Red Dragon

Hangars and Support Building

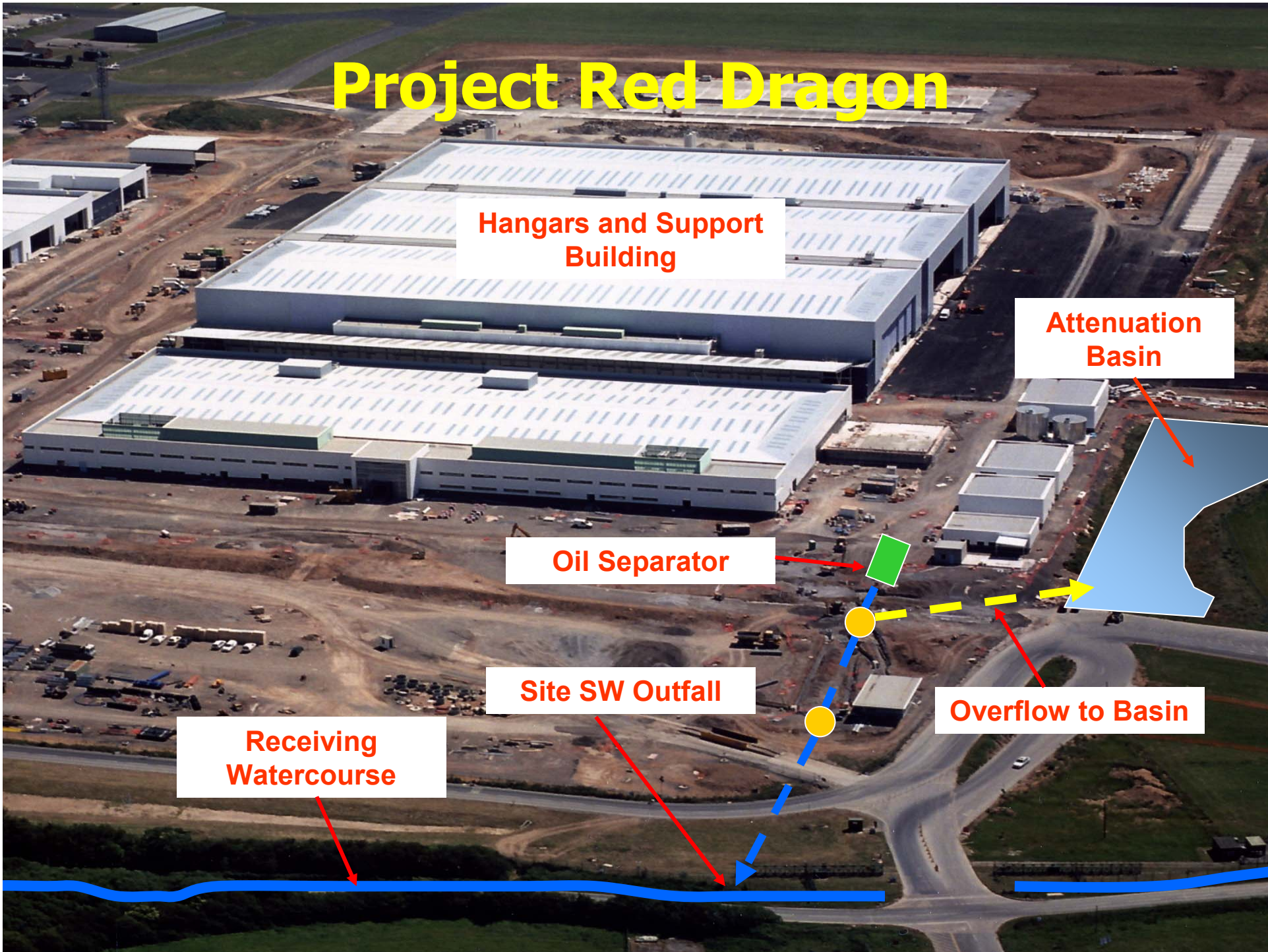
Attenuation Basin

Oil Separator

Site SW Outfall

Receiving Watercourse

Overflow to Basin



# Project Red Dragon

## Basin Operation Principles

- ◆ Provides a Site Control
- ◆ Basin is dry under normal flow conditions
- ◆ During higher flow rates, orifice plate in manhole only allows GFR to pass to outfall
- ◆ All excess flow passes to basin for attenuation
- ◆ As flow rates reduce, attenuated storm water gravitates to outfall in controlled manner
- ◆ Reduces the risk of flooding in receiving watercourse.

