Stop Urban Pollution (StopUP)

SuDS Tool User Guide

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25 February 2025

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Project manager	Elizabeth Gorton
Project director	Bridget Woods Ballard

Document history

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25 Feb 2025	06-00	EJG	BAW	BAW	Correct project end date and client representative
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Document authorisation

Prepared	Approved	Authorised
Elizabeth Gorton	Bridget Woods Ballard	Bridget Woods Ballard

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Contents

What are SuDS?

Sustainable Drainage Systems (SuDS) are a collection of drainage components designed to manage rainfall close to where it falls, to mimic natural drainage and encourage stormwater infiltration, evapotranspiration, reuse, storage, control and passive treatment.

SuDS are designed to manage both the flood and pollution risks resulting from urban stormwater runoff and to contribute wherever possible to environmental enhancement and place making. By reducing the rates and volumes of runoff from contributing urban surfaces, they can help improve receiving sewer capacity and lower risks of combined sewer overflow spills.

What is the StopUP SuDS Tool?

The StopUP SuDS Tool has been built by HR Wallingford as part of the EC StopUP project. The tool is a web-based tool designed for non-technical users.

The tool allows users to create a detailed representation of a SuDS network, to apply rainfall, and then to calculate and report on its hydraulic and water quality performance. In doing that, the StopUP SuDS Tool can assist users in the design and evaluation of planned SuDS schemes.

What can I use the StopUP SuDS Tool for?

The StopUP SuDS Tool can be used to evaluate the performance of a SuDS system through the assessment of its:

- Reduction in runoff volume from the site including the number of rainfall events with zero runoff (Interception);
- Water resource conservation;
- Network performance for extreme events (peak flow rates leaving the site and flood volumes on the site);
- Pollution treatment effectiveness of the SuDS system.

How does the StopUP SuDS Tool work?

The StopUP SuDS Tool evaluates each SuDS component individually with contributing areas and other upstream SuDS contributing flows and pollutants. The SuDS are represented as simple storage reservoirs which store water in up to three storage layers (drainage, soil and surface layers) and transfer water between the layers using simple rules based on how full each layer is. Unlike more complex drainage software, the hydraulic influence of downstream SuDS and the routing through the SuDS and connecting pipework is not represented.

The water quality model is not physically-based but uses a pollutant wash-off model combined with average event mean concentrations reflective of different land use types. The efficiency of SuDS to remove pollutants reflects observed removal rates for typical components (based on measured influent and effluent concentrations published in summaries of data held within the BMP database https://bmpdatabase.org/). As such, the StopUP SuDS Tool does not reflect any pollutant removal differences that might be expected from different design configurations because the observed data does not currently demonstrate sufficiently robust relationships and uncertainty levels are high.

Where can I find more information?

