

landscape

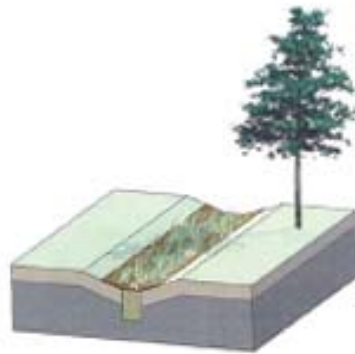
Let's make some
noise

We're ready to take landscape
architecture forwards in 2006

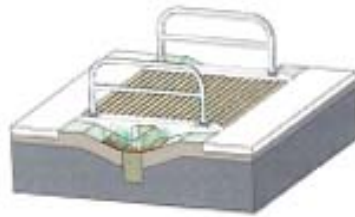
keeping the rain on the plain

Sustainable drainage design began as a method of controlling site runoff at source in order to reduce the effects of development on flooding and pollution of urban watercourses. While the benefits of SUDS have been widely accepted, there has been a gradual recognition that rainwater runoff is just one of many natural resources that should be conserved and reused thoughtfully in the development process. **Peter Wilder** discusses the movement from source control to resource control





Opposite: View from the terraces at Dalton Park, County Durham.



Left: Grass swale and swale crossover design developed for Oxley Park Project 60K

Land and water are intrinsically linked, each shaping the other. As a landscape architect, forming the land should be part of our basic design vocabulary and, as such, our understanding of the mechanics of drainage and hydrology should be second nature. While many perceive the government's housing agenda and the £50,000 house to be unachievable in a market economy, the ODPM's Design for Manufacture Competition has pushed the sustainability agenda to a new level. The sites selected by English Partnerships for the competition are typically brownfield containing the remnants of disused buildings and associated infrastructure as well as a scattering of existing ecology. Not only must the houses meet rigorous standards of energy efficiency and affordable modular construction, but the landscape has to provide surface water attenuation, habitat creation, play facilities, clear and legible circulation and sufficient buffering between the many conflicting uses. This is a tall order considering that the high land values demanded by EP and low end cost of the housing results in relatively high density solutions. The sustainable design approach that has been taken is one developed over several successful regeneration schemes that include urban and rural brownfield sites, and involves the assessment of both existing site resources and locally available waste products in the rehabilitation of brownfield or contaminated sites.

The development of a 35ha colliery slagheap in County Durham was one of the first schemes

to incorporate both waste products and site-recovered products in the regeneration process. The construction of a development plateau for the retail scheme resulted in the moving of over 60,000m³ of colliery shale. Digital terrain modelling used to create a landform sympathetic with the surrounding countryside was also used to generate detailed watershed and gradient mapping to inform a sustainable approach to the land drainage. As well as creating a sculpted and free-flowing landform, the design process led to the creation of stormwater wetlands, balancing and filtration ponds, and shallow ephemeral watercourses to maximize the filtration and attenuation of silt-laden runoff from the site. High quality standards were required as the site discharged directly into a stream running through a culvert beneath the site.

TOPSOIL CREATION

The client's brief to turn the desolate site into an inviting parkland required some new thinking on soil. The traditional 'cap and cover' approach to dealing with the colliery shale would have resulted in the importation of over 40,000m³ of topsoil, an operation both economically unviable and environmentally unacceptable. Soil scientist Tim O'Hare of Soil and Land Consultants was brought onto the team to assess the suitability of the colliery shale as a basis for topsoil manufacture. While the material was found to contain a typically high proportion of hydrocarbons, the potentially phytotoxic substances apparent during loss on ignition testing were found to be tied up at normal pH levels. This meant that material could be used as a base component in a manufactured topsoil, and a search then began to find a locally viable bulky organic material to provide structure and nutrient levels to the shale. Northumbrian Water could provide locally produced, lime-treated sewage sludge cake for around £2 per tonne once waste exemption licenses had been negotiated.

The sustainable drainage strategy was conceived as a three-stage system, providing pre-filtration through vegetation belts, filtration through constructed wetlands and ponds, and attenuation via a balancing lake. A large part of the pre-filtration was carried out by the sowing of annual ryegrass as a burse crop for the wildflower meadows. This rapid-growing grass absorbed a large proportion of the free nitrates and phosphates available in the sewage sludge cake, and prevented algal blooms and eutrophication in the watercourses. In all, more than seven different habitat zones were created including woodland, wet and dry meadow, ephemeral marshland and shallow and deep ponds with varying aquatic mangrins.

The interception of site runoff through filtration and attenuation, along with the increased water-holding capacity of the colliery shale, has reduced the amount of suspended solids in the site runoff, and the attenuation capacity has absorbed the increased runoff from all hard surfaces resulting in a runoff coefficient that is better than that of a greenfield site (7.5/100ha for this region). The approach has been heralded by the Environment Agency North East as one of the most comprehensive SUDS schemes in the UK.