# SUDS In Scotland

## Lessons to be Learnt?

- ◆ Approximately 1000 SuDS implemented since 1993
- ◆ Effect of urbanisation on pollution of Scottish rivers recognised
- ◆ Potential of SuDS identified
- ◆ Research and monitoring programmes well advanced
- ◆ Proper “partnership” between SEPA and Water Authorities
- ◆ SUDS “will” be adopted
- ◆ Scottish Parliament have powers to pass laws



# SUDS In Scotland

## Problems Overcome



- ◆ Experienced similar difficulties ten years ago as England and Wales are today
- ◆ Little information on performance, maintenance and whole life costs of schemes
- ◆ Confusion led to formation of SUDS Scottish Working Party in 1997
- ◆ Framework agreement and design manual developed
- ◆ SUDS now an integral part of planning policy in many areas – **MIND SET**

# Learning From Scotland

## The Welsh Perspective

### SUDS Working Party for Wales

- ◆ Limited number of Stakeholders:
  - ◆ One Road Authority – The Welsh Office
  - ◆ One Water Company – DCWW
  - ◆ One Assembly
  - ◆ One EA Region
  - ◆ In England, things are more complex as there are many interested parties.

# SUDS.....

Are we simply reinventing the wheel?



# Water Harvesting in Negev Desert

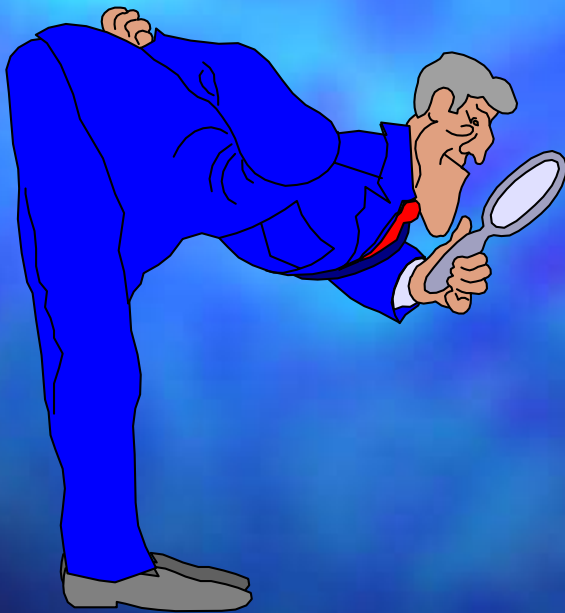
## An Early Form of SUDS?

- ◆ Techniques of water harvesting around 4000 years old
- ◆ Collection, storage and conservation of runoff to sustain life
  - ◆ First imperative of desert settlement
- ◆ Small catchment areas and low water volume
  - ◆ Permanent rivers almost absent
  - ◆ Annual rainfall varies between 25mm and 200mm
- ◆ Collection of water from sloping ground
  - ◆ Conveyance
- ◆ Rainwater collected by use of cisterns
  - ◆ Artificially constructed reservoirs
  - ◆ Early cisterns crude and inefficient but developed



# Water Harvesting in Negev Desert

## Comparisons to SUDS Techniques



- Conveyance to cisterns
- Catchment understood for strategic location of cisterns
- Mimic natural drainage patterns
- SUDS build on water harvesting principles by consideration of quality and amenity
- Modern rainwater harvesting techniques – re-use of 'grey water'

# Innovation..... or a Tried and Tested Practice?

- ◆ SUDS build on principles that are over 4000 years old
- ◆ Use of old technology in a modern strategy
- ◆ Solution is based on natural drainage pattern
- ◆ Schemes successfully implemented in UK
- ◆ Barriers have been overcome
  - ◆ Common goal
  - ◆ Working together
- ◆ Research and monitoring will provide greater understanding of systems
- ◆ Better guidance required
- ◆ Clarity of responsibility
- ◆ Sustainability for the future.....

**Thank You!**