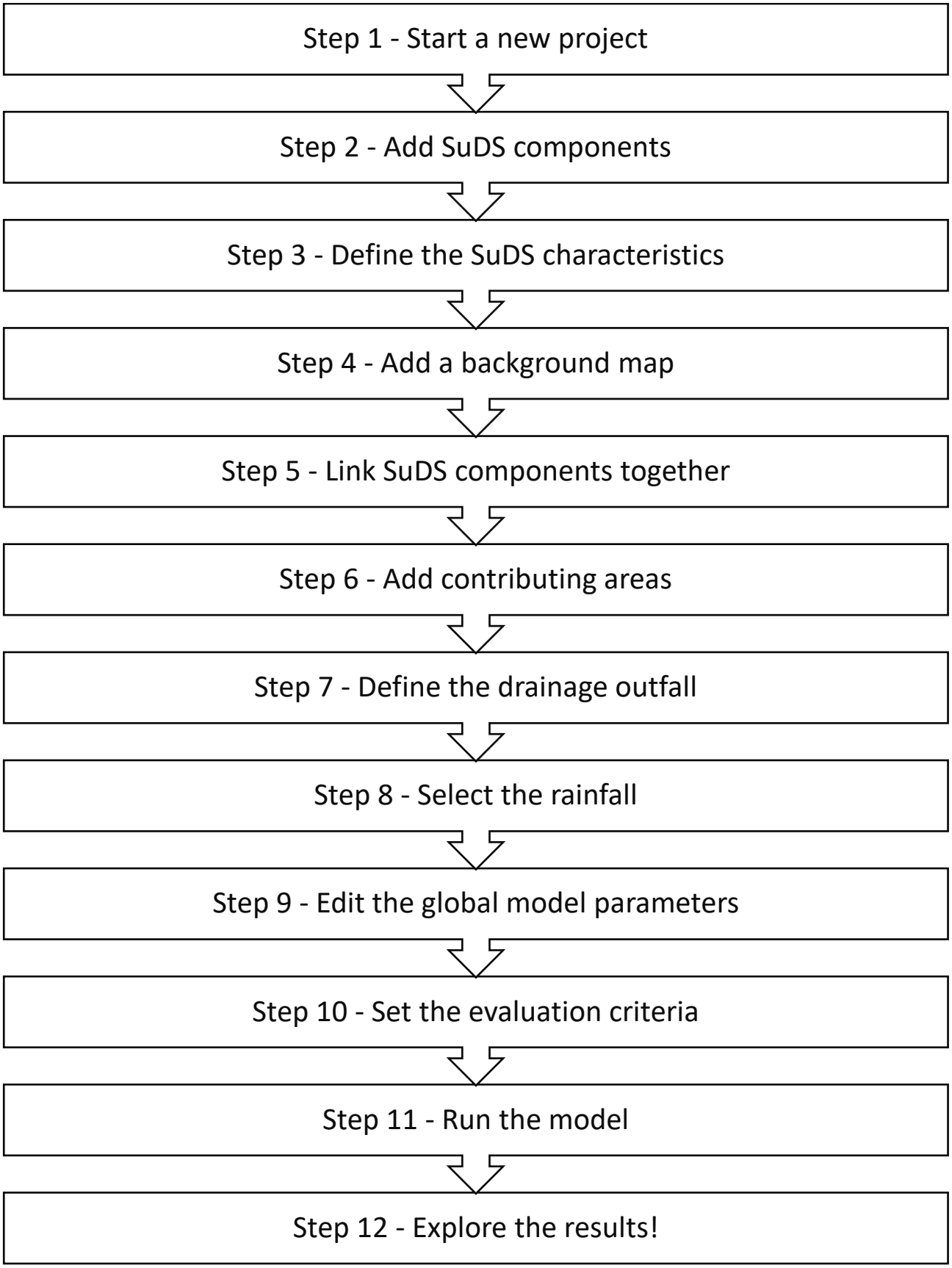
This User Guide is aimed at providing enough information to get you going with building and running the StopUP SuDS Tool. If you would like more technical information on the tool, see the Technical Guidance document.

Do you want to provide any feedback?

The StopUP project runs until August 2025 and in addition to this the StopUP SuDS Tool will be further developed between February 2025 and December 2026 as part of SuDS-iQ, a project led by Southern Water, delivered by HR Wallingford and funded by the Ofwat Innovation Fund. https://waterinnovation.challenges.org/winners/suds-iq/.

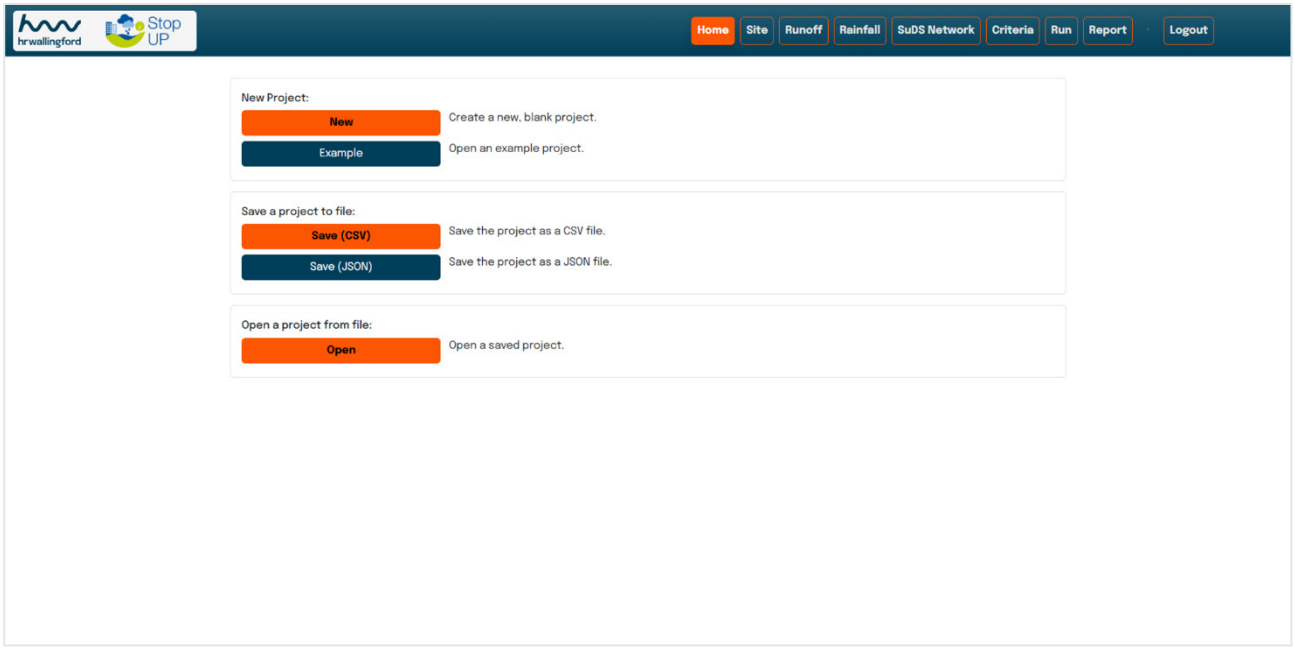
If you have any feedback or undertake any testing of the Tool against other drainage models or observed data we would be grateful if you can share those with us at email address support.stopup@hrwallingford.com.

