

→ Sustainable drainage systems (SuDS)

Traditional engineering solutions are gradually being replaced or integrated with sustainable solutions – often centred around the blue-green infrastructure (BGI) approach. New methods are inevitable not least due to greater population densities and expanding impervious surfaces in urban areas which, combined with extreme climate events, intensify pressure on water drainage systems.



→ What exactly are SuDS?

Managing rainfall and boosting biodiversity

Sustainable drainage systems (SuDS) are a way of managing rainfall that minimises the negative impacts on the quantity and quality of runoff whilst maximising the benefits of amenity and biodiversity for people and the environment.

The SuDS Manual 2015

Published by the Construction Industry Research & Information Association (CIRIA)

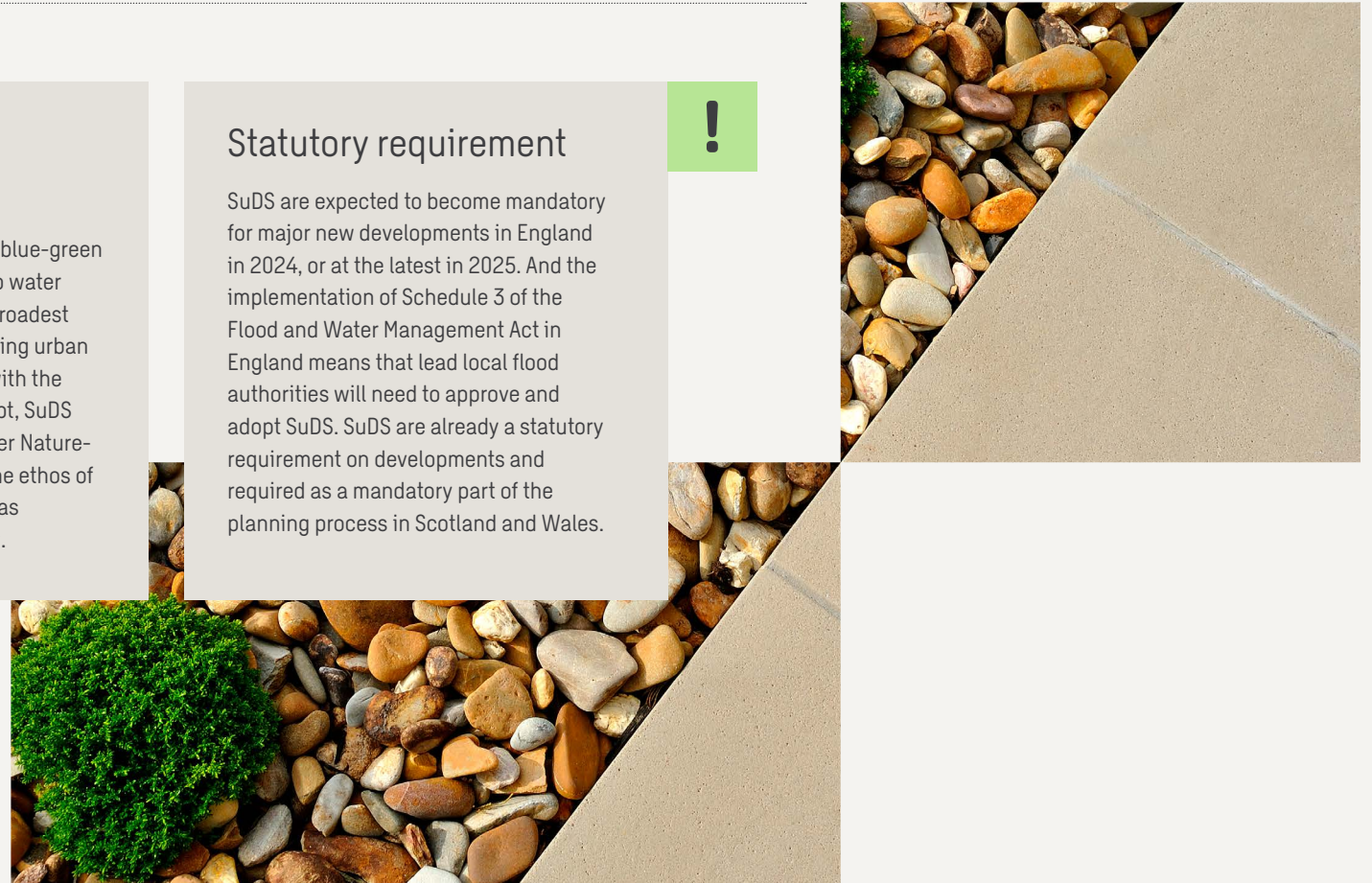


Effective water management

SuDS are an integral part of the blue-green infrastructure (BGI) approach to water management – which is in its broadest sense holistically aimed at making urban drainage systems compatible with the natural water cycle. As a concept, SuDS are part of an ecosystem of wider Nature-based Solutions which follow the ethos of building *with* the environment, as opposed to merely reacting to it.

Statutory requirement

SuDS are expected to become mandatory for major new developments in England in 2024, or at the latest in 2025. And the implementation of Schedule 3 of the Flood and Water Management Act in England means that lead local flood authorities will need to approve and adopt SuDS. SuDS are already a statutory requirement on developments and required as a mandatory part of the planning process in Scotland and Wales.



→ From traditional to transformational

Turning challenges...



Out with the old:



- ✗ Fewer green areas and parks
- ✗ Hard landscape areas
- ✗ Additional treatment volumes
- ✗ Lack of capacity
- ✗ Pollution of Receiving Waters
- ✗ Reduced groundwater recharge
- ✗ Drought and wildlife stress
- ✗ Land erosion

The negative impacts of conventional drainage – limited capacity causing flooding, watercourse pollution and loss of natural infiltration - is well recognised. Traditional pipe drainage collects and conveys water away from where it rains, as quickly as possible, contributing to increased risk of flooding, likelihood of contaminated water and the loss of our relationship with water and the benefits it can bring.

...into opportunities



In with the new:

