SUSTAINABLE DRAINAGE SYSTEMS (SUDS) - OPTIONS

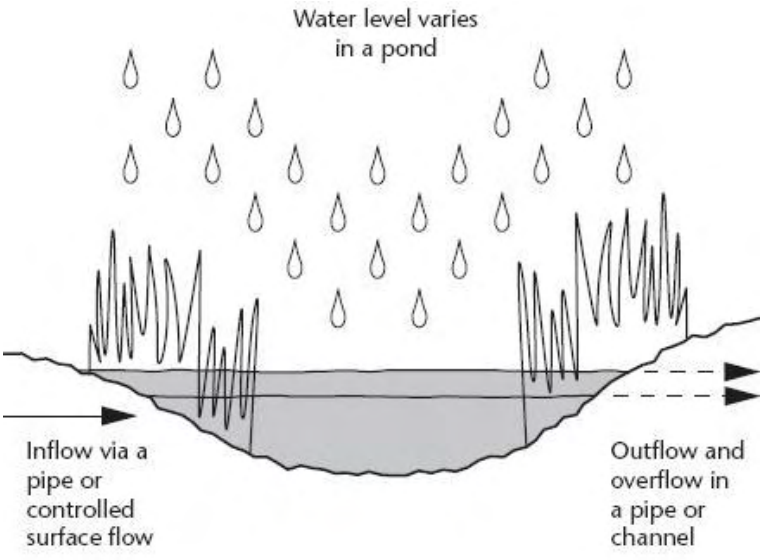
The various sustainable drainage systems that could be applied effectively in various areas of Hastings Borough Council are as described below.

It must be noted that a detailed site investigation is essential to establish the most appropriate techniques to be applied.

Ponds and Wetlands: Can be designed to accommodate considerable variations in water levels during storms, thereby enhancing flood-storage capacity. These would create habitats attractive to wildlife and thus enhance the environmental and visual amenity value of the area. Ponds and wetlands can be fed by swales; filter drains or piped systems which are also SUDS. This option is often restricted by the amount of land available for development.

Photograph 1: Typical Example of Retention Pond

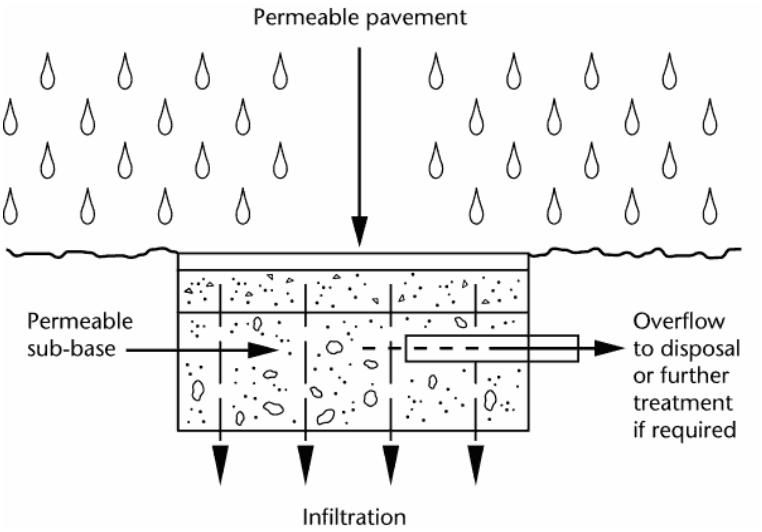
Figure 1: Retention Pond Schematic



Permeable Pavement: Reduces the need for surface water drains and off-site sewers can be reduced or eliminated where run-off is encouraged to permeate through a porous pavement, such as permeable concrete blocks, crushed stone and porous asphalt. Pollutant removal occurs either within the surfacing or sub-base material itself, or by the filtering action of the reservoir or subsoil.

Photograph 2: Typical example of Permeable Pavement

Figure 2: Permeable Paving Schematic

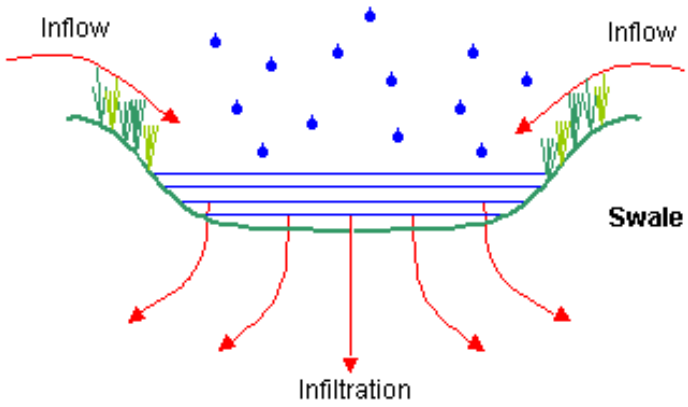


Swales and Basins: These can be created as features within the landscaped areas of proposed development sites. They provide temporary storage for storm water, reduce peak flows to receiving waters, and facilitate the filtration of pollutants as well as allowing water infiltration directly into the ground.