How do I use the StopUP SuDS Tool?



Step 1 – Start a new project

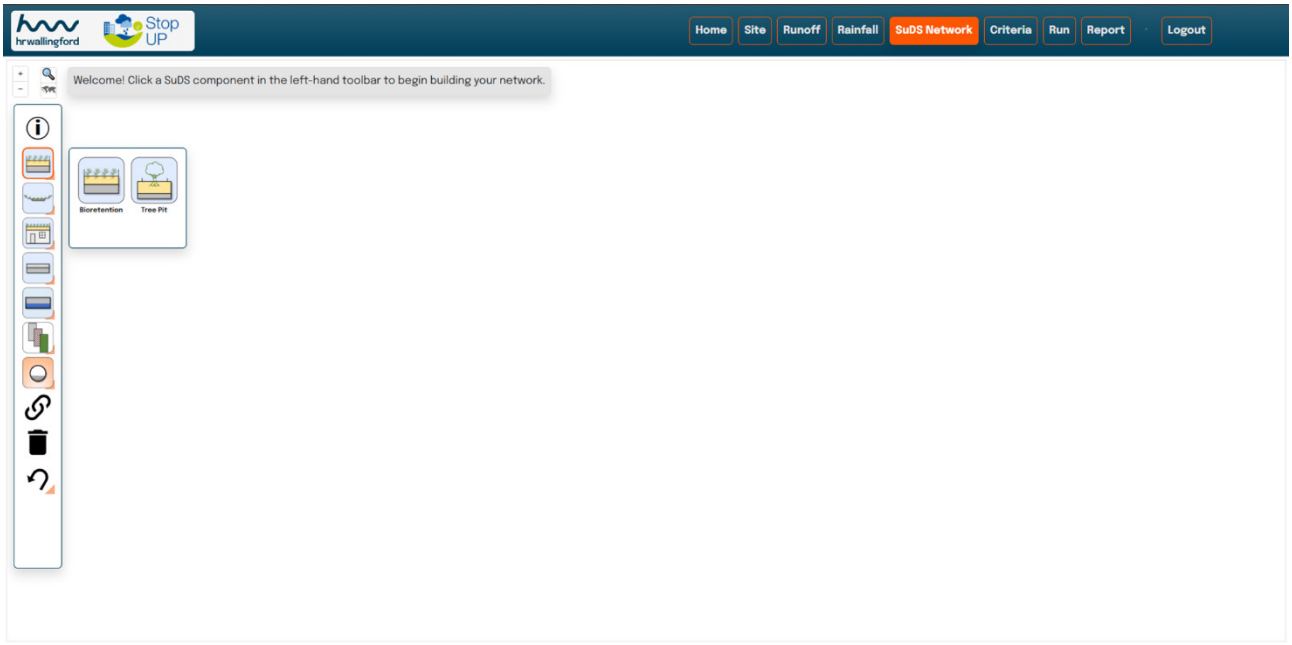
From the 'Home' page, choose to start a new project, view an example project, save a project, or open a previously saved project.



Step 2 – Add SuDS components

Click on a SuDS component on the left hand toolbar and then onto the window to add a SuDS component to the network.