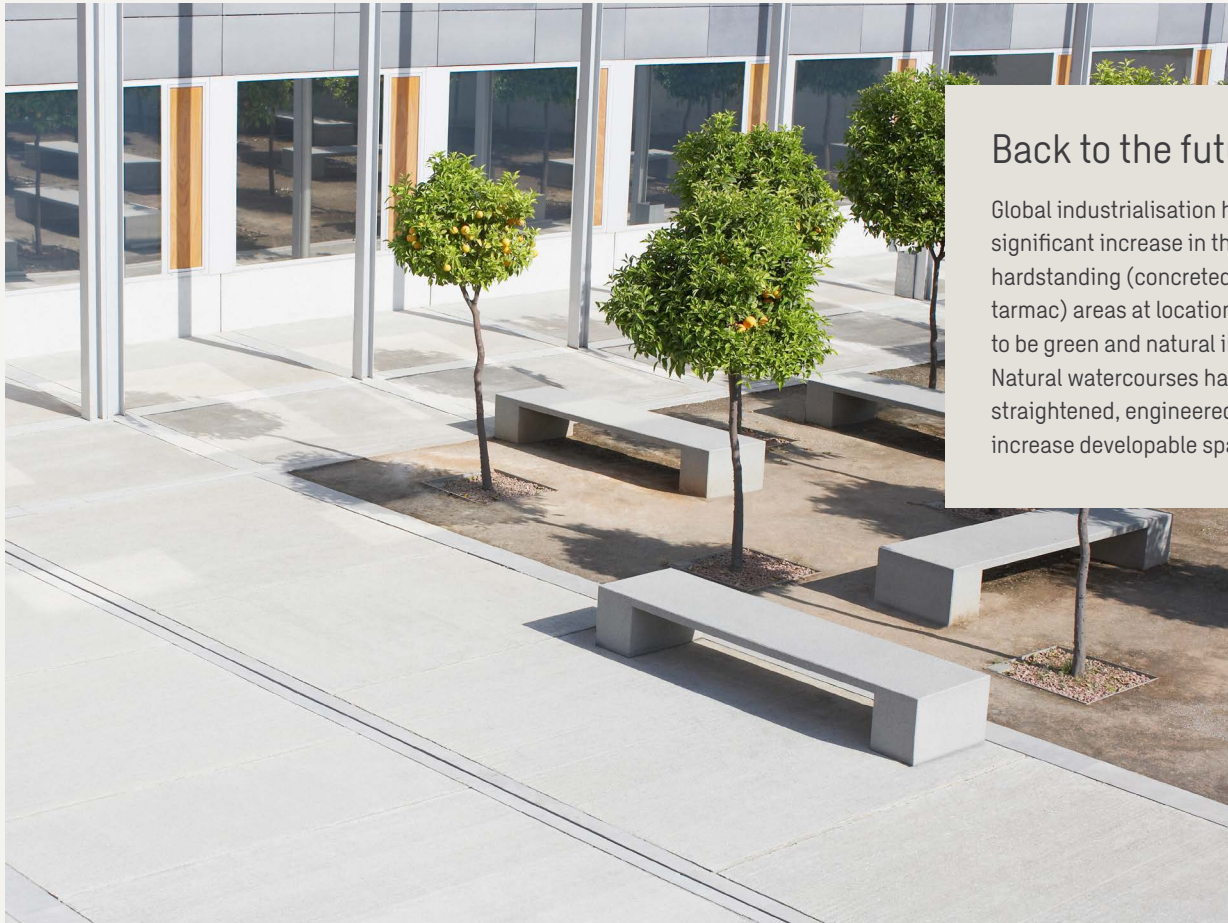


- ✓ Improved air and water quality
- ✓ Better community health and wellbeing
- ✓ Improved habitats for wildlife
- ✓ Flood prevention and reduction
- ✓ Natural groundwater recharge

Implementing SuDS on the other hand, is a way of managing rainfall that mimics the drainage processes found in nature. In turn, it reduces the impact of new and existing developments with respect to water in both rural and urban areas by replicating natural systems.

Well-designed SuDS will also enable authorities to satisfy Biodiversity Net Gain (BNG) requirements.

→ Why the time is now for ‘nature-first’



Back to the future

Global industrialisation has led to a significant increase in the amount of hardstanding (concreted, paved or tarmac) areas at locations which used to be green and natural in the past. Natural watercourses have been diverted, straightened, engineered and culverted to increase developable space in our cities.

Growing environmental and climate awareness, coupled with the need to promote a more resilient and sustainable development, is promoting a shift towards a blue-green infrastructure approach in the built environment.

Cities are therefore undergoing a transformation in how they tackle the challenges of climate and environmental change and are looking more towards developing and implementing visions for ‘blue-green’ urban futures.



→ The four pillars of sustainable drainage

Water Quantity

01.

Controlling the quantity of runoff to support flood management.

Water Quality

02.

Managing the quality of the runoff to prevent pollution.

Amenity

03.

Creating and sustaining better places for people.