RESOURCES ARISING

During the development of most brownfield sites, the material on site is often considered worthless, and the construction programme allows little flexibility to assess arisings for potential reuse. At Dalton Park we found large deposits of glacial clay and sand beneath the colliery shale during the formation of the development plateau. The sand was stockpiled and re-used as an admix to the shale in the areas within 10m of a watercourse where the sewerage sludge could not be used, and the clay deposits used to line the pond areas as a protective layer over the HDPE liners. As a result, no material was taken offsite, and very little material had to be brought onto site to create the parkland.

Sustainable design is a process that continues to evolve and take on board new approaches and principles. It is interesting to note that principles which were exploratory some years ago now return to us as part of the brief set by clients or organisations such as English Partnerships. The reuse of resources on site and the recycling of water waste and bio-renewables have combined to give sustainable design a new agenda. The challenge now lies in finding creative ways to reuse materials on site, to reduce construction traffic in development and to produce solutions which engage, excite and educate the public in their understanding of the natural environment. ▶

SUDS' broad application

Sustainable drainage design is not restricted to country parks and contaminated land: in its original guise as a method of source control against impact on urban hydrology, it has leapt out of the public realm and into commercial developments, schools and even onto roof decks as these applications show

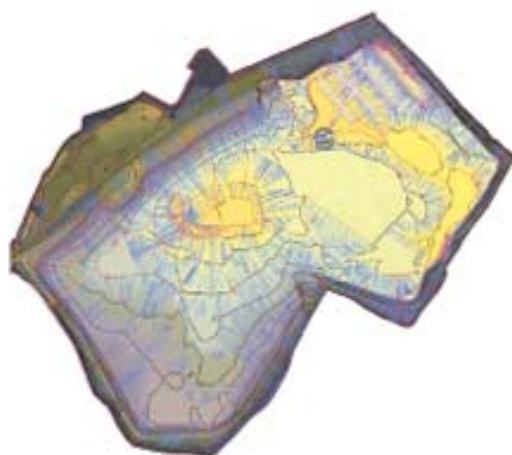


1 C4.1, MILTON KEYNES

The roof deck became an opportunity to collect and reuse rainwater as part of the building's energy-efficient and sustainable design. Collected rainwater can be recycled for toilet flushing and for landscape irrigation, and falling water in the courtyard helps to draw air movement through the courtyard, helping with the natural ventilation of the buildings. In addition to rainwater, excavated site spoil was also seen as a material with potential for reuse in sound attenuation bunds at the periphery of the site.

2 BETTESHANGER COLLIERY, KENT

Led by the South East England Development Agency (SEEDA), the 80ha scheme sets new standards for sustainable design and environmental planning. Digital terrain modelling was employed to assess the watershed characteristics of the proposed landform and to determine where erosion was likely to occur. Existing wetlands were enhanced to intercept and filter site runoff, while new ponds were created at watershed pinchpoints to prevent washout of slope profiles and provide pre-filtration zones on the upper slopes of the colliery spoil tip. The detailed hydrological profiling of the site enabled a comprehensive sustainable drainage approach to be adopted that incorporated habitat zones into stormwater wetlands, while a cut and fill approach ensured that sufficient material was generated on site for the manufacture of topsoil for the entire development.



3 SUSTAINABLE HOUSING

The government housing agenda for the South East of England demands affordable, energy-efficient, sustainable developments. In the Design for Manufacture Competition, nine consortia are currently bidding for the chance to build the ultimate modular house that meets the ODFM's targets for affordable housing and highest BREEAM and ECOHomes standards. The landscape has to work hard, be affordable and set high standards for sustainable design and habitat creation and meet NPFA guidelines for play facilities. With quality standards and land purchase prices high, and a requirement for a low delivery cost, space is at an absolute premium. The ability to squeeze the maximum value out of the landscape has been pushed to the limit. With site discharge rates set as low as 5 litre/sec/ha, runoff attenuation has been squeezed into every available space, including underground storage. Surface-water collectors and porous paving direct rainwater runoff into underground space crate systems that allow for retention or infiltration to groundwater discharge depending on the soil permeability. However complicated the site and its constraints, sustainable drainage can be integrated in the most cost-effective and environmentally friendly way.

4 BINHAI INTERNATIONAL AIRPORT, CHINA

The landscape is designed to be memorable, visionary, practical and economically viable. The fan-shaped landscape rises up to the terminal building, providing a green façade to the terminal and a green roof to the car parking and high-speed rail facility. The fan shape also reuses the vast amounts of surplus spoil generated during the excavation of buildings and tunnels on the site and directs surface water runoff to a holding pond at the fulcrum of the fan. The proposals are practical solutions to achieving the best with available natural resources and recognise the importance of conserving and reusing those resources.



Peter Wilder, co-founder of Macfarlane Wilder, has lectured in the UK and USA on subjects ranging from topsoil manufacture and sustainable drainage to urban hydrology and rainwater harvesting.