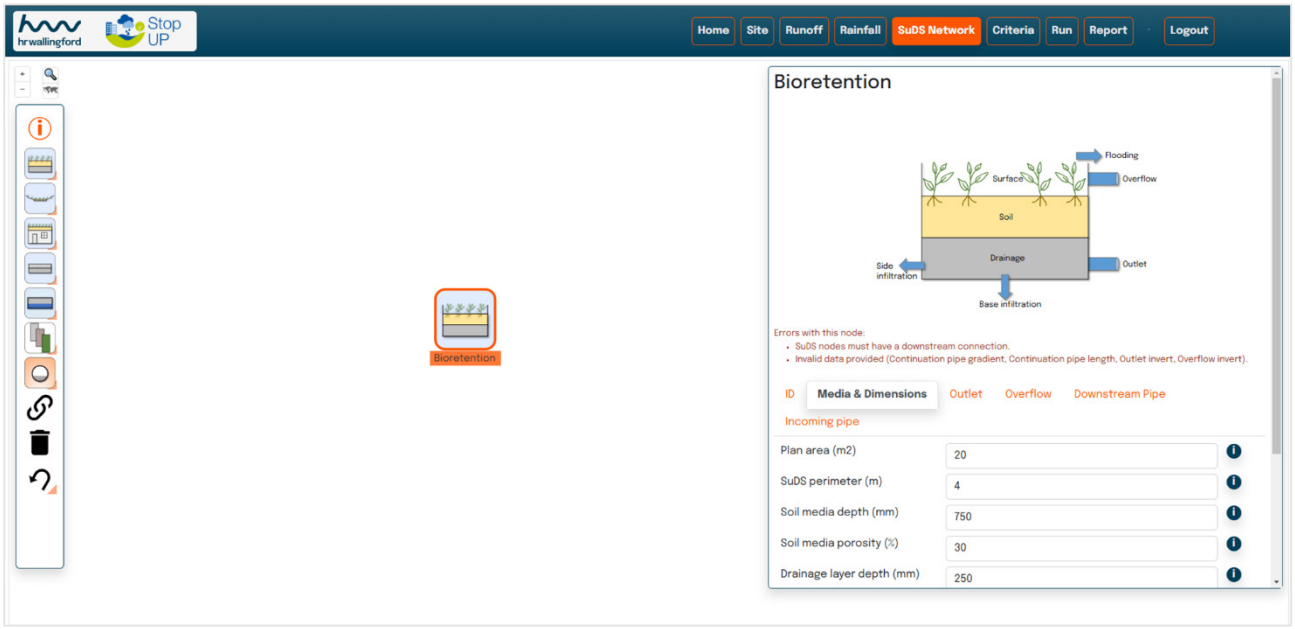
Delete SuDS components by clicking on the SuDS component and then the bin icon on the toolbar.



Step 3 – Define the SuDS characteristics

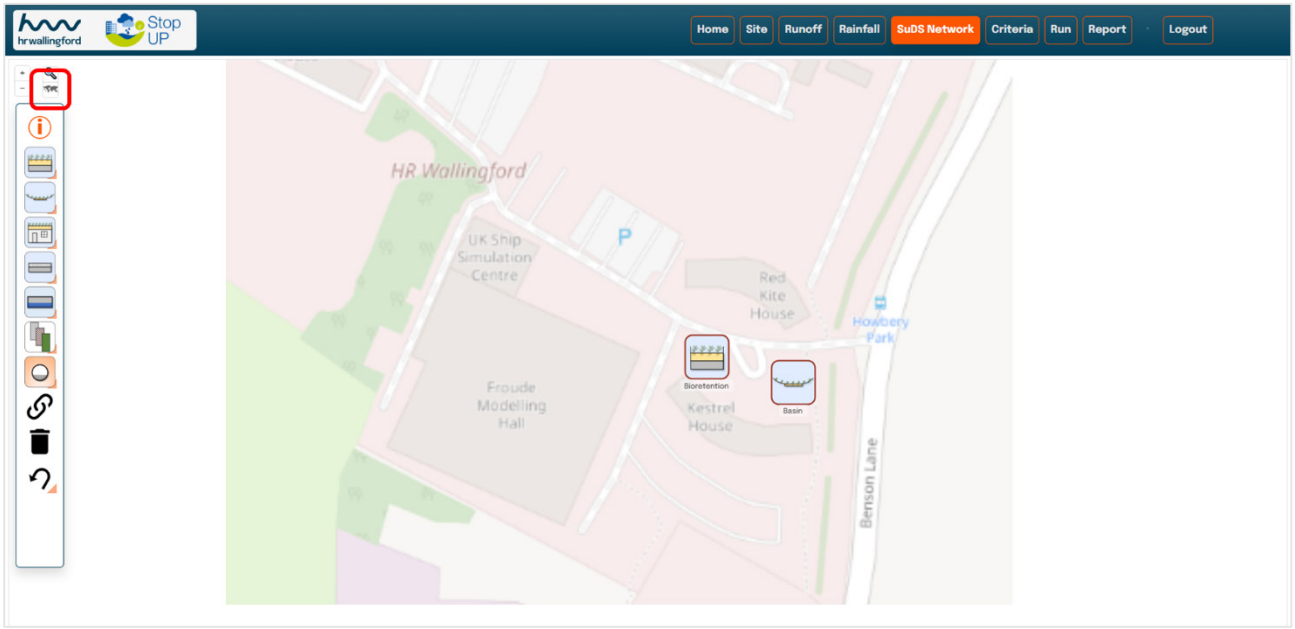
Click on a SuDS component to see and edit its dimensions and parameters.