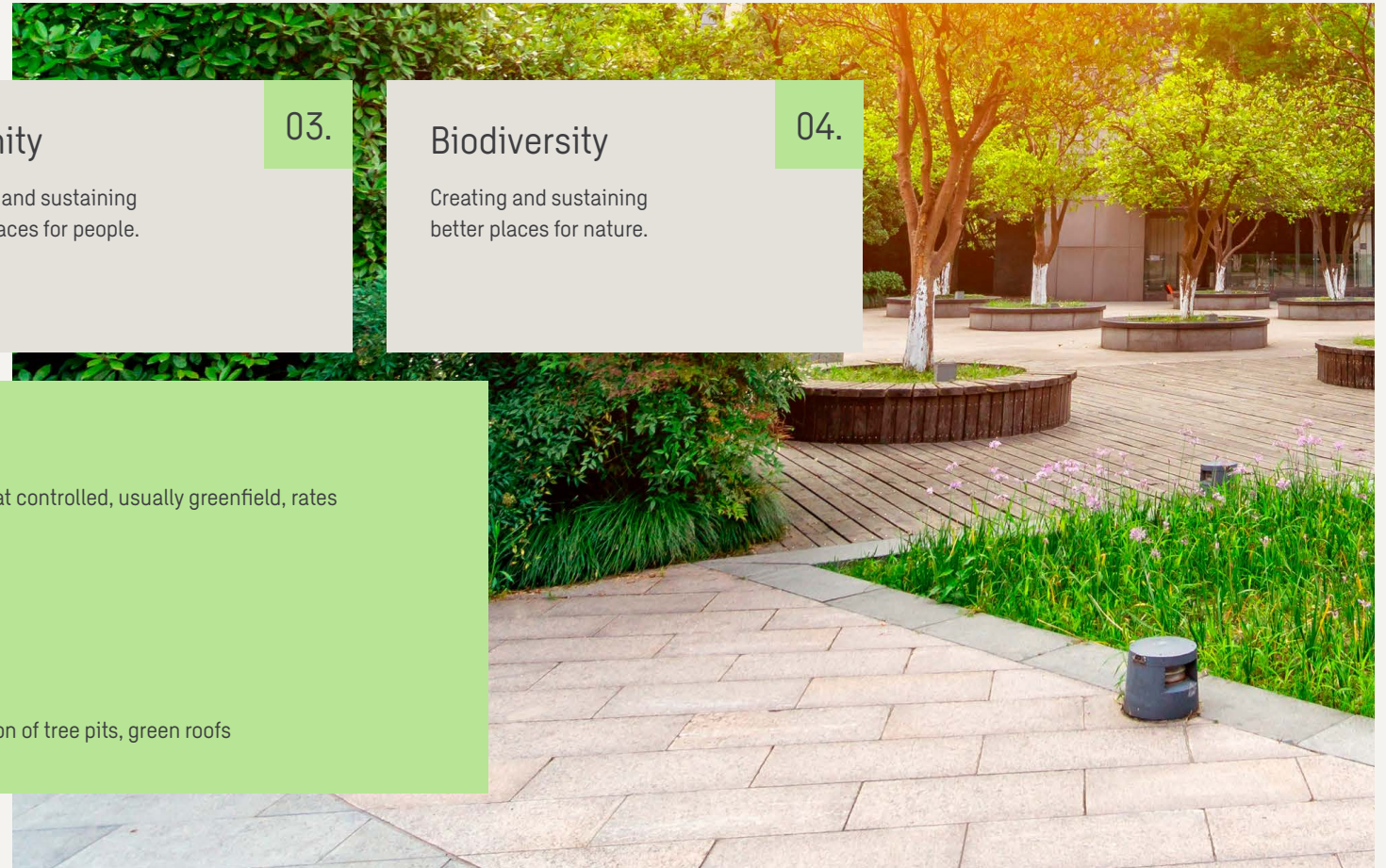
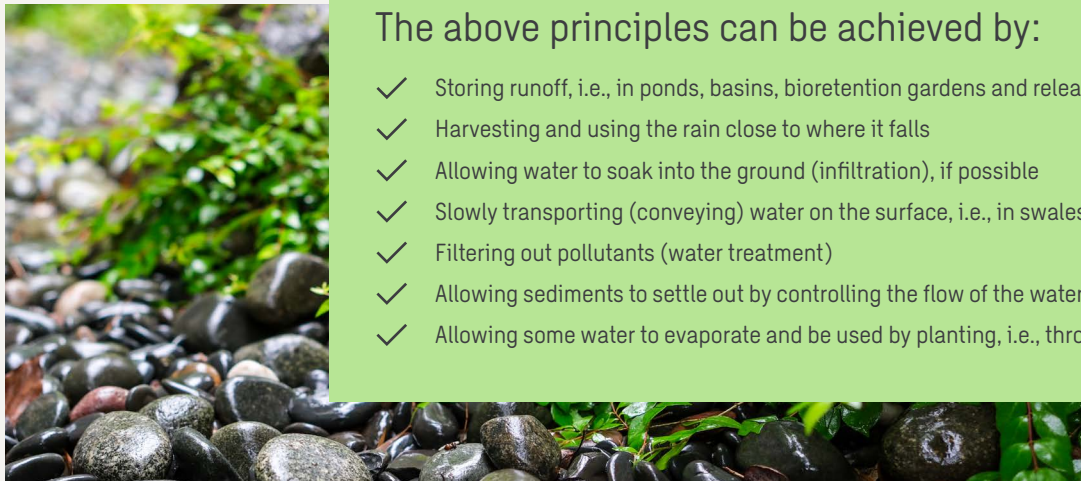
Biodiversity

04.

