

Sustainable Drainage for Golf Courses and Sports Grounds - An Environmentally Responsible Approach

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What is it?

Sustainable drainage systems quite simply aim to mimic as closely as possible the natural drainage of a site, in order to manage the impact of development in terms of flood risk and water pollution.

Why do we need it?



'Green Roof' - An innovative sustainable drainage design

'Sustainability' is the latest buzzword, enthused by environmentalists, but to many its meaning is somewhat fuzzy. What relevance has sustainability to the drainage of a waterlogged pitch or golf course, where the primary aim is to remove water as rapidly as possible with minimum cost and disturbance?

First, we need to consider the background to the development of sustainable drainage and the "drivers" for change. There is increasing evidence that the earth's climate is changing with wetter and milder winters (associated with more intensive rainfall events) and hotter, drier summers. The impact of these changes include:

- Increased run-off and risk of flooding.
- Greater erosion and entrapment of sediment in surface run-off, which potentially can cause harm to aquatic species.
- Increase in pollutants from contaminated floodwater.
- Reduced availability of water for irrigation.
- Reduced groundwater recharge - which has a knock-on effect on water supplies and aquatic eco-systems, which are dependent on groundwater.

'Changes to legislation and the regulatory framework will make a sustainable drainage approach essential in the future'

The government has also set out priorities for sustainable management of water in the future which include:

- Prudent use of water resources in keeping water use within the limits of its replenishment.
- Tackling diffuse pollution of water.
- Minimising the creation of new flood risks and effectively managing existing flood risks.

Drainage of a new or, indeed, existing site may include a number of stakeholders including Local Authorities, environmental regulators (notably the Environment Agency), Highways Authorities, private landowners/land managers and possibly internal drainage boards. Therefore, compliance with the relevant environmental legislation and observance of planning policy guidance are vital considerations when planning new drainage systems, as potentially they could have a significant impact on the environment.

Effective drainage solutions for sports grounds and golf courses are essential to both utilisation and playing surface quality. Rapid removal of surface water is fundamental to the success of these systems. But, on the flip side, this leads to a sharper spike in the rate of discharge, and if there is reduced infiltration there may also be an increase in the volume of water reaching the final outfall. Changes to legislation and the regulatory framework will make a sustainable drainage approach essential into surrounding ground. This effect is more pronounced where hard surfaces (roads/buildings) replace naturally free draining ground, but sports ground drainage can still have a significant effect when pre and post development conditions are compared (refer to Diagram 1).

Post development (effective drainage = water rapidly conveyed to outfall and reduced loss of water to ground)

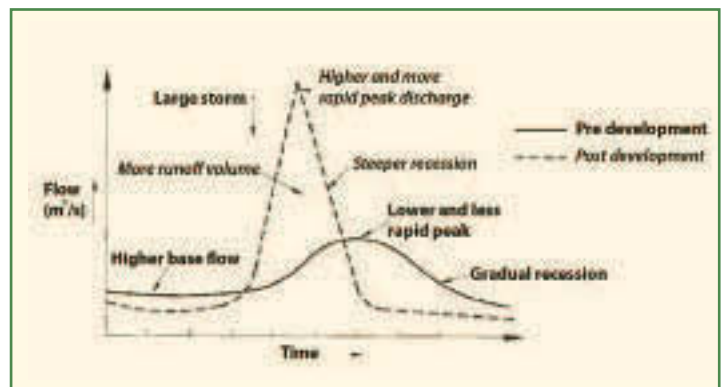


Diagram 1 - Pre and post development run-off hydrographs following storm rainfall

In order to restore the status quo a 'brake' may need to be placed on flow rates. This process is known as attenuation and can be achieved through the temporary storage of water in, for example, hollows or ponds, from which water can be discharged at a controlled rate.



Ponds or lakes provide effective storage

To restore groundwater to pre development levels some form of infiltration may also be needed, for example; soakaways, depending on existing ground conditions.

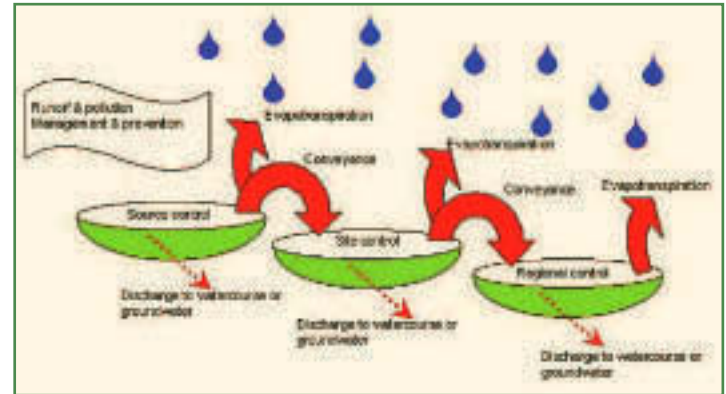


Backfilling soakaway trench on golf course

Finally, drainage water can potentially be a carrier of pollutants such as pesticides and fertiliser. Therefore, to maintain good water quality some method of mopping up potential contaminates is a sensible approach and this could involve well-designed reed beds. However, prevention is always better than cure!

The management train

The concept of the Management Train (no connection with British Rail) underpins good sustainable drainage design. Essentially it provides a series of interlinked drainage techniques or features that incrementally reduce pollution, flow rate and volumes to acceptable levels.