Many of the parameters you will need for each SuDS component are set to default values so that anyone can run the model easily without much information. However, this means that the answers are unlikely to be correct for your site, as the default values are unlikely to be valid. If you do know more about your site, then you should check the default values are appropriate and update them where necessary. And where there are empty boxes, you need to enter this information, otherwise the model won't run!



Step 4 – Add a background map

Use the map button above the tool bar to add a background map or image to the window to help visualise the SuDS scheme on the site.

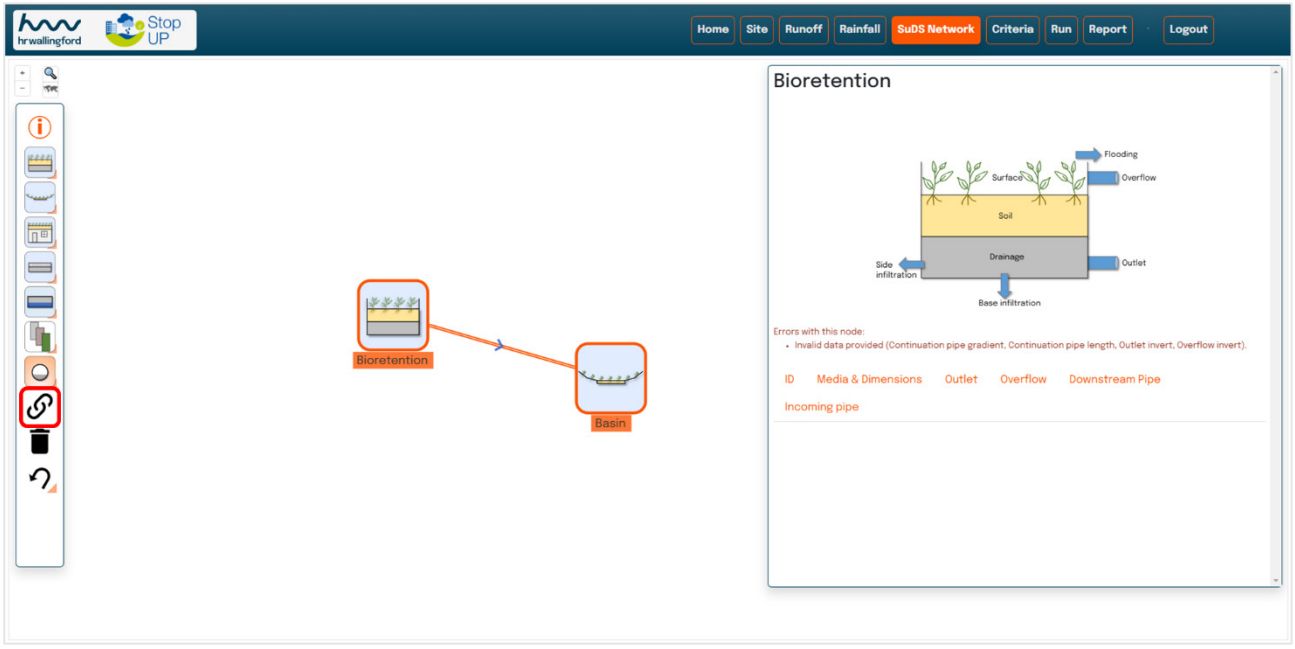


Map data from OpenStreetMap (https://www.openstreetmap.org/copyright)

Step 5 – Link SuDS components together

Link SuDS together to show the connectivity of the SuDS network. To link two SuDS together click on the upstream SuDS component, press shift and click on the downstream SuDS component (so that both SuDS are highlighted), and then click on the link icon in the toolbar.