Creating and sustaining better places for nature.

The above principles can be achieved by:

- ✓ Storing runoff, i.e., in ponds, basins, bioretention gardens and releasing it slowly at controlled, usually greenfield, rates
- ✓ Harvesting and using the rain close to where it falls
- ✓ Allowing water to soak into the ground (infiltration), if possible
- ✓ Slowly transporting (conveying) water on the surface, i.e., in swales
- ✓ Filtering out pollutants (water treatment)
- ✓ Allowing sediments to settle out by controlling the flow of the water
- ✓ Allowing some water to evaporate and be used by planting, i.e., through installation of tree pits, green roofs



→ Types of SuDS

Within the concept of 'Sponge Cities' (built environment which incorporates an abundance of natural areas such as trees, parks and lakes) and the development of blue-green infrastructure in urban areas, SuDS in simple terms collect water and filter it slowly, lowering and delaying flow rates, into the ground, rivers or the sewerage system. A wide range of SuDS exist including attenuation basins, swales, permeable pavements, soakaways, rain gardens, filter strips, and green roofs.

Here are some of the most effective types of SuDS to consider.

Swales

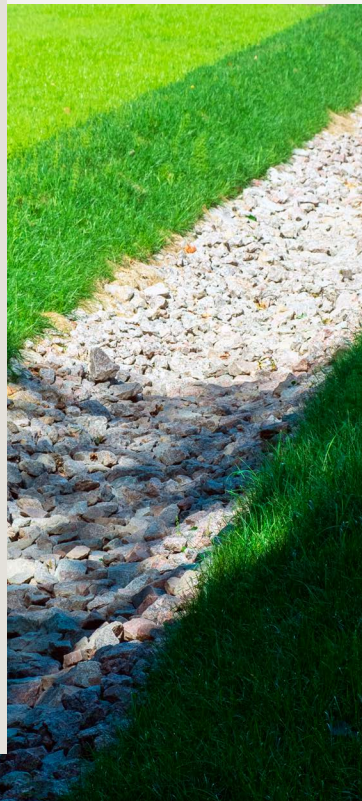
A swale is a shallow, vegetated channel designed to store and convey surface water runoff slowing the flow while removing pollutants. It could be part and focus of an urban landscape for example as part of a pedestrianised area. There are two types of swales that could be utilised:

Dry Swales

A dry swale is usually dry and will fill with water during a rainfall event, releasing it back into a piped system after the event and returning to its dry state.

Wet Swales

A typical wet swale does not have an underdrain and water is visible in all rainfall events. Any additional SuDS features within an area could drain towards and outfall to these swales.



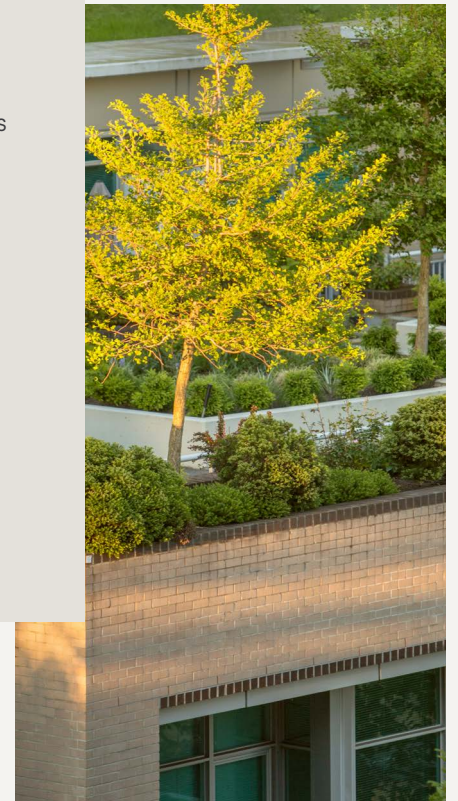
Raingardens & tree pits

Bioretention systems are shallow landscaped depressions which are used to reduce runoff rates and volumes and treat pollution (e.g. along highways and in public open spaces). They can form attractive landscaping features within the urban environment and help create a sense of place. New trees can be planted within tree pits as standalone features or part of bioretention systems to improve their performance.



