

LONDON STRATEGIC SUDS PILOT STUDY

SuDS CAPEX Estimation, Technical Note

DECEMBER 2020



1 SUMMARY

This technical note covers the derivation of SuDS CAPEX values for the economic evaluation of benefit.

The process of deriving 'typical' and representative CAPEX values has been based largely on case studies. This approach was chosen due to the inability to obtain sensible and robust contractor and management rates. The use of estimating guides (i.e. SPON'S) was discounted due to the inherent variability of SuDS design, which would have required the creation of an extensive list of construction 'items' to form the CAPEX values, which don't account for variable site conditions, unexpected construction impacts and the financial effect of 'estates costs'.

To ensure robust and reliable values ranges have been calculated from numerous case studies. The minimum and maximum values will be used during the economic assessment to account for the inherent variability and uncertainty.

2 STAGE 1, PRELIMINARY CONCEPTUAL DEVELOPMENT

2.1 CAPEX Inventory

An inventory of Capital Expenditure (CAPEX) Costs was collated from standard industry assumptions and related project examples, covering all components of the preliminary design. Information was drawn from numerous sources, including:

- EA, Cost Estimation for SUDS - Summary of Evidence Report (2007)¹
- Stovin & Swan, Retrofit SuDS - Cost Estimates and Decision Support Tools (2007)²
- CIRIA, SuDS Manual³
- SPONS Civil Engineering and Highway Works Price Book (2018)
- SPONS External Works and Landscape Price Book (2018)
- SPONS Architects and Builders Price Book (2018)
- South West Water S104 Cost Estimation (*Capital works cost evaluation inventory for infrastructure investment*)

Where a component type (i.e. *manhole chamber*) references multiple cost estimates, a range has been derived. Within the cost estimation calculation, the unit cost for each component has defined based on a minimum, maximum or average cost value, depending on confidence and / or uncertainty.

2.1.1 Site Costs

The estimated site costs have been derived from typical industry standards and experience, drawing from numerous water and wastewater infrastructure project examples. The values derived (and used to evaluate the scheme total investment costs) are averages of the expected full range of values typically associated with a project of this type.

Each SuDS Evaluation Scenario includes a discrete set of percentages for the site costs, defined based on the type and mix of SuDS features proposed. Where the implementation of the option aligns well with existing investment structures the Client Overheads and contractor mobilisation and preliminaries are likely to be lower, which has been reflected in the assumptions.

A schedule of site cost assumptions is shown in Table 1.

¹ http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/SC080039_cost_SUDS.sflb.ashx

² <https://copenhagenwater.files.wordpress.com/2013/11/131110-ice-retrofit-suds-cost-estimates.pdf>

³ https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

Item	Minimum	Average	Maximum
Design Costs	3%	7%	13%
Client Overheads	5%	7%	10%
Highways Notices / Estates Costs	13%	14%	15%
Contractor Mobilisation and Preliminaries	5%	7%	10%
Utility Diversions	3%	6%	8%
Contingency	5%	7%	8%
Total	34%	48%	64%

Table 1 – Site Cost Assumptions

2.2 SuDS Feature Costs

A detailed breakdown of the proposed individual SuDS features CAPEX costs are shown in Table 2 and Figure 1.

SuDS Type	SuDS Configuration	Unit Rate	Units	Unit Value	CAPEX
Rainwater Planter	RB-Small	£200	Per box	1	£200
Rainwater Planter	RB-Large	£200	Per box	3	£600
Rain Garden	RS-Small	£504	Per m ²	1.5	£755
Rain Garden	RS-Medium	£504	Per m ²	3	£1,511
Rain Garden	RS-Large	£504	Per m ²	10	£5,035
Swale	Sw-Wet10m	£26	Per m ²	15	£397
Swale	Sw-Wet25m	£24	Per m ²	37.5	£906
Swale	Sw-Wet50m	£23	Per m ²	75	£1,754
Swale	Sw-Wet100m	£23	Per m ²	150	£3,449
Swale	Sw-Dry10m	£120	Per m ²	15	£1,804
Swale	Sw-Dry25m	£118	Per m ²	37.5	£4,407
Swale	Sw-Dry50m	£117	Per m ²	75	£8,746
Swale	Sw-Dry100m	£116	Per m ²	150	£17,424
Street Tree Pit	TP-WetSmall	£1,102	Per tree	1	£1,102
Street Tree Pit	TP-WetMedium	£1,692	Per tree	1	£1,692
Street Tree Pit	TP-WetLarge	£2,871	Per tree	1	£2,871