To delete a link between two components, click on the link and then click on the bin icon in the toolbar.



Step 6 – Add contributing areas

Click on the contributing area component on the left hand toolbar and then onto the window to add it to the network. Create a link between the contributing area and a SuDS component to define the areas that drain to each of the SuDS (see Step 5 for creating links).

Set the contributing area parameters, such as its ID, contributing area and land use by clicking on the icon.

Step 7 – Define the drainage outfall

Choose whether the drainage network drains to a sewer, a river or the ground.

Click on the appropriate outfall component on the left hand toolbar and then onto the window to add it to the network. Create a link between a SuDS component and the outfall (see Step 5 for creating links).

Only one sewer or river outfall can be used within a network. However, any number of 'to ground' outfalls can be used within the network alongside a sewer or river outfall as these represent areas of the site discharging to soakaways or other systems not requiring performance assessment. Water leaving the network through the 'to ground' outfalls is reported as being lost to infiltration.

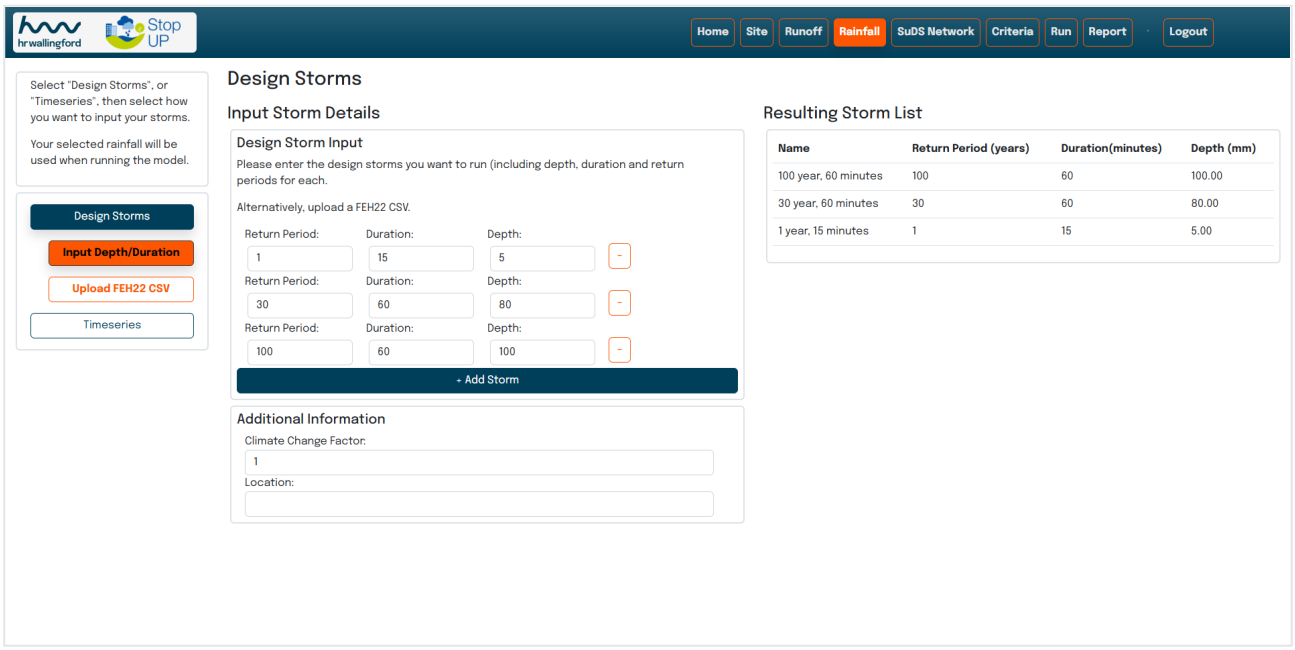
Step 8 – Select the rainfall

There is no default rainfall within the tool therefore on the rainfall tab, you need to choose whether to run either:

- Design storms to assess the network for peak flow rates at the site outfall and for total volume of flooding from the drainage system; or
- Time series rainfall to assess where surface water runoff goes (infiltration, evapotranspiration, reuse or leaves the site), how many rainfall events result in zero runoff from the site and how much pollution might be removed by the system.

