Guidance for SuDS in Southwark

Introduction

Sustainable Drainage Systems (SuDS) are designed to maximise the opportunities and benefits of surface water management. This is particularly important in increasingly urban areas where there is less permeable ground available for natural infiltration and evapotranspiration, leading to increased rainfall runoff from impermeable surfaces which contribute to flooding, pollution and erosion. SuDS can counteract these impacts on the water cycle and additionally enhance urban spaces by making them more vibrant, attractive, sustainable and resilient, with improved air and water quality, microclimate and amenity.

There are four main categories of benefits which can be achieved through high quality SuDS design, as summarised below:

SuDS Design

Water Quantity

- Use surface water runoff as a resource
- Support the management of flood risk in receiving surface waters
- Preserve natural hydrological systems
- Design system flexibility and adaptability
- Drain the site effectively
- Manage on-site flood risk

Water Quality

- Support the management of water quality in the receiving surface waters and groundwater
- Design system resilience to cope with future change

Amenity

- Maximise multi-functionality
- Enhance visual character
- Deliver safe surface water management
- Support site resilience and adaptability
- Maximise legibility
- Support community environmental learning

Biodiversity

- Support and protect natural local habitats and species
- Contribute to the delivery of local biodiversity objectives
- Contribute to local habitat connectivity
- Create diverse, self-sustaining and resilient ecosystems

The installation of high quality and multi-functional SuDS is most likely to be achieved through early and multi-disciplinary consideration of surface water management. Ideally this should be integrated within the overall site planning and design, including early consultation with relevant stakeholders and consideration of ongoing operational and maintenance responsibilities.

SuDS design should be based around the general principles of:

- Harnessing surface water runoff as a resource;
- Managing rainfall close to where it falls;
- Managing runoff on the surface;
- Promoting infiltration of rainwater into the ground;
- Encouraging evapotranspiration;
- Attenuating runoff to mimic natural flow characteristics;
- Reducing contamination of runoff through pollution prevention and controlling the runoff at source; and
- Treating runoff to reduce the risk of urban contaminants causing environmental pollution.

The following sections provide an overview of common types of SuDS measures, which may be suitable for installation within the Borough. Generally, SuDS should not be thought of as isolated features, but delivered as an interconnected sequential train of surface water management and treatment. Further information on the philosophy of SuDS and detailed guidance on design, installation and maintenance, is provided in the CIRIA SuDS Manual (2015) and other sources described at the end of this document.

Swale

Swales are vegetated shallow depressions designed to convey and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath the ground level. They have the ability to remove pollutants and can be used to channel surface water to the next stage of a treatment train. Check dams can be constructed along their route to control flow velocities, and promote infiltration and sediment deposition.

Advantages	Disadvantages
• Encourages evapotranspiration and infiltration of runoff • Provides attenuation to reduce peak run-off rates • Relatively simple to incorporate into landscaping • Effective removal of urban pollutants • Minimal maintenance requirements • Aesthetically pleasing • Good community acceptability	• Careful consideration of location and design is required to reduce potential health and safety hazards • May limit opportunities to use trees in landscaping • Blockages can occur in connecting pipework • Retrofitting opportunities are limited

Effective Locations	Ineffective Locations
• Residential and commercial areas • Contaminated sites • Sites above vulnerable groundwater • Alongside roadways • Linear street garden areas • Field boundaries	• High density areas • Steeply sloping areas

Performance Criteria	Rating
Ecological Advantages	Medium
Peak Flow Reduction	Medium
Amenity Potential	Medium
Water Quality Treatment Potential	High
Surface Water Volume Reduction	Medium

In the Community

Swales can be used to replace conventional drainage systems and are particularly effective when installed adjacent to roadsides or transport links, to capture and re-route surface water. They are also suitable for residential and commercial areas and may be integrated with areas of open space and landscaping, or used to create informal barriers.

Design

Example

Filter Strip or Drain

Filter strips and drains can be used to manage runoff from impermeable areas, providing conveyance and filtration. Filter Strips allow water to flow across grass or dense vegetation; whereas filter drains are hardscape systems where runoff is temporarily stored in a shallow trench filled with stone or gravel.