Swales and basins are often installed as part of a drainage network connecting to a pond or wetland, prior to discharge to a natural watercourse. These are often used alongside secondary roads to replace conventional kerbs.

Photograph 3: Typical example of Swale

Figure 3: Swale Schematic

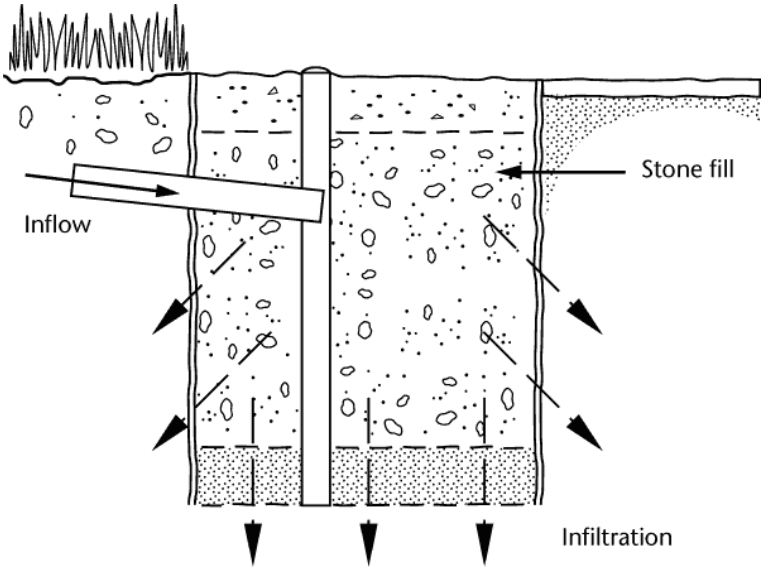


Infiltration Trenches and filter drains: Infiltration trenches comprise stone-filled reservoirs to which run-off is diverted, and from which water gradually infiltrates into the ground. Filter drains are similar structures through which a perforated pipe runs. This facilitates the storage, filtering and some infiltration of water passing from the source to the discharge point.

Pollutants are removed by absorption, filtering and microbial decomposition in the surrounding soil. These are widely used by highway authorities.

Photograph 4: Typical example of Infiltration Trench

Figure 4: Infiltration Trench Schematic



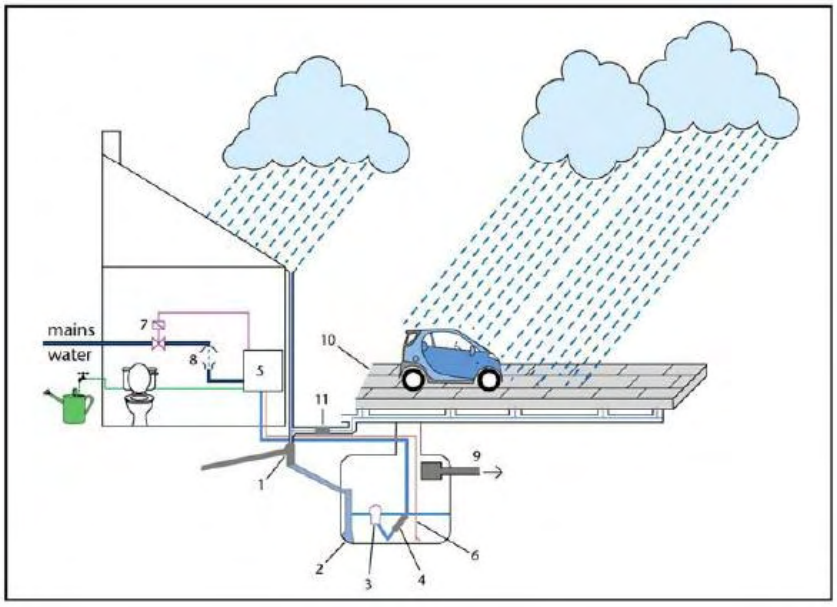
Green Roofs and Rain Water Reuse: Green roofs can reduce the peak flow and the total volumes discharged and improve water quality. Additionally, they can improve insulation and increase the lifespan of the roof.

