



Barratt Developments PLC  
SHE Form 86  
Sustainable Drainage Risk Assessment

<b>Development</b>	
<b>Location</b>	
<b>Assessment by</b>	
<b>Date</b>	
<b>Description of SuDS</b>	

## **Introduction**

Well-designed Sustainable Drainage System (SuDS) components should include features that are no more hazardous than those found in the existing urban landscape, for example ponds in parks. SuDS design should mean that health and safety risks are considered throughout the design process. The results should be that risks are reduced to acceptable levels by designing out hazards.

This assessment will provide detail on the design considerations for SuDS and provides guidance to reduce the risk. There may be additional elements to be considered depending on the development. A drawing identifying the location and features associated with the SuDS must be attached to this assessment.

## **Drowning**

Drowning is the principle risk and can occur in permanent bodies of water or in normally dry areas when they contain water temporarily during and after rainfall events. Drowning more frequently occurs from accidentally falling in rather than by deliberately accessing a body of water and then getting into difficulty.

The risk of drowning is also exacerbated when features such as steep banks, deep bank-side or water-edge silt and/or overhanging branches are present. Fast flowing water or areas that become inundated very quickly with a rapid rise in water level may also increase the risk of drowning.

## Siting/Location

Consideration must be given to the location of a SuDS pond or similar. An open accessible situation with local roads, footpaths and homes providing a high degree of natural surveillance from surrounding properties and residents will serve to reduce risks and maximise potential benefits.

## Access to the water

Edge gradient above and below the water line and the depth profile of the water is important. The key considerations are:

- Provision of a dry bench before the feature to provide a level surface for an individual to assess the surroundings
- All slopes (where people may access regardless of fencing) should be not greater than 1 in 3 (both above and below the water line) to allow unaided movement in either direction for able bodied visitors or those maintaining the location.
- A level wet bench provided at or just below the water surface line which will be both clearly wet and uncomfortable underfoot. This may dry out occasional during dry periods but should remain boggy at most times. The width of the wet bench should be a minimum of 1.5m
- Clear identification of the water edge e.g. planting or hard edging.
- Access discouraged by shallow muddy margins or reeds/shrubs that do not obstruct visibility but provide a safe deterrent/barrier.

### Fencing

Where the water is accessible, the edge gradient above and below the water line, and the depth profile of the water are the critical elements. If risk is high either due to the nature of the edge, the presence of hard features such as culverts, steps etc then fencing will be deemed necessary. Where it is considered unsupervised young children can easily gain access to the water and the risk is high, then a 750mm high fence should be provided to prevent them getting to the water but allow adults entry to step across when necessary. The fence must be a vertical pale type rather than one that can be easily climbed. Where fences are provided, full responsibility for maintenance must be established and the fence erected as soon as the feature is created.

Fencing may not always be appropriate and different types of planting at the margin can be provide an element of physical protection and create a clearly identifiable border. However, if this is the chosen method of control, fencing must be erected until the planting has matured sufficiently to provide the protection.

### Life Saving Equipment

Provision of Public Rescue Equipment should only be required if water conditions (flow and depth) suggest that one is needed. These should be considered the last element of a risk based approach to SuDS and only provided if all other design measures have been considered and there remains a risk. For Public Rescue Equipment to be effective the person in the water needs to be noticed if in trouble, which is therefore affected by the siting of the SuDS. Their presence can provide a false sense of security for those playing around the water or thinking or entering. If they are provided as a measure to reduce risk, arrangements must be made to regularly inspect, maintain and immediately replace if used or missing.

### Warning Signs

In public areas, signs may be required to educate on the risks associated with the SuDS feature. Deep water is not recommended for SuDS designs on housing developments and therefore signs warning of this should not be needed. However, if the SuDS has the potential to have deep water or other significant hazards then signs will be required. Signs should be placed at the entrance to the location which should clearly state the site name, map of the site emergency instruction i.e. dial 999, location and postcode for emergency services and any hazard symbols and text which are relevant. Signs should also be provided along the routes adjacent to the water to reiterate the message which directly relate to the hazard with symbol based messages backed up with text.

