

# Sustainable drainage systems

## Bristol Business Park sustainable drainage system for preventing water runoff and flooding of nearby areas

### Background

Bristol Business Park's previous drainage system incorporated traditional methods to deal with rainwater leading to conventional ditches and ponds. Sustainable drainage systems (SUDS) are designed to cope with a 1 in 30 year flood. The last phase to be completed at the business park was within a catchment drained by a small watercourse which begins near the site boundary, and has a very shallow bed downstream, adjacent to a road prone to frequent flooding.

### Objectives

The main objectives of this project were to minimise runoff and reduce the risk of flooding using innovative SUDS methods. The planning policy of the South Gloucestershire Council states that all new developments should incorporate sustainable drainage systems. With the aid of their local plan, guidance notes and strategic flood risk assessments, the planners worked on the final phases, developing an innovative drainage system which would meet the 1 in 100 year flood criteria.

### Materials and Methods

#### Site

The site is located to the North of Bristol in Frenchay. The business park is on a brow of a hill, near the University of the West of England (UWE) extending across 11.6 ha.

#### Method

The SUDS used at the business park included permeable paving, swales (narrow, low tracts of land) and a detention pond. Hydraulic models were used to estimate future rain and flow rates of this particular scheme, allowing for the 1 in 100 year flood scenario.

Permeable paving was used in the parking areas (totalling 1.2 ha). It consists of paving blocks with gaps around the edges of each which allow water to drain through. Water then runs through a granular layer and into a porous sub-base. This not only slows the water flow rate but also helps to clean the water. Rainwater from the

rooftops feeds into conventional downpipes and in turn into the permeable paving system's porous gravel sub-base.

The detention pond is the water storage facility of the system. Water collected from the permeable paving is discharged firstly into the swales and then into the detention pond, which also has the capacity to store water from previous phases of the development.



The detention pond provides a valuable function for people and wildlife, enhancing the aesthetics and biodiversity of Bristol Business Park (photo: CABE/Stephen McLaren).



Swales, which take water from the permeable paving, add an attractive feature to the business park (photo: CABE/Stephen McLaren).

## Approach

The main driving force behind this project was to minimise and manage water runoff and potential flooding events whilst working with the business park developer to make best use of the land and ensure they received a good commercial return. The main reason behind the use of permeable paving as a drainage system was to maximise the amount of land that could be developed. Originally the proposal contained a larger detention pond but due to siting problems and, as indicated, the need to maximise land, a compromise was reached of a smaller but slightly less attractive detention pond.

## Results

- The final phase of the Bristol Business Park which included sustainable drainage has achieved its aim of introducing an innovative SUDS which has prevented flooding from water runoff. This at no point compromised the appearance or the commercial viability of the business park.
- The pavement has been observed during and after a range of heavy and prolonged storms, and only negligible flows have discharged into the swales, demonstrating the attenuating and infiltrating attributes of the paving system. The benefit of using permeable paving was that it reduced the size of the pond, increasing the proportion of the site that could be developed. It also satisfied the SUDS planning policy of the local authority.
- The swales and the detention pond have created attractive, valuable features in the park for people and wildlife. The landscape features also provide a cooling effect.
- The drainage system fulfilled its primary function of flood alleviation and brought with it additional human and ecological benefits.

## Discussion

This case study highlights a sustainable drainage system in a new business development and the issues that developers face, mainly the trade off between maximising development space and reducing runoff. Minimising runoff and flood events is now integral to local and national government policy. Each new development must take into account their individual site, climate, stakeholders and local policy before deciding on a sustainable drainage system.

## Reference

<http://www.cabe.org.uk/public-space/sustainable-urban-drainage> (accessed: 1st February 2010)