

Appendix 3 – Urban Partnership Funding Calculator Report

1. Testing Report
2. Benefit Quantification Method

MEMO – Urban Partnership Funding Calculator – Testing Report

Date	July 2020 (v1.0)
To	London Strategic SuDS Pilot Study (LSSPS) – Urban Partnership Funding Calculator Steering Group (and LLFAs who provided project data for testing)
From	Metis Consultants Ltd

Circulation List

Name	Organisation
Michael Arthur (Memo Author)	Metis Consultants Ltd
Danielle Parfitt (Memo Reviewer)	Metis Consultants Ltd
Andy Sparks	Thames Flood Advisors
Ian Russell	London Borough of Enfield
Charles Snead	Transport for London
George Warren	Greater London Authority
Michael Bradshaw	London Borough of Harrow
Twm Palmer	London Borough of Hounslow
Jasdeep Bhachu	London Borough of Ealing
Graeme Kasselmann	Thames Water

Purpose

The purpose of this memo is to summarise the testing completed to compare the outcomes of the 2011 Partnership Funding Calculator (PFC), the 2020 PFC and the Urban PFC (based on the 2011 PFC). As test data was not made available from the ongoing LSSPS projects, Metis have completed testing using four of their own projects (as agreed with Ian Russell on 2 July 2020).

This memo also addresses the remaining tasks on the originally agreed work scope. This includes proposing appropriate payment rates for SuDS / Infrastructure outcome measures and considering potential contributions that could be made by a range of parties based on benefit achieved by the proposed scheme.

Background

The Urban PFC (UPFC) was completed for testing in December 2019 (v1.2). However, due to other LSSPS project priorities changing and the release of the 2020 version of the PFC by the Environment Agency in mid-April 2020, testing of the Urban PFC was not progressed. Metis completed a detailed review of the 2020 PFC and assessed the impacts of it on several active projects during May and June 2020. Following this activity, Metis proposed that the UPFC work package for the LSSPS be concluded with testing the UPFC and comparing outcomes with the 2011 and 2020 PFCs to understand how all three versions influence FCERM Grant in Aid (GiA) funding eligibility for urban schemes.

PFC Testing

Testing was completed using the following four schemes:

- London Borough of Ealing
 - Carr Road Critical Drainage Area (CDA) – New wetland located in Roxeth Recreation Ground providing 1,500m³ of flood storage

Metis Consultants Ltd

Company Registered in England and Wales Number: 7074879

Registered Office: Spencer House, 23 Sheen Road, Richmond. TW9 1BN

- Greenford Flood Alleviation Scheme (FAS) – New wetland in Paradise Fields providing 3,200m³ of flood storage plus a swale (~80m) and wetland in Ravenor Park providing 750m³ of flood storage
- London Borough of Hounslow
 - Hounslow Town Centre CDA – Surface water sewer diversion into Kingsley Park where a new dry basin, wetland and swales provide 500m³ of flood storage
- London Borough of Harrow
 - Whitchurch Lane CDA – Dry flood storage area in Stanmore Country Park (flood storage of 650m³), rain gardens (flood storage of 400m³) in Morecambe Gardens and a combined storage area / wetland in Grove Park (flood storage of 900m³)

All four schemes are at a similar stage of development. Draft Outline Business Cases were submitted in early 2020 and further design work is being progressed to address initial NPAS feedback. This includes running a wide range of modelled scenarios including ‘do nothing’ (abandonment of all current maintenance activity) and several climate change variations to accommodate new Outcome Measure (OM) 2B property counts (introduced in the 2020 PFC). This has created a common set of baseline data to populate all three versions of the PFC considered and complete a fair comparison of outcomes.