Advantages	Disadvantages
• Simple to design and can be incorporated into site landscaping for aesthetic benefit • Minimal public safety risks • Encourages evaporation and infiltration • Important hydraulic and water quality benefits can be achieved • Can be retrofitted into a site with ease • Low construction cost	• Vegetation must be light and can get damaged • Loose gravel can be removed • Drains relatively small catchments • High cost to replace filter materials

Effective Locations	Ineffective Location
• Residential and commercial areas • Between hard standing surfaces and grassland • High density areas • Contaminated sites • Sites above vulnerable ground water	• Steeply sloping areas

Performance Criteria	Rating
Ecological Advantages	Low
Peak Flow Reduction	Medium
Amenity Potential	Low
Water Quality Treatment Potential	High
Surface Water Volume Reduction	Low

In the Community

Filter strips or filter drains are a suitable retrofitting option for heavily trafficked or spatially constrained areas as they cause no safety hazards and can be implemented into small spaces with ease. They can be simply implemented along the edges of pathways or pavements or integrated within site landscaping.

Design

Example

Bio-Retention Areas or Rain Gardens

Bio-retention areas or rain gardens are vegetated depressions with gravel and sand layers below, designed to collect, channel, filter and cleanse water vertically. Water can infiltrate into the ground or enter a piped drainage system. These systems can be integrated with site landscaping, including tree pits, planter areas or gardens. Treatment performance can be improved through engineered soils and enhanced vegetation.

Advantages	Disadvantages
• Provides initial water treatment • Aesthetically pleasing • Provides ecological benefits • Capability to be retrofitted in heavily paved areas or existing vegetation • Effective pollutant removal • Minimal ground take with spatially flexible layout	• May be susceptible to clogging or blockage due to surrounding landscape • Regular inspection and maintenance is required to maintain effectiveness

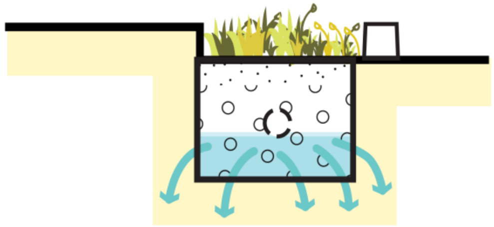
Effective Locations	Ineffective Locations
• Residential and Commercial areas • Contaminated sites • Sites above vulnerable groundwater • Seating areas • Impermeable areas • High density areas	• Steeply sloping areas

Performance Criteria	Rating
Ecological Advantages	Medium
Peak Flow Reduction	Medium
Amenity Potential	Good
Water Quality Treatment Potential	High
Surface Water Volume Reduction	Medium

In the Community

Rain gardens and bio-retention systems can be planned as aesthetically pleasing landscaped features, providing critical green space within the urban areas. These measures can be retro-fitted around existing street infrastructure, such as seating areas, and incorporated within both paved and vegetated areas.

Design



Example

Rainwater Harvesting

Rainwater harvesting involves capturing rainwater and reusing it for purposes such as irrigation or toilet flushing. Rainwater is collected from building rooftops or other paved surfaces and stored in tanks for treatment and reuse locally.

Advantages	Disadvantages
• Water can be used for variety of non-potable uses, such as toilet flushing and irrigation • Reduces potable water demand • Provides source control of storm-water run-off • Rooftop or underground tanks can minimise land take and visual impact • Can be retrofitted to existing buildings	• Potentially complex installation and high capital cost, particularly for retrofit • Ongoing energy requirement for pumping, if below ground storage is used • Careful management required to manage any health risks associated with water reuse • Above ground storage can be visually intrusive • Regular maintenance is required

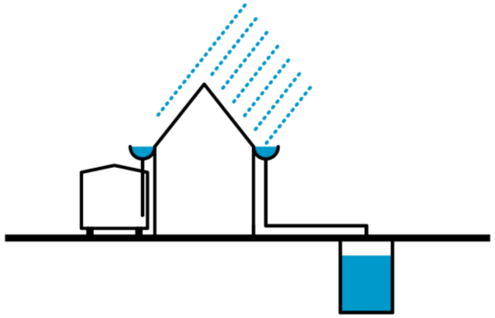
Effective Locations	Ineffective Locations
• Residential and Commercial areas • High density areas • Contaminated sites • Sites above vulnerable groundwater	• Fields or large open space

