

Infiltration Assessment

1. The Use of Infiltration

The use of infiltration to dispose of stormwater runoff has a number of important benefits:

- It can reduce the volume of runoff and the peak rates of runoff discharged from the site (and thus help deliver important flood risk management criteria);
- It can help replenish aquifers local to the site through deep infiltration, and/or act to support local river base flows and wetland systems via shallow infiltration processes;
- It can help support local soil moisture levels and vegetation.

These benefits mean that infiltration is advocated as the first route of disposal of surface water runoff to be considered when developing runoff management options by many national guidance documents (including, for England and Wales, the draft National Standards for Sustainable Drainage and Building Regulations Part H (2002)).

There are, however, a number of scenarios where infiltration may not be possible or cannot be relied on as a complete discharge route for all size (return period) of event. These caveats are important and it should not, therefore, be interpreted that infiltration must be used at all cost and rather, that infiltration should be used where conditions allow and where it is safe.

The following considerations should be fully evaluated before determining the extent to which infiltration can be used on a site:

- The infiltration capacity of the soil;
- The risk of ground instability or subsidence as a result of infiltration;
- The risk of slope instability or solifluction as a result of infiltration;
- The risk of pollution from mobilising existing contaminants on the site;
- The risk of pollution from infiltrating polluted surface water runoff from the site;
- The risk of groundwater flooding as a result of infiltration;
- The risk of groundwater leakage into the combined sewer as a result of promoting infiltration on the site.

Infiltration may be at or near the surface and spread over a wide area (e.g. basin), or it could be a point location such as a normal soakaway. Many sites will use normal small soakaways for roof water where possible. The issues listed above become more of a risk the more any water is concentrated into a point discharge. Thus, large volume deep soakaways pose more of a risk than small shallow basins for example.

Preliminary information on whether a site may be suitable for infiltration, or to identify issues that should be considered, can be obtained from the British Geological Survey (BGS) Infiltration SuDS Map. This map allows users to determine the:

- Likely presence of constraints that ought to be considered when planning infiltration SuDS;
- Likely potential for the ground to accept infiltration;
- Likely potential for ground instability when water is infiltrated;
- Likely issues around groundwater quality protection.

2. The Objectives of the Checklist

This Infiltration Assessment Checklist is intended to be used by organisations approving the drainage scheme (drainage approving bodies) to help assess submissions for drainage approval that include infiltration systems.

Infiltration Assessment

As discussed above there may be scenarios that preclude infiltration as the main outfall for surface water. If it can be shown that infiltration is not suitable for the main destination for surface water from a site (e.g. because of the presence of contamination that could be mobilised and pose a risk to groundwater or other receptors) then completing this checklist is not necessary and infiltration tests will not be required. On marginal sites where it is not clear whether infiltration is possible or not, infiltration tests may be necessary to show that infiltration cannot be relied upon as the main outfall for surface water.

It is intended to facilitate a consistent assessment process and to ensure that designs meet the key design requirements set out in the SuDS Manual (C697, 2007).

It is also intended to help designers ensure that they have provided all relevant information to the drainage approving body in their submissions for approval.

Note: The use of infiltration should be approved by a geotechnical engineer or engineering geologist (e.g. a Registered Ground Engineer Advisor or similar).

- on larger sites or sub catchments (> 1000m² draining to an infiltration device);
- in areas where there are likely to be issues with the use of infiltration (e.g. due to potential solution features);
- where the consequences of failure are significant (e.g. damage to buildings).

This requirement is particularly important where infiltration tests have not been undertaken by a specialist site investigation company. Normally a company carrying out site investigations and infiltration tests will include a geotechnical engineer or engineering geologists and they can advise of any potential significant issues and advise on the suitability of infiltration and any constraints that should be applied to a site. This can be included in the report provided by the specialist company for very little cost.

Note: If infiltration is proposed at conceptual design stage and there are no infiltration test results available, alternative proposals for discharge should be provided so that in the event that infiltration tests show infiltration is not possible the site can still be effectively drained.

The infiltration checklist can be applied to all sites. However for lower risk situations approving authorities may wish to reduce the extent of the check list. This will be a decision made by individual authorities based on their knowledge of local conditions. Such cases could include the following, subject to there being no significant geotechnical, contamination or groundwater flooding issues in the area in which the site is located:

- Less than ten properties with individual soakaways for roof drainage with each soakaway draining less than 100m² of roof area;
- Small car parks or similar areas less than 1000m²

3. Use of Infiltration

Infiltration can be used in the following ways:

- As a destination for the disposal of stormwater for design events. Note: Limited infiltration capacity may mean that infiltration is used for small and/or medium events and then may work in combination with discharge to surface waters for more extreme events.

- To help provide Interception for a sustainable drainage system with an outfall to a water course or sewer.