It should be noted that the various 2020 PFC results reported here differ from the recent work to update the EA PAFS system. The following adjustments and assumptions have been made to allow fair comparison between the PFC variants:

- The total scheme flood damage avoided benefit is the difference between ‘do nothing’ (no climate change) and ‘do something’ (end of appraisal period including climate change).
- Only one of the schemes (Whitchurch Lane) can claim OM2 (or the PFC 2020 OM2A/B) benefits for moving properties down a risk band. For the remaining schemes, the available space is not sufficient to achieve this under the future climate change scenario (+40%)
- Non-flood damage avoided benefits included are those only related to the specific SuDS benefits selected for the UPFC. Some of the schemes could claim additional non-flood benefits, but these are not included to ensure fair comparison between scheme PFC outcomes.
- SuDS Benefits were estimated using the latest release of the BEST Tool (v5.1.1 – September 2019) in line with previously issued UPFC guidance (UPFC - Benefit Quantification Method - v1.1.pdf – December 2019)
- Benefits achieved for reduced flooding of infrastructure (UPFC Infra OM1a/b/c/d) were analysed, but none of the proposed schemes provided sufficient flood risk reduction (including climate change allowances) to justify claiming these. The potential inclusion of infrastructure benefits is sensitivity tested to explore how much of a difference this could make as this is a key component of the UPFC.
- The 2020 PFC introduces OM1B as measure of the flood risk reduction benefits to people that are not associated with avoiding household damages (risk to life, stress & health, mental health, vehicle damages avoided and residential property evacuation costs avoided). To allow fair comparison between PFCs, the total scheme benefits are kept the same and individual benefits that attract higher payment rates are separated out as appropriate.
- The 2020 PFC OM1B benefits are distinct and separate from the SuDS social benefits. The SuDS benefits used are non-flood related. They include improved physical activity, emotional wellbeing and education associated with the non-flood impacts of SuDS. There is no double counting between these parameters.
- Although some of the schemes are eligible, the testing has excluded any benefits that could be claimed under OM4 (environmental benefits) to allow fair comparison of the impact of SuDS benefits. Environmental benefits created by SuDS were generally not permitted to be claimed

under OM4 for the PFC 2011 and the PFC 2020 introduces entirely new criteria for OM4 benefits. To ensure comparability, the UPFC benefit rates for SuDS were adjusted to match the OM4 benefit rates in the PFC 2020 (refer below for further detail).

Version 1.3 of the UPFC was used for testing. The update from v1.2 to v1.3 included correction of a summing error in the SuDS OM section and update of payment rates to reflect the changes made in the 2020 PFC. Payment rates for SuDS OMs were increased from 15p (used in v1.2) to 20p to align with the environmental and 'people related' payment rates used in the 2020 PFC. No changes were made to the infrastructure OM payment rate (30p). Version 1.3 of the UPFC and updated supporting documentation are supplied with this memo as Appendix B.

The outcomes of the testing are presented in Tables 1 and 2 on the following pages. Four tests were done using the same total benefit, whole life cost and property risk reduction data:

- **PFC 2011** – The 2011 version of the PFC.
- **UPFC with Modified PF Score Calculation** – This is the 'full' UPFC with a significant modification made to how the PF Score is calculated. On the basis that non-EA RMAs are not permitted to claim future maintenance costs, the UPFC makes the PF Score calculation equal to *Maximum Potential GiA / Cost for Approval* (compared to *Maximum Potential GiA / Whole Life Cost* for the PFC 2011). Further explanation and justification for modifying this calculation is provided in Appendix C.
- **UPFC with Standard PF Score Calculation** – This is the UPFC with no modification to the PF Score calculation (but including improved payment rates for SuDS / Infrastructure benefits).
- **PFC 2020** – The 2020 version of the PFC as released in April.

Sensitivity Analysis

Sensitivity analysis was completed for the following parameters and results are presented in Appendix A:

1. Use unfactored SuDS Benefits
2. Inclusion of infrastructure benefits
3. Reduce future (maintenance & decommissioning) costs by 50%

Conclusions

Testing of the UPFC shows that:

- Separating out SuDS specific benefits and applying higher payment rates (compared to OM1 payment rates) has a relatively minor impact on the overall Partnership Funding Scores (PFS) – generally a 2-3% increase in PFS. This is due to a relatively low SuDS benefit value compared to the flood damages avoided benefits.
- The overall value of SuDS benefits is low compared to overall project benefit and factoring the SuDS benefits to account for double counting has a low impact on PFS.
- The SuDS benefit estimation parameters used for the UPFC are heavily weighted towards distributed public realm type SuDS interventions in highways / footways. Three of the four test schemes are within existing public parks (Carr Road, Greenford and Hounslow Town Centre). They do not generate a high SuDS benefit value overall as the representative B£ST parameter used is focussed on street greening. Whitchurch Lane includes street greening and generates the highest overall SuDS related benefit because of this. Including benefits from increased visitors to local parks within the UPFC would make it more representative of urban SuDS schemes and increase overall benefit value.