### Recommended Depths and velocities for SuDS and exceedance flow routes

Maximum velocity (m/s)	Depth (m)	Comments
0 – 0.4	<1.5	Level benches recommended: <ul style="list-style-type: none"> <li>At just below the water surface</li> <li>At a depth of 600mm</li> </ul>
0.5 – 0.9	<0.6	Level bench recommended <ul style="list-style-type: none"> <li>At or just below the water surface</li> </ul>
1.0 - 2.0	<0.3	

## **Slips and Trips**

Physical injuries, such as falls, slips, trips and entrapment, should be no more prevalent at SuDS components than at any other natural or amenity feature, provided that good design principles have been followed and that consideration has been given to the potentially increased likelihood of wet and slippery conditions. The steepness of the bank, freeboard, condition of the pathways and additional hazards should all be given significant consideration to ensure a trip or stumble does not result in a fall into deep or fast flowing water. This includes consideration of the perception and abilities of the very young, very old and people with disabilities, as much as lighting and the expected site activities.

### Structural Integrity

All features should be structurally sound for use, taking into account the likelihood of vandalism or misuse, the durability of materials and the planned on-going maintenance regime. Any structural surfaces designed for accessibility should be suitably slip resistant, particularly those where surface water flow can be expected. The risks associated with ice formation should also be considered and managed appropriately but the same considerations as for general water safety will apply, i.e. shallow water features are preferred.

### Vertical drops/steep sided structures

Good SuDS design should avoid the need for high vertical drops or deep steep sided structures. In many cases, such hazards can be avoided by sensible profiling slopes of headwalls, and/or risks reduced by locating such structures away from open water. High headwalls should not be necessary in an efficient drainage design where flows are managed in sub-catchments. If steep slopes and high vertical drops cannot be removed from the design, then consideration should be given to how the risk is managed effectively and to access arrangements for maintenance. Vehicle movements should also be given careful consideration where SuDS are close to roadways.

### Level changes

Unexpected changes in level, particularly if not immediately visible, should be avoided. Slopes should be gentle at 1 in 3 or less, where accessible, and other changes in level visible and expected.

### Inlet/outlet/safety grilles

Safety grilles are only required on pipes greater of 350mm or greater diameter. Grilles at inlets should slope at an angle of 45 degrees so that debris is likely to lodge against them.

## **ill health from untreated/polluted water**

Rainwater runoff in SuDS features is no different from the water that runs across roads and car parks and stands as puddles for lengthy periods after rainfall. Many existing water features in parks and public open spaces already take highway runoff. Indeed, with good SuDS design and effective source control, accessible SuDS components should contain 'treated' runoff, and therefore any pollution levels should be very low. However, as with any natural water bodies, water in SuDS could potentially contain toxins that could potentially cause ill health, and there are management principles that should be followed to minimise potential risks.

## **Principal hazards to be considered as part of the assessment process**

Drowning (consider ice in winter months)

Slips, trips and falls

Entry into Pipes/Confined Spaces

Water Quality – Health Risks

Design Factors	
Item	Comments
Age profile of persons in close proximity to the SuDS – Consider proximity to schools, parks, play areas, rights of way etc.	
Consider visibility and natural surveillance of the proposed SuDS feature	
Type and nature of water edge planting – Consider time taken to mature and precautions required to protect feature during this period	
Gradient and extent of slopes above, at and below the water level	
Definition of water edge and nature of ground (e.g. soft/hard)	
Water depth profile	
Water surface area	
Underwater obstacles or traps	
Potential currents, velocities	

Potential increase in depth of water and rate of rise	
Potential for ice formation	
Headwall or channel location	
Headwall height or channel depth/width	
Slope of headwall or channel profile	
Level changes	
Inlet/outlet pipe diameter (grilles required?)	
Depth of chambers - Is access possible?	
Likely contamination of water via rat urine or dog fouling etc.	
Likelihood of toxic algal blooms	