Interception is concerned with preventing runoff from the site for the first 5mm (or other specified depth) of rainfall for most events (note: it is not expected that Interception will necessarily be delivered for all events e.g. when soils are saturated following prolonged heavy rainfall). The delivery of Interception ensures that the runoff frequency from the site more closely mimics greenfield characteristics, and constrains the number of potentially polluting discharge events. Interception does not necessarily need a specific infiltration capacity, but most soils (even capping layer soils on contaminated sites) should provide some Interception if covered with a layer of topsoil. To deliver Interception, it should be demonstrated that the system can remove the specified interception rainfall depth within 48 hours through the use of evaporation/evapotranspiration/ infiltration processes.

This checklist is designed to be used for sites where infiltration is a **significant** destination for surface water. It is not intended to be used for sites where infiltration will only be used to help provide Interception (e.g. water leaking from the base of swales or basins). Some of the items discussed may need to be considered when deciding if any infiltration is acceptable (e.g. where there are risks of mobilising contamination in the subsoils).

Table 1: Infiltration Assessment Checklist

REQUIREMENTS	
Site ID	
Asset ID	
Infiltration Component Location	
Infiltration Component Type	

INFILTRATION CAPACITY	Details	Acceptable submission ?	Additional requirements
Confirm that infiltration test results have been provided, along with trial pit records with soil/rock descriptions of the materials in which the test has been completed in accordance with British Standard BS EN ISO 14688-1, <i>Geotechnical investigation and testing – Identification and classification of soil – Part 1: Identification and classification of soil</i> or BS EN ISO 14689-1, <i>Geotechnical investigation and testing – Identification and classification of rock – Part 1: Identification and description</i> .			
Confirm that the infiltration tests have been undertaken at the location, depth and with a head of water that replicates the proposed design.			
Confirm that infiltration tests state which stratum the results are appropriate to and any limitations in the test, e.g. has the infiltration rate been estimated by assuming water only infiltrates into one particular stratum such as a discrete layer of limestone?			

INFILTRATION CAPACITY	Details	Acceptable submission ?	Additional requirements
Confirm that the infiltration tests follow BRE365 or CIRIA 156 as far as is relevant to the design. If not, state what variations have been made to the test and why.			
Confirm that the head of water in the infiltration test falls to less than 25% of the initial head of water. (Note: if this does not occur the results should not be extrapolated – the results should state infiltration test cannot be determined .)			
Confirm that account has been taken of the soil descriptions and an assessment of the likely impact of water on the soil and long term infiltration rate has been included (e.g. high initial infiltration rates in dry mudstone may not be representative of long term values when soaking water has caused weathering).			
Confirm what measures are necessary to prevent construction activities (especially compaction) changing the infiltration characteristics.			
Confirm that the test infiltration capacity is likely to be representative of the wider ground mass (e.g. the test has not been undertaken in a limited extent of sand within a mass of clay).			
GROUNDWATER LEVELS			
Confirm that evidence has been provided of groundwater levels and seasonal variations (e.g. via relevant groundwater records or on-site monitoring in wells).			
Confirm that the maximum likely groundwater levels are >1m below the base of the infiltration device.			

INFILTRATION CAPACITY	Details	Acceptable submission ?	Additional requirements
GROUND STABILITY			
<p>Confirm it has been demonstrated that infiltration will not cause significant risk of instability (e.g. retaining walls, slopes, solution features or loosely consolidated fill) or movement that could adversely affect any nearby buildings or other structures. Where infiltration is proposed closer than 5m to the foundations of buildings or structures this assessment should be approved by a suitably qualified professional such as a Registered Ground Engineering Adviser. The BGS Infiltration SuDS Map is a useful source of information. Some local authorities have solifluction maps.</p>			
<p>Confirm that an assessment has been taken of the potential for subsidence due to infiltration</p>			
GROUND CONTAMINATION			
<p>Confirm that an assessment of the potential for deterioration in groundwater quality as a result of infiltration e.g. due to mobilisation of contamination has been undertaken. Note – this assessment should be undertaken by a qualified geo-environmental engineer or similarly qualified person and may require a site investigation with contamination testing. The BGS Infiltration SuDS Map can provide useful preliminary information.</p>			
<p>Confirm that a suitable treatment train has been provided before the runoff reaches the soil (to reduce risks of groundwater contamination to an acceptable level) – See National SuDS Standards and The SuDS Manual.</p>			

INFILTRATION CAPACITY	Details	Acceptable submission ?	Additional requirements
FLOOD RISK			
Confirm that an assessment has been undertaken of the potential effect of infiltration on groundwater levels local to any infiltration component and the potential wider impact of multiple infiltration components within the site, with respect to groundwater flood risk.			
Confirm that an assessment has been undertaken of the risk of springs developing in layered geology/steep topography as a result of the proposed infiltration.			
Confirm that details of overflows or additional discharge points if total infiltration cannot be relied on for all return period events have been provided.			
COMBINED SEWER RISK			
Confirm that an assessment has been undertaken of the risk of groundwater leakage into any local combined sewers.			

INFILTRATION SYSTEM DESIGN ACCEPTABILITY	Summary details including any changes required	Acceptable (Y/N)	Date changes made
Acceptable Minor changes required Major changes required / re-design			