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SuDS Type	SuDS Configuration	Unit Rate	Units	Unit Value	CAPEX
Street Tree Pit	TP-DrySmall	£1,302	Per tree	1	£1,302
Street Tree Pit	TP-DryMedium	£1,959	Per tree	1	£1,959
Street Tree Pit	TP-DryLarge	£3,271	Per tree	1	£3,271
Street Tree Pit	TP-WetRetrofit	£1,526	Per tree	1	£1,526
Street Tree Pit	TP-DryRetrofit	£1,793	Per tree	1	£1,793
Streetscape Bioretention	Bi-TrafficCalming	£531	Per m ²	6	£3,186
Streetscape Bioretention	Bi-BuildOut	£792	Per m ²	6	£4,754
Streetscape Bioretention	Bi-ResBuildIn	£1,259	Per m ²	3	£3,777
Streetscape Bioretention	Bi-NonResBuildInSmall	£640	Per m ²	6	£3,838
Streetscape Bioretention	Bi-NonResBuildInLarge	£275	Per m ²	30	£8,264

Table 2 – Stage 1, SuDS Component CAPEX Cost Estimates (tabulated)

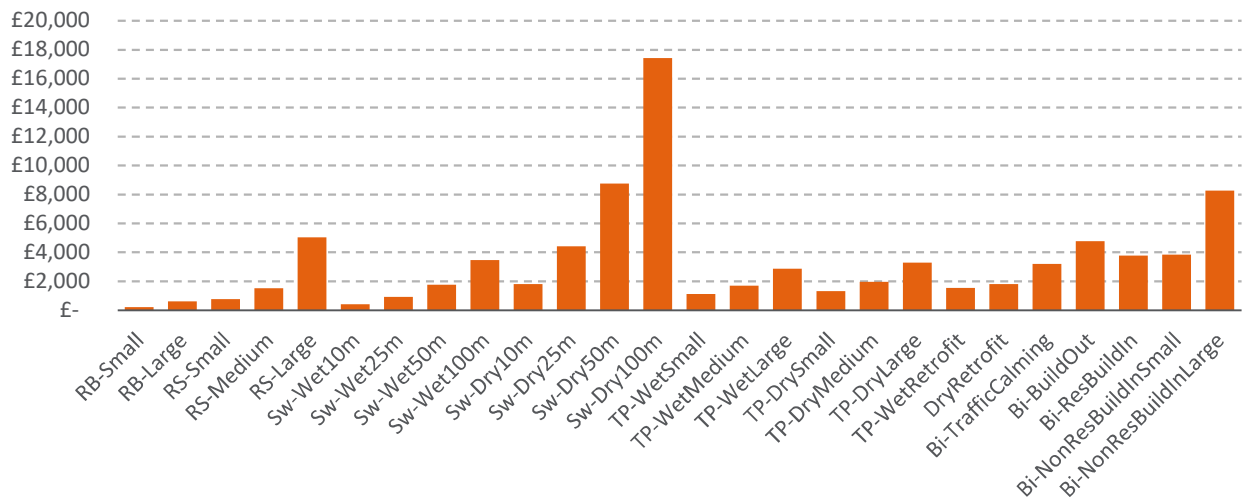


Figure 1 – SuDS Component CAPEX Cost Estimates (plotted)

3 STAGE 2, COMPREHENSIVE ECONOMIC VALUATION

3.1 Overview

To provide a more relevant and realistic understanding of SuDS CAPEX, specifically relevant to London and sufficient to enable the derivation of unit value (i.e. per m²), values have been derived statistically from a collection of related case studies and industry literature. The derivation converts scheme costs into unit costs, including an adjustment factor to account for non-SuDS elements of the scheme CAPEX (where a detailed cost breakdown was not available).