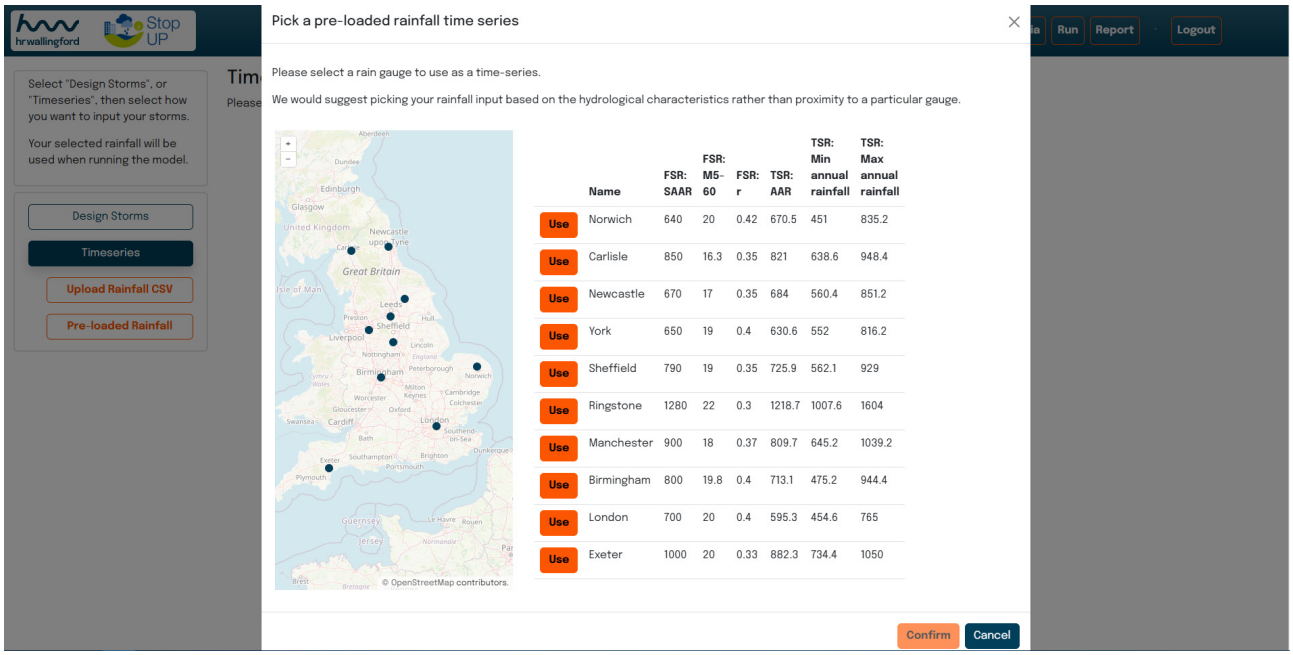
If you choose design storms, choose either to manually input rainfall storm depths for given return periods and durations, or upload a UK Flood Estimation Handbook (FEH) 2022 CSV file (https://fehweb.ceh.ac.uk/). If you upload a FEH CSV file you will need to choose which matrix of return periods and durations to simulate.

Remember to add a climate change uplift factor if you need to consider an increase in rainfall event depth as a result of a changing future climate.



If you choose time series rainfall, choose either to upload a rainfall time series using a CSV file or pick one of the pre-loaded rainfall time series from sites across the UK. To upload a CSV file it needs a column with date/time and a column with rainfall intensity in units of mm/hr. The rainfall can be between one to ten years in duration, although it is recommended that at least three years is used.

If you choose a preloaded time series, check the hydrological statistics are representative of your location, as the closest time series may not result in the most similar rainfall time series to your site.



	Name	FSR: SAAR	FSR: M5-60	FSR: r	TSR: AAR	TSR: Min annual rainfall	TSR: Max annual rainfall
Use	Norwich	640	20	0.42	670.5	451	835.2
Use	Carlisle	850	16.3	0.35	821	638.6	948.4
Use	Newcastle	670	17	0.35	684	560.4	851.2
Use	York	650	19	0.4	630.6	552	816.2
Use	Sheffield	790	19	0.35	725.9	562.1	929
Use	Ringstone	1280	22	0.3	1218.7	1007.6	1604
Use	Manchester	900	18	0.37	809.7	645.2	1039.2
Use	Birmingham	800	19.8	0.4	713.1	475.2	944.4
Use	London	700	20	0.4	595.3	454.6	765
Use	Exeter	1000	20	0.33	882.3	734.4	1050