Performance Criteria	Rating
Ecological Advantages	Low
Peak Flow Reduction	High
Amenity Potential	Low
Water Quality Treatment Potential	Low
Surface Water Volume Reduction	High

In the Community

Rain-water harvesting can be implemented on a variety of scales; however, is particularly suitable for implementation in buildings with large rooftop areas, significant water consumption and defined ownership and maintenance responsibilities. Installation is generally easier when integrated into the design of new buildings; however, water butts can provide a simple means of retrofit.

Design



Example

Ponds and Basins

Ponds or Basins can be used to store and to treat water. 'Wet' (retention) ponds have a constant body of water and run-off water is additional to this, whilst 'dry' (detention) ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration through its base to ground or to store water for a period of time, before it is discharged via a soakaway to ground. They can support emergent and submerged vegetation, enhancing both treatment and biodiversity.

Advantages	Disadvantages
• Pollutant removal through sedimentation and biological treatment mechanisms • Effective accommodate of large storm events • Good community acceptability • Potential for biodiversity improvement • Relatively simple construction • Has the potential for supply of irrigation to other amenities • Aesthetically pleasing • Potential recreational benefit	• Requires infiltration to achieve significant reduction in surface water runoff volumes • Significant spatial requirements • Requires control measures to prevent migration of invasive species • Consideration of public safety may require control measures in certain settings • Careful design is required to manage undesirable impacts associated with eutrophication and fluctuating water levels

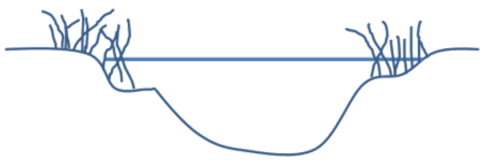
Effective Locations	Ineffective Locations
• Residential and Commercial areas • Fields • Parks or areas of open space • Areas with feature requirements	• High density areas • Locations with vulnerable people

Performance Criteria	Rating
Ecological Advantages	High
Peak Flow Reduction	High
Amenity Potential	High
Water Quality Treatment Potential	High
Surface Water Volume Reduction	Low

In the Community

Ponds can be aesthetically pleasing, and can be used to support urban amenity, recreation and ecology. They can provide central features within areas of community space. However, careful design consideration is required to ensure they do not pose a health and safety risk to the public.

Design



Example

Soakaway

Soakaways and other infiltration systems collect and store runoff, allowing it to rapidly soak into permeable layers of soil. During construction, an underground pit is dug and filled with gravel and rubble or specially designed material. Surface water can be directed into a soakaway using a number of above or below ground methods, with overlying vegetation and underlying soils providing treatment benefits.

Advantages	Disadvantages
• Minimal land take • Provides recharge of natural ground water levels • Good storm volume reduction and peak flow attenuation • Simple operation and maintenance • Relatively simple to construct • Effective retrofitting solution • Good community acceptability	• Not always practicable near to structural foundations • Long term performance is uncertain and difficult to guarantee if property owner is responsible for maintenance • Requires good subsurface drainage • Infiltration rates need to be investigated

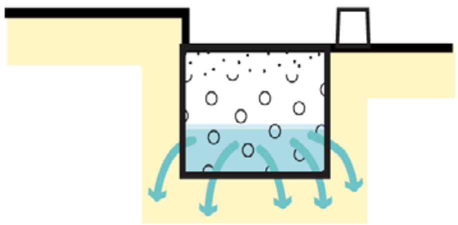
Effective Locations	Ineffective Locations
• Residential and commercial areas • High density areas • Fields • Small grassed/planted areas	• Contaminated sites • Sites above vulnerable groundwater • Sites with shallow groundwater • Sites underlain by impermeable ground

Performance Criteria	Rating
Ecological Advantages	Low
Peak Flow Reduction	High
Amenity Potential	Low
Water Quality Treatment Potential	Medium
Surface Water Volume Reduction	High

In the Community

Soakaways are effective in areas with good infiltration potential and where the water table is relatively low. Soakaways can be covered over by suitable permeable materials and be used for a variety of purposes at ground level. Caution should be taken when implementing these techniques in tightly constrained areas as they should not be built within a close proximity to structural foundations.