The CAPEX derivation was split into SuDS and non-SuDS costs, before design, mobilisation and site costs have been applied as a defined additional percentage.

3.2 CAPEX Components

3.2.1 Material Costs

3.2.1.1 SuDS CAPEX Cost

These values have been derived / estimated CAPEX costs associated with the SuDS elements only (i.e. soil, drop kerbs, vegetation etc.)

3.2.1.2 Non-SuDS CAPEX Costs

These values have been derived / estimated CAPEX costs associated with any non-SuDS elements (i.e. kerb stones, sub-base, road markings etc.)

3.2.2 Delivery Costs

3.2.2.1 Design, Mobilisation & Site Costs

Estimated non-material costs as uplift percentages to the total materials costs (*inc. preliminaries, traffic management, plant etc.*). The values have been split into the follow two types:

- **Direct Procurement** – Assumption that the SuDS feature is proposed, designed and constructed for its function as a water management asset, funded by TW and / or the LLFA
- **Opportunistic Procurement** – Assumption that the SuDS element has been included within an existing project funded and procured for a different overall purpose (e.g. highway re-surfacing, property re-development etc.)

For Streetscape Bioretention an estimate of cost savings associated with Opportunistic Procurement has been applied. This accounts for elements of the construction common to both a SuDS and non-SuDS approach.

3.3 Uncertainty

An upper and lower estimation for all the CAPEX components has been derived to provide an uncertainty banding. The values have been derived from the set of case studies and industry literature as follows:

- **Minimum or Maximum**
- **20th or 80% percentile** - where the minimum or maximum are considered outliers

3.4 Site Costs

The site costs defined for Stage 1 were critically reviewed against information and evidence in the case studies, and through Project Steering Group consultations. The assumptions have also been split into the two different SuDS feature types groups (public realm / private) and between Direct Procurement and Opportunistic Delivery.

A schedule of site cost assumptions is shown in Table 3.

Item	Direct Procurement			Opportunistic Delivery		
	Min	Av	Max	Min	Av	Max
Design Costs	10%	18%	25%	5%	10%	15%
Client Overheads	5%	8%	10%	3%	4%	5%
Highways Notices / Estates Costs	15%	23%	30%	0%	1%	3%
Contractor Mobilisation and Preliminaries	5%	10%	15%	0%	0%	0%
Contingency	3%	6%	10%	0%	3%	5%
Partnership Funding	-	-	-	-10%	-18%	-25%
Total	38%	64%	90%	-3%	0%	3%

Table 3 – Stage 2 Site Cost Assumptions

3.5 CAPEX Inventory

3.5.1 Streetscape Bioretention

Case studies were selected derive typical CAPEX costs based on the inclusion of engineered bioretention components and availability of cost information, shown in Table 4.