- The most significant overall impact on PFS is generated by altering the way the PFS is calculated (including or excluding future costs). Excluding future costs improves the PFS by more than 50% for all schemes tested.
- The modifications made for the 2020 PFC generally improve PFS by a slightly higher margin than using the UPFC with a standard PFS calculation. The improvement in the PFS from the 2011 to 2020 versions is between 2% and 6%. This is in line with the 7.9% increase made in the payment rate for OM1(A).

The sensitivity analysis shows that:

- The factoring of SuDS benefits should be made conditional on the SuDS OMs being claimed for a specific scheme. For example, if no amenity benefits are being claimed, then 100% of the health benefits should be permitted (currently factored down by 0.7 to account for double counting with amenity). This would increase the overall total SuDS benefit available for a scheme within the UPFC.
- Analysis and recognition of local infrastructure benefits can have a significant impact on PFS outcomes. The UPFC thresholds for impacts on local infrastructure are too high. None of the tested schemes were able to claim any infrastructure benefits, but the sensitivity analysis shows that these can be substantial. The UPFC local infrastructure benefits should be extended to include local facilities (such as GP surgeries), local roads and local electricity supply infrastructure. Inclusion of local infrastructure benefits could increase total benefit value by approximately 10% without increasing scheme whole life costs. If regionally significant infrastructure benefits from the scheme, then benefit value could increase by more than 15% with minimal additional whole life cost. This could then be used to identify which infrastructure providers could be approached for scheme funding in proportion to the benefits delivered.
- Reducing future costs has a moderate positive impact on PFS and GiA eligibility. This should be a consideration for SuDS schemes to ensure high quality design and build activities to minimise future maintenance efforts. This approach would increase the relative value of GiA available towards the appraisal, design and construction costs of a scheme.
- Reduction in future costs has no impact on the UPFC with modified PFS calculation as this excludes future costs.

The 2020 PFC makes significant changes to OM4 (Environmental) benefits. These are no longer restricted to 'scheduled' environmental sites or waterways, but remain focussed on generally non-urban, larger scale habitats. Benefits from SuDS schemes could be incorporated within the 2020 PFC OM4 parameters, but these are limited to wetlands and ponds. Benefits from smaller scale SuDS such as rain gardens or tree pits would be disproportionately difficult to quantify and include in OM4. OM4 benefits are measured in proportion to plan area or length of watercourse improved, which means that small footprint interventions would not perform well.

Recommendations

It is recommended that:

- If the Steering Group wished to progress development of the UPFC further, the following changes would be beneficial:
 - Addition of conditional factoring to account for the scheme specific SuDS benefit categories claimed and adjust for double counting as necessary
 - A wider range of local infrastructure benefits are added to the Infrastructure OMs

- Local park visitor number increases are added as an amenity benefit to SuDS OM2b (as not all SuDS schemes are in the highway / footway)
- An output is generated which shows which parties could / should be approached for scheme funding based on benefits delivered
- The Steering Group continues to influence Defra policy makers to:
 - Specifically recognise local scale environmental / social (SuDS) benefits within future PFC updates.
 - Address the inconsistency in the PFC where EA and non-EA led schemes are assessed using whole life costs, but non-EA organisations are not permitted to access future costs under GiA and future cost contributions are not recognised.
- The key lessons learned from this study are presented to LoDEG members – these include:
 - Moving to the 2020 PFC appears to be generally beneficial for urban schemes
 - Larger scale SuDS (wetlands / ponds) will likely perform better in the 2020 PFC compared to the 2011 PFC
 - Effort expended in quantification and inclusion of SuDS benefits within OM1 has good potential to increase a scheme PFS. The UPFC benefit estimation methods can be used to quickly quantify the benefits as a standardised set of assumptions for B£ST are available.
 - Scheme development should focus on high quality, well designed SuDS with low maintenance costs where practical.
 - Recognition of benefits to regional and local scale infrastructure should not be overlooked in the appraisal process – these can provide significant overall increase in benefit value (increasing the overall PFS) and identification of potential additional funding partners (to fill funding gaps as are often required for urban schemes).