Design



Example

Living Roofs

A planted soil layer is constructed on the roof of a building to create a living medium. Following rainfall, water is stored in the soil layer and absorbed by planted vegetation. They may be designed to be accessible and landscaped to provide biodiversity and amenity benefit. Blue roofs can also be used to store water, without the use of vegetation.

Advantages	Disadvantages
• High potential to reduce surface run off • Suitable for high density development • Can deliver building insulation and sound proofing • Inaccessible to general public • Can provide biodiversity benefits to the local area • Improved air quality • Assists in amelioration of the urban heat island effect • Can be retrofitted	• Additional structural loading to roof (compared with most traditional rooftops) • Irrigation may be required during drought • Replacement and maintenance of plants is required on a regular basis

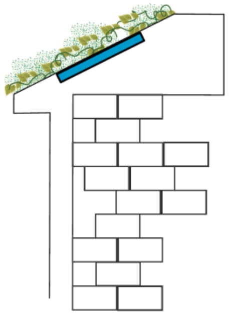
Effective Locations	Ineffective Locations
• Residential and Commercial areas • High density areas • Contaminated sites • Sports centres	• Roofs with inadequate access • Steep pitched roofs • Rooftops with inadequate structural support

Performance Criteria	Rating
Ecological Advantages	High
Peak Flow Reduction	Medium
Amenity Potential	High
Water Quality Treatment Potential	High
Surface Water Volume Reduction	Medium

In the Community

Living roofs provide an opportunity to attenuate and store rainwater in spatially constrained areas, while providing potential benefits for local biodiversity, air quality, microclimate and amenity. They have controlled access, which means the associated risk of misuse or vandalism is low.

Design



Example

Permeable / Porous Paving

This is paving which allows water to soak into the underlying ground. It can be in the form of paving blocks with gaps in between or porous mediums where water filters through the paving itself. Water can be stored in the sub-base beneath or be allowed to infiltrate into the ground below.

Advantages	Disadvantages
• Good potential for water quality treatment • High potential for surface water run off • Very efficient • Good community acceptability • Requires minimal maintenance • Effectively requires no space, as it allows for a dual usage • It can remove the need for manholes or gully pots	• Requires closure of surfaced areas whilst SuDS are constructed • Cannot be used where high sediment loads are likely to be washed across the surface • Requires vegetation maintenance • Regular inspection of the surfaces required to ensure effectiveness • Can deflect if subject to heavy vehicular loads

Effective Locations	Ineffective Locations
• Residential and Commercial areas • Car Parks • Low speed roads (below 30 mph) • Pathways • Residential pavements • Hard courts	• High speed roads

Performance Criteria	Rating
Ecological Advantages	Low
Peak Flow Reduction	High
Amenity Potential	Low
Water Quality Treatment Potential	High
Surface Water Volume Reduction	High

In the Community

Permeable surfaces offer effective drainage solutions that integrate within residential environments. Porous paving is effective at managing runoff from paved surfaces, and this low maintenance method is particularly useful in built up environments, including city centres. Replacing hard standing with permeable surfaces could improve drainage across a site whilst creating more aesthetically pleasing environments.

Design

Example

References

For detailed information on the design and delivery of SuDS, reference should be made to the CIRIA *SuDS Manual* (2015), which is freely available online at www.ciria.org.

A range of further resources on SuDS, including case studies, videos, presentations, fact sheets and links to research can be found on the Susdrain website at http://www.susdrain.org.

Additional supporting information is available from DEFRA (www.defra.gov.uk) and the Environment Agency (www.environment-agency.gov.uk).

Developers within Southwark should also refer to the London Borough of Southwark publication *Developers' Guide for Surface Water Management,* for detailed guidance on drainage strategies submitted with planning submissions.