Rainwater reuse (or harvesting) involves the collection of the rainwater on site and its use as a substitute for mains water, for example in watering a garden or for flushing toilets. These

could be applied to any proposed development but would probably be more feasible in multi-storey residential blocks.

Photograph 5: Typical Example of Green Roof

Figure 5: Rain water Harvesting Schematic



1 Filter
2 Smoothing inlet
3 Suction filter
4 Pump
5 Control unit
6 Water level monitor
7 automatic change over
8 AA air gap
9 Overflow trap
10 Permeable pavement
11 Oil trap

Sub-Surface Storage: The sub-surface storage systems work by replacing soil with plastic storage units and by doing so increasing the voids ratio from around 30% to 95% thus maximising the capacity to store flow. These systems allow the use of the land for recreational purposes and secondary roads. This technique is normally incorporated when the area available for mitigation is restricted.

Figure 6: Typical application of Sub-surface storage techniques

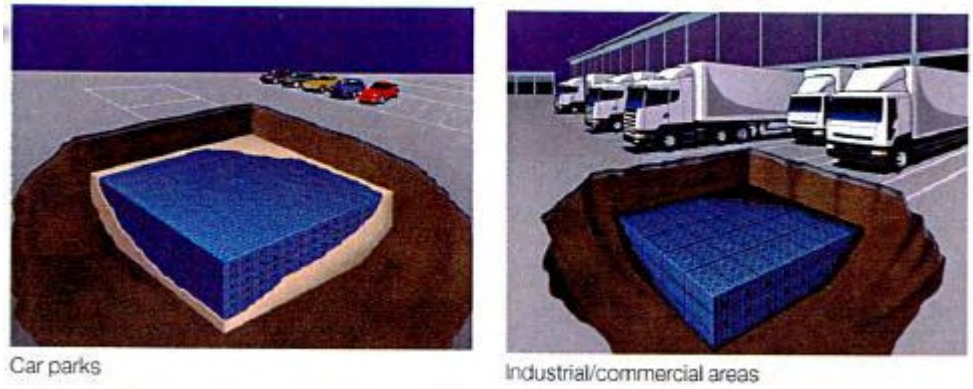
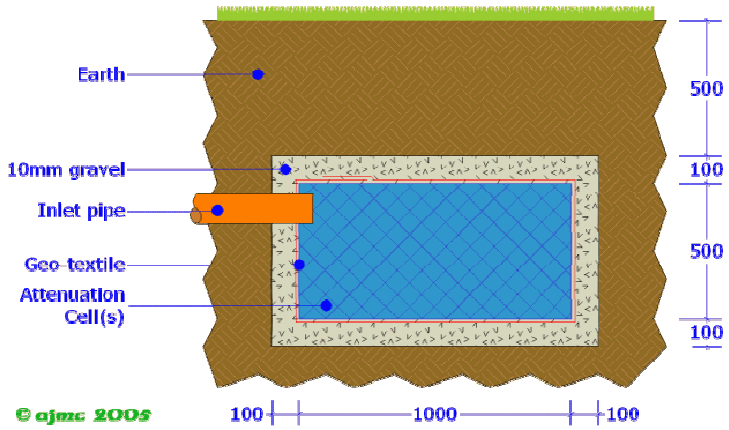


Figure 7: Sub-surface Storage Schematic



The following table provides a comparison of the cost/benefit offered by the different attenuation systems considered for development sites.

Table 1: Cost/Benefit Analysis of various SUDS Techniques

Attenuation System	Cost Implication	Benefits
Ponds and Wetlands	Large areas of land-take required	Easy to build and maintain. Major environmental benefits
Permeable Pavement	More expensive than normal pavement	No land-take for drainage. No need for surface water drains
Swales and Basins	Minor land-take required. Economical	Replace conventional kerbs. Reduces costs. Provides a rural aspect
Infiltration Trenches and filter drains	Minor land-take required. Economical	Environmentally friendly. Use of natural materials
Green Roofs and Rain Water Reuse	Relatively new and therefore rather costly	Residential/ commercial water savings. Less flow to watercourses. Water available during summer
Sub-surface Storage	Relatively expensive	Maximises land-use for development