Table 1: Scheme Costs & Benefits Summary

Borough	Scheme Name	Costs		Benefits										Scheme Benefit-Cost Ratio
				Flood Damages Avoided (Compared to 'Do Nothing' Baseline)							SuDS Benefits		Whole Life Benefit (using factored SuDS Benefits)	
		Whole Life Cost	Capital Cost (PV Cost for Approval)	Residential & Business		Infrastructure			Factored*	Unfactored*				
Buildings & Contents	Mental Health			Critical & High Risk	Electricity	Water & Wastewater Treatment	Roads	Rail						
Ealing	Carr Road	£1,157,539	£556,947	£4,803,997	£123,417	£0	N/A	N/A	N/A	N/A	£103,443	£121,408	£5,030,857	4.3
Ealing	Greenford FAS	£2,554,156	£1,574,884	£5,375,148	£170,376	£0	N/A	N/A	N/A	N/A	£238,721	£254,627	£5,784,245	2.3
Hounslow	Hounslow Town Centre	£1,247,721	£498,142	£6,256,615	£248,463	£0	N/A	N/A	N/A	N/A	£116,650	£125,429	£6,621,727	5.3
Harrow	Whitchurch Lane	£1,573,401	£881,886	£1,802,554	£262,337	£0	N/A	N/A	N/A	N/A	£279,592	£351,738	£2,344,483	1.5

* 'Factored' means that the SuDS benefits were adjusted for double counting. 'Unfactored' means no double counting factors were applied and this represents the total potential SuDS benefits

Table 2: PFC Outcome Comparison

Borough	Scheme Name	PFC 2011			UPFC (based on PFC 2011) - Modified PF Score calc (PFC = Max GiA / Cost for approval)			UPFC (based on PFC 2011) - Standard PF Score calc (PFC = Max GiA / WLC)			PFC 2020		
		Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required
Ealing	Carr Road	24%	£134,477	£422,470	53%	£294,434	£262,513	25%	£141,666	£415,281	28%	£153,548	£403,399
Ealing	Greenford FAS	13%	£198,125	£1,376,759	23%	£355,731	£1,219,153	14%	£219,342	£1,355,542	15%	£228,682	£1,346,202
Hounslow	Hounslow Town Centre	29%	£146,869	£351,273	77%	£384,713	£113,429	31%	£153,593	£344,549	35%	£172,506	£325,636
Harrow	Whitchurch Lane	9%	£75,180	£806,706	20%	£174,517	£707,369	11%	£97,816	£784,070	13%	£111,060	£770,826

Appendix A – Sensitivity Testing

Refer following pages for:

- Table A1: Scheme Costs & Benefits Summary – Sensitivity 1 (unfactored SuDS Benefits)
- Table A2: PFC Outcome Comparison – Sensitivity 1 (unfactored SuDS Benefits)
- Table A3: Scheme Costs & Benefits Summary – Sensitivity 2 (Inclusion of infrastructure benefits)
- Table A4: PFC Outcome Comparison - Sensitivity 2 (Inclusion of infrastructure benefits)
- Table A5: Scheme Costs & Benefits Summary – Sensitivity 3 (Reduce future costs by 50%)
- Table A6: PFC Outcome Comparison - Sensitivity 3 (Reduce future costs by 50%)

The altered parameters for each sensitivity test are highlighted in **bold green** for ease of reference.

Appendix B – Urban Partnership Funding Calculator

The following files are issued with this report:

- UPFC - v1.3.xlsx
- UPFC - Benefit Quantification Method - v1.2.pdf

Appendix C – Newton Park Case Study

The following files are issued with this report:

- Partnership Funding Calculator - Newton Park Case Study - v1.2.pdf

Table A1: Scheme Costs & Benefits Summary – Sensitivity 1 (unfactored SuDS Benefits)