Green roofs

Green roofs are roofs covered with vegetation. Various types of green roofs exist, providing a range of benefits depending on their nature: they can be shallow and lightweight, covered with grass or sedum (e.g. extensive green roofs) or proper roof gardens including plants and trees (e.g. intensive green roofs). Green roofs are a great solution in dense urban environments where space is at a premium.



→ SuDS as a **Placemaking** priority

Sustainable drainage systems present valuable opportunities to enhance developments for people, places, and the environment. Key to maximising the benefits SuDS is considering Placemaking must-haves in the design process at the earliest opportunity with landscape architects, ecologists, pollution experts and transport planners wherever possible.

A team of teams approach

Without a proactive and collaborative 'nature in the round' mindset, there is a risk of missing valuable opportunities, leading to poor outcomes like unattractive, isolated and fenced-off elements that fail to fully contribute towards climate change mitigation, social value, and the enhancement of the urban landscape.

Integrating SuDS for a sense of place

- ✓ Air quality improvements for community health
- ✓ Reduced heat island impact
- ✓ Biodiversity net gain

Water management is about more than water management alone

To ensure sustainable quality of life in liveable and attractive cities, we need to draw on many different ideas and perspectives on water management from professionals across multiple disciplines – as well as citizens – prioritising Nature-based Solutions and a holistic approach to Placemaking where possible.

Learn more about **Placemaking** below.

sweco.co.uk/placemaking



→ Sustainable drainage featured project

Queensland Gardens SWMP

The Queensland Gardens project has been awarded Building with Nature Full Accreditation (Excellent). Sweco was appointed to reduce surface water flooding by freeing up capacity in the sewer network and delivering sustainable drainage solutions, whilst also improving public green infrastructure within a residential area in Queensland Gardens south-west of Glasgow City Centre. The site consisted of mown grass and scattered trees. Standing water was common within the grounds during the winter.



Within this project Sweco carried out flood risk assessment, drainage catchment analysis and design of new blue-green features comprising of an attenuation basin and swales around two blocks of flats.

The design was based on community consultation, which was a key to developing a design sympathetic to the concerns of residents. A community consultation event gave residents an opportunity to comment on proposals and provide the design team with a greater understanding of the current issues and the uses of the space.

In addition to consultations with the key stakeholders, Scottish Water, Scottish National Heritage, Glasgow City Council, Scottish Environmental Protection Agency