Step 9 – Edit the global model parameters

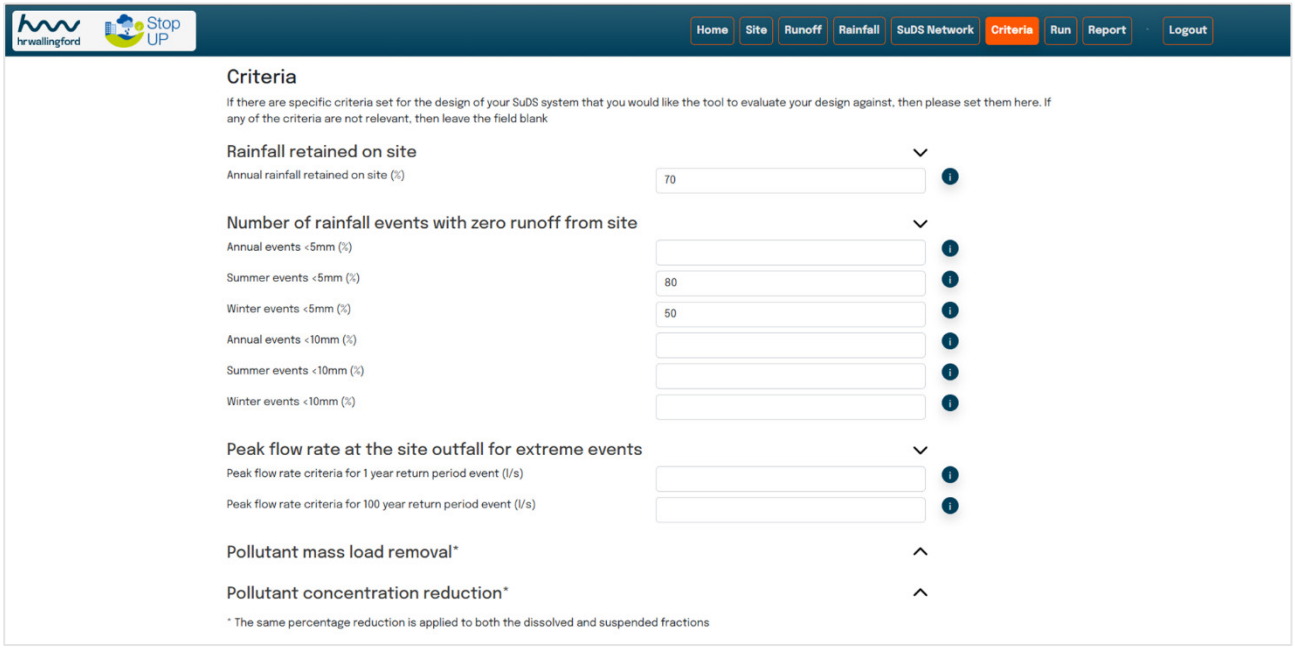
Global parameters related to runoff from contributing areas, evapotranspiration and pollutant build-up and wash-off parameters are contained in the 'Runoff' tab.

Most of these global values have default values so that anyone can run the model easily. Unless you are an expert user, it is not recommended that you adjust the runoff and pollutant parameters. However you will need to set the soil type of the site which controls the percentage runoff from pervious surfaces.

Additionally, the evapotranspiration parameters (latitude of the catchment and monthly minimum and maximum temperatures) are based on London, UK as default. Therefore, it is recommended that you update these values to be correct for your site.

Step 10 – Set the evaluation criteria

If you have specific criteria set for the design of your SuDS system that you would like the tool to evaluate the SuDS design against, then enter them into the 'Criteria' tab. If any of the criteria are not relevant, then leave the fields blank. The criteria are used to evaluate the SuDS system as part of the evaluation reporting.



Step 11 – Run the model

When you have finished defining your SuDS network, go to the 'Run' tab and run the model.

If there are any errors or missing information within the model these will be highlighted and need to be fixed before the model can be run. If edits have been made since a run, this will be highlighted.

Step 12 – Explore the results!

Use the results on the 'Run' tab to understand the system performance. You will see different performance metrics depending on if you run design storms or a rainfall time series.

When you are ready to export the results to a report go to the 'Report' tab where you can print the Hydraulic and Evaluation report (design storms and time series) and the Water Quality and Evaluation report (time series only). Before you do so though, you should define any site information you would like to be displayed on the reports in the 'Site' tab and set any specific criteria in the 'Criteria' tab (Step 10).

When you are finished, make sure to save the project for later by going to the 'Home/Files' button.

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