

# A Case Study in Sustainable Drainage Systems: **Dunfermline Eastern Expansion, Dumfries & Galloway, Scotland**

**T**he Dunfermline Eastern Expansion (DEX) is a 550ha (5.5km<sup>2</sup>) site which lies to the east of Dunfermline and close to the Firth of Forth. The site, which was predominantly green field, is to be developed over a 20 year period as a mixture of industrial, commercial, residential and recreational areas.

The Scottish Environmental Protection Agency (SEPA) is primarily concerned with the quality of the run-off compromising the downstream river quality. In addition, the catchment immediately downstream of the site has an existing flooding problem, and SEPA is also concerned about the velocity and volume of run-off from the site. For these reasons, the use of SuDS was made a planning condition, and DEX is now the largest site in the UK to use widespread sustainable drainage methods.

DEX is located on an area of predominantly low permeability clay soil. Infiltration methods have limited application on the site. Some residential roads will be served by soak-aways where soil permeability permits.

Construction of infrastructure started in 1997, and was completed in mid 1999. Much of the spine road system is drained using offset kerbs, filter drains and swales that discharge into extended detention basins and wetlands which also serve adjoining housing areas. Treatment of surface water run-off from the development and roads is achieved through a system of regional ponds and wetlands prior to discharge at a controlled rate to local watercourses. Many of the proposed sub-catchment developments use an attenuation basin at the end of a traditional piped system.



*Roadside filter drain.*



*Large swale receives motorway drainage.*



*Large retarding basin and swale.*



*Attenuation Pond.*

**T**he wetland is located in a public park area where informal public open space adjoins an existing forested area and an area set aside for football pitches, a rugby pitch and tennis courts.

Permeable paving has been used in the Tesco car park which is connected through attenuation/infiltration basins to the wetland.

Run-off from a car manufacturing factory is passed through two extended detention ponds to the Calais Burn (stream) and limestone quarry ponds.

Flow from the industrial areas will be attenuated and treated within the industrial development sites.

The ponds and basins are very large scale and have been designed to hold the run-off that can be expected from up to 90% of storms occurring in a single year.



*Permeable paving, "Tesco" carpark.*



*Side entry pits to filter drain filling station.*



*Detention basin makes use of space in roundabout.  
Grass-crete enables maintenance access.*



*Retention pond.*

**INNOVATIVE DRAINAGE SOLUTIONS** have been used, such as using the open space in the centre of a roundabout as an extended detention basin

**MONITORING** the effectiveness of the system is being undertaken with the assistance of Abertay and Edinburgh Universities over a five year period.

The **COST** of maintaining the systems will also be assessed during this time. However, the use of conventional drainage systems would have resulted in prohibitive costs to drain the development (the discharge being required via a 5km sewer to the Forth River).

**ADOPTION ISSUES** have presented barriers to the use of SuDS on the DEX site. Initially, the highway authority were unwilling to accept responsibility for any drainage methods other than traditional piped systems or soakaways. However, they have now agreed to adopt most of the strategic road system, including the swales, filter drains, offlet kerbs and an extended detention basin in the middle of the roundabout. The local council resisted adoption of retention basins.

**SAFETY**; the local councillors were anxious about safety near open water. However, barrier planting and shallow reed planted margins have alleviated this concern. The use of fencing has been included in this development.