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Name	Est. Total Cost		Est. Unit Cost (per m ²)		Adjustment Factor	Final Unit Costs (per m ²)	
	SuDS Costs	Non-SuDS Costs	SuDS Costs	Non-SuDS Costs		SuDS Costs	Non-SuDS Costs
Haselbury SuDS	£28,457	£101,490	£82	£293	100%	£82	£293
Alma Road	£9,416	£33,584	£58	£207	100%	£58	£207
Derbyshire Street Pocket Park	£13,139	£46,861	£478	£1,706	35% (Costs included diverse mix of SuDS features and streetscape regeneration, inc. upper end construction materials and pedestrian focused design)	£167	£597
Talgarth Road	£26,278	£93,722	£674	£2,403	50% (Costs included street trees)	£337	£1,202
Bridget Joyce Square	£104,019	£370,981	£619	£2,208	35% (Cost included permeable paving and creation of multi-functional pedestrian space which elevated costs)	£217	£773
Ribblesdale Road	£9,723	£34,677	£66	£234	100%	£66	£234
Priory Common Rain Meadow	£10,511	£37,489	£124	£441	75% (More extensive natural feature (beyond the feature design considerations for streetscape bioretention))	£93	£331
Camden Costs	-	-	£32	£87	100%	£32	£87
Maximum						£337	£1,202
80th Percentile						£197	£703
50th Percentile						£87	£312
20th Percentile						£61	£218
Minimum						£32	£87

Table 4 – Streetscape Bioretention Case Study Information

Note:

Information was collated from the following sources: www.sustrain.org / www.tfl.gov.uk / London Borough of Enfield / London Borough of Camden

3.5.2 Living Roofs

Living Roof information was drawn from a selection of industry literature and policy which provided a broad understanding of typical CAPEX costs, shown in Table 5.

Name	Est. Unit Cost (per m ²)
Living Roofs and Wall Technical Report (GLA)	£130
The Renewable Energy Hub (UK)	£125
Cost Estimation for SUDS - Summary of Evidence (EA)	£85
"The UK Green Roof Market First Assessment 2017 (Livingroofs.org)"	£76
Willmott Dixon	£80
Stage 1 Values	£80
Maximum	£130
80th Percentile	£125
50th Percentile	£83
20th Percentile	£80
Minimum	£76

Table 5 – Living Roof CAPEX Sources

Note:

Information was collated from the following sources: www.london.gov.uk / www.renewableenergyhub.co.uk / www.evidence.environment-agency.gov.uk / www.livingroofs.org / www.willmottdixon.co.uk

3.5.3 Street Trees

Cost information for street trees is less available, making a statistical derivation of typical costs more difficult. The two primary sources of information used are shown in

Name	Est. Unit Cost (per tree)	
	SuDS Costs	Non-SuDS Costs
Silva Cell	£3,378	-
Treeconomics	£4,867	£330
Maximum	£4,867	£495*
50th Percentile	£4,123	£330
Minimum	£3,378	£165*

Table 6 – Street Tree CAPEX Sources

Note:

Information was collated from the following sources: www.deeproot.com / www.treeconomics.co.uk

* the minimum and maximum values were manually derived as +/- 50% due to the lack of information to enable a statistical derivation

3.6 SuDS Feature Costs

The final derived CAPEX costs used in the formulation of SuDS Evaluation Scenarios (See SuDS Evaluation Scenarios, Technical Note) and for calculation of cost-benefit is shown in Table 7.

SuDS Feature Type	SuDS Costs		Non-SuDS Costs		SuDS Cost Savings		Total SuDS Material Costs		Design, Mobilisation & Site Costs				Total / Site				Units
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Direct Procurement		Opportunistic Delivery		Direct Procurement		Opportunistic Delivery		
									Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	
Streetscape Bioretention	£69	£207	£218	£703	-£64	-£191	£223	£719	£84	£647	-£6	£18	£307	£1,366	£218	£737	per m ²
New Street Tree	£3,676	£4,569	£49	£147			£3,725	£4,717	£1,397	£4,245	-£93	£118	£5,122	£8,962	£3,632	£4,835	per tree
Street Tree Replacement	£2,205	£2,742	£29	£88			£2,235	£2,830	£838	£2,547	-£56	£71	£3,073	£5,377	£2,179	£2,901	per tree
Living Roof	£81	£128					£81	£128	£0	£1	-£0	-£1	£20	£89	-£37	-£67	per m ²
Rainwater Planter	£150	£175					£150	£175	£38	£123			£188	£298			Per planter

Table 7 – Stage 2, SuDS Component CAPEX Cost Estimates

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