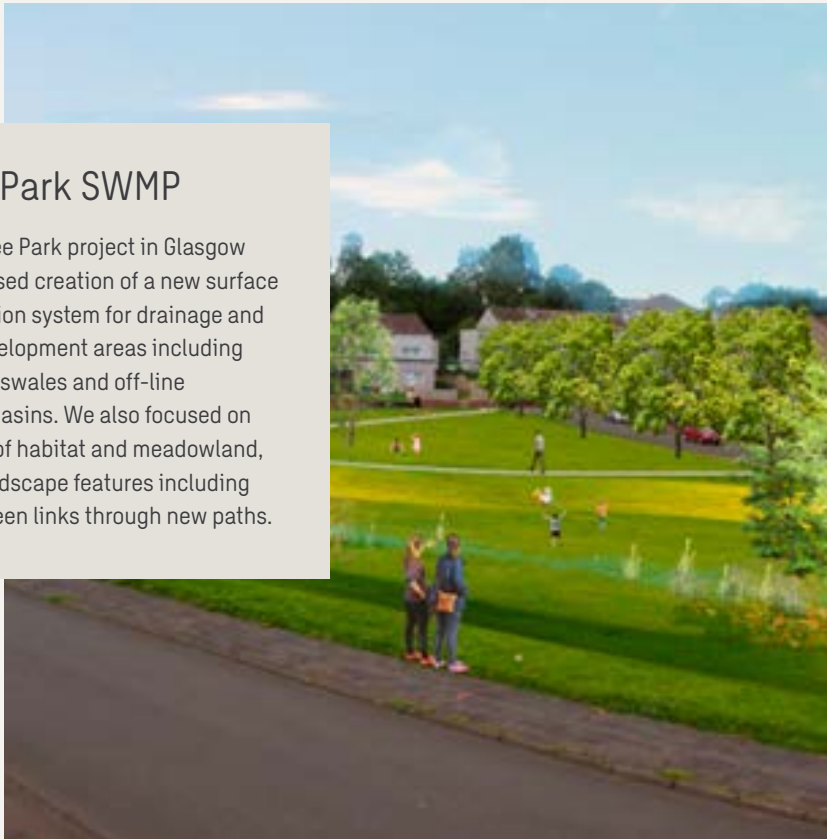
(SEPA), Glasgow Central Green Network, Scottish and Southern Electric and Network Rail, we engaged with Southside Housing Association (SHA) who instigated a side-by-side community led project for further investment into car parking and landscaping across the site.

We assisted with their successful bid for Green Infrastructure Funding which utilised matched funding to the SWMP project. We have co-designed with their landscape architects and other bodies such as the 10,000 Raingardens projects to produce the combined project that is being proposed as an exemplar SWMP which has achieved Building with Nature Excellent accreditation. This approach resulted in a planning application incorporating both projects which was accepted with minor queries.

→ Sustainable drainage project highlights

Penilee Park SWMP

For the Penilee Park project in Glasgow Sweco proposed creation of a new surface water collection system for drainage and potential development areas including SuDS basins, swales and off-line attenuation basins. We also focused on the creation of habitat and meadowland, with hard landscape features including enhanced green links through new paths.



Great Southgate Farm, Welsh Water – Stormwater Separation and Monitoring

Sweco delivered a range of surface water separation schemes under a programme of works for Welsh Water. These were developed through extensive flow monitoring and InfoWorks modelling verification followed by annual monitoring of performance to ensure improvements to bathing water quality were achieved. An example of a scheme under this programme of works is Great Southgate Farm which involved separating over 1Ha of surface area that drained to the combined sewer network and installing an alternative discharge to a new soakaway system designed by Sweco.

Effingham, Surrey – Residential Development and School Expansion

An example of SuDS design for a new development is Effingham in Surrey. This involved strategic drainage and SuDS design for a 400-house new build residential estate and school expansion. The school development included a variety of permeable and impermeable surfaces such as Multi Use Games Areas (MUGA), basketball courts and astro-turf pitches. Detailed design included surface swales, detention basins, permanent ponds and consented greenfield run off discharges to the nearby watercourse. Sweco has provided ongoing support to ensure that planning approval is granted and are engaged to provide construction support and assistance.

Crudwell Primary School, Wessex Water – Stormwater Separation

At Crudwell Primary School our consultants developed a surface water separation and SuDS scheme for the school on behalf of Wessex Water. This included design development and coordination, with the school's headteachers and governors to agree on a solution that was sympathetic to the schools' requirements, health and safety concerns and educational needs.

→ Let's transform society together

Success requires a co-ordinated inter-disciplinary approach to water resource and green space management from institutional organisations, industry and academia, as well as local communities and stakeholders. With a multi-disciplinary skill set across different specialisms, and cross-border collaboration between our many water experts in the Nordics and wider Europe, Sweco can deliver all phases of SuDS design, from feasibility study to construction support.

Complete water consultancy

Our water specialists have all the skills required for the sustainable management of water resources. We protect surface and groundwater quality and champion Nature-based Solutions to manage water availability and flood risk. From long-term regional water resources management plans to local studies, we ensure our clients always meet their regulatory obligations while promoting innovation, resilience and cost-effective solutions.

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