There are numerous features that can be selected and built in to the drainage scheme at an early stage (which is preferable to bolting on the feature later). Table 1 on page 14 sets out a description of key features with their attributes. There may be hybrid features, e.g. ponds with shallow wetland margins or swales, which also infiltrate to ground through soakaways.

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Swale online with ditch

The first step in the process can be very close to the source of surface run-off for drainage and may involve infiltration methods, notably soakaways or, for buildings and car parks, green roofs and pervious pavements respectively. Having small control features at source removes the need for larger structures further down the chain.

Drainage water may also be routed to soakaways or detention/infiltration basins (which hold water during high rainfall/storm events and releases it at a controlled rate), which in turn may be connected to wetlands and ponds for final clean up prior to discharge.



Wetland with boardwalk

TABLE 1. Typical Sustainable Drainage Scheme Components

COMPONENT	DESCRIPTION
Filter strips	These are wide, gently sloping areas of grass or other dense vegetation that treat run-off from adjacent impermeable areas.
Swales	Swales are broad, shallow channels covered by grass or other suitable vegetation. They are designed to convey and/or store run-off, and can infiltrate the water into the ground (if ground conditions allow).
Infiltration basins	Infiltration basins are depressions in the surface that are designed to store run-off and infiltrate the water to the ground. They may also be landscaped to provide aesthetic and amenity value.
Wet ponds	Wet ponds are basins that have a permanent pool of water for water quality treatment. They provide temporary storage for additional storm run-off above the permanent water level. Wet ponds may provide amenity and wildlife benefits.
Extended detention basins	Extended detention basins are normally dry, though they may have small permanent pools at the inlet and outlet. They are designed to detain a certain volume of run-off as well as providing water quality treatment.
Constructed wetlands	Constructed wetlands are ponds with shallow areas and wetland vegetation to improve pollutant removal and enhance wildlife habitat.
Filter drains perforated pipes	Filter drains are trenches that are filled with permeable material. Surface water from the edge of paved areas & flows into the trenches, is filtered and conveyed to other parts of the site. A slotted or perforated pipe may be built into the base of the trench to collect and convey the water.
Infiltration devices	Infiltration devices temporarily store run-off from a development and allow it to percolate into the ground.
Pervious surfaces	These allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water.
Green roofs	These are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with layers providing protection, waterproofing and insulation.

What methods are best?

Deciding which components are most appropriate will be dependent on a thorough site assessment, the water catchment characteristics, the quality and quantity performance requirements and amenity/environmental requirements. For example, on a small compact site there may be little room for ponds and wetlands and therefore infiltration techniques (if ground conditions are suitable) or sub-surface storage may be the only viable alternatives. Environmentally sensitive areas can also impose stringent design requirements both in terms of quality and quantity of water. Therefore a multiple, staged approach may be needed incorporating a variety of components to achieve the benchmark design standards. In short, there is not one size that fits all and a thorough understanding of the site, the environmental sensitivities of the wider area and, of course, the cost implications will all influence the final design solution.

What are the benefits?

At a time when golf is trying to foster a greener, environmentally responsible image, sustainable drainage provides a concept that sits comfortably alongside this ideal. In addition to environmental protection there are real benefits which can be achieved through creation of habitat and boosting biodiversity and ecology. Ponds and wetlands enhance the landscape and can be integrated successfully on the golf course as playing features (preferably with a steer from a recognised Golf Course Architect to ensure that they contribute positively rather than ensnaring the unwary).

Rainwater harvesting

Collecting water from drainage systems in catchment areas has a double benefit as it serves to store water for attenuation as well as providing a valuable source of water for irrigation. Decent aboveground reservoirs need room and they do not come cheap (with lining usually essential to prevent losses of water).

However, at a time of over-stretched water resources a degree or complete self-sufficiency in irrigation water sourcing can be a very attractive proposition.

What are the costs?

The financial costs will vary considerably depending on the complexity of the scheme and standards required. Developing soakaways, ditches or enlarged drainage swales may not be as financially onerous as conventional conveyance through carrier pipe drainage.

There are also the maintenance costs to consider, as these systems require a degree of aftercare if they are to perform as intended. For example, ponds have a habit of becoming silted up and ditches choked with leaf litter and other debris, which can significantly reduce their capacity and efficiency. Maintenance of these areas is often tied in to the environmental management plan that invariably is required for new developments if they are deemed to potentially have a significant environmental impact.

At a time of 'credit crunch' sustainable drainage could be considered by some as unnecessary 'frills' to satisfy the environmentalists. However, the more positive can see the potential for beneficial spin-offs such as water feature creation

and landscape enhancement. Water harvesting also has major attractions.

Summing it all up

Sustainable drainage is the concept of maintaining the quality and quantity of surface run-off, i.e. drainage, whilst maximising biodiversity and amenity. Modern methods of draining sports grounds and golf courses and the demands of year round playability must be considered in a wider environmental context. Planning regulations for new developments will often demand appropriate sustainable drainage proposals to be put in place and maintained for the future. Undoubtedly, it will become increasingly more difficult to rely on conventionally designed drainage systems without due regard for the environmental impacts. Sustainable drainage is not a substitute for efficient drainage but is complementary and undoubtedly represents the future for all drainage systems.



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