Borough	Scheme Name	Costs		Benefits										Scheme Benefit-Cost Ratio
				Flood Damages Avoided (Compared to 'Do Nothing' Baseline)							SuDS Benefits		Whole Life Benefit (using unfactored SuDS Benefits)	
		Whole Life Cost	Capital Cost (PV Cost for Approval)	Residential & Business		Infrastructure			Factored	Unfactored				
Buildings & Contents	Mental Health			Critical & High Risk	Electricity	Water & Wastewater Treatment	Roads	Rail						
Ealing	Carr Road	£1,157,539	£556,947	£4,803,997	£123,417	£0	N/A	N/A	N/A	N/A	£103,443	£121,408	£5,048,822	4.4
Ealing	Greenford FAS	£2,554,156	£1,574,884	£5,375,148	£170,376	£0	N/A	N/A	N/A	N/A	£238,231	£254,627	£5,800,152	2.3
Hounslow	Hounslow Town Centre	£1,247,721	£498,142	£6,256,615	£248,463	£0	N/A	N/A	N/A	N/A	£116,597	£125,429	£6,630,506	5.3
Harrow	Whitchurch Lane	£1,573,401	£881,886	£1,802,554	£262,337	£0	N/A	N/A	N/A	N/A	£279,592	£351,738	£2,416,629	1.5

Table A2: PFC Outcome Comparison – Sensitivity 1 (unfactored SuDS Benefits)

Borough	Scheme Name	PFC 2011			UPFC (based on PFC 2011) - Modified PF Score calc (PFC = Max GiA / Cost for approval)			UPFC (based on PFC 2011) - Standard PF Score calc (PFC = Max GiA / WLC)			PFC 2020		
		Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required
Ealing	Carr Road	24%	£134,957	£421,990	54%	£298,027	£258,920	26%	£143,395	£413,552	28%	£154,067	£402,880
Ealing	Greenford FAS	13%	£198,686	£1,376,198	23%	£359,010	£1,215,874	14%	£221,364	£1,353,520	15%	£229,288	£1,345,596
Hounslow	Hounslow Town Centre	30%	£147,065	£351,077	78%	£386,479	£111,663	31%	£154,298	£343,844	35%	£172,717	£325,425
Harrow	Whitchurch Lane	9%	£77,427	£804,459	21%	£188,588	£693,298	12%	£105,703	£776,183	13%	£113,486	£768,400

Table A3: Scheme Costs & Benefits Summary – Sensitivity 2 (Inclusion of infrastructure benefits)

Borough	Scheme Name	Costs		Benefits										Scheme Benefit-Cost Ratio
				Flood Damages Avoided (Compared to 'Do Nothing' Baseline)						SuDS Benefits		Whole Life Benefit (using factored SuDS Benefits)		
		Whole Life Cost	Capital Cost (PV Cost for Approval)	Residential & Business		Infrastructure				Factored	Unfactored			
Buildings & Contents	Mental Health			Critical & High Risk	Electricity*	Water & Wastewater Treatment	Roads*	Rail						
Ealing	Carr Road	£1,157,539	£556,947	£4,803,997	£123,417	£0	£341,084	N/A	£470,792	N/A	£103,443	£121,408	£5,842,732	5.0
Ealing	Greenford FAS	£2,554,156	£1,574,884	£5,375,148	£170,376	£0	£381,636	N/A	£526,765	N/A	£238,231	£254,627	£6,692,155	2.6
Hounslow	Hounslow Town Centre	£1,247,721	£498,142	£6,256,615	£248,463	£0	£444,220	N/A	£613,148	N/A	£116,597	£125,429	£7,679,043	6.2
Harrow	Whitchurch Lane	£1,573,401	£881,886	£1,802,554	£262,337	£0	£127,981	N/A	£176,650	N/A	£279,592	£351,738	£2,649,115	1.7

* Estimated using % of residential & business damages averaged from 2007 flood events in the UK (Table 6.3 from the Multi-Coloured Manual Handbook). +7.1% for electricity (damage avoided to sub-station and other supply infrastructure) and +9.8% for roads (direct damage to road surface and associated disruption). None of the study areas considered had potentially benefitting Critical / High Risk or rail assets.

Table A4: PFC Outcome Comparison - Sensitivity 2 (Inclusion of infrastructure benefits)

Borough	Scheme Name	PFC 2011			UPFC (based on PFC 2011) - Modified PF Score calc (PFC = Max GiA / Cost for approval)			UPFC (based on PFC 2011) - Standard PF Score calc (PFC = Max GiA / WLC)			PFC 2020		
		Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required
Ealing	Carr Road	28%	£156,179	£400,768	97%	£537,996	£18,951	46%	£258,856	£298,091	32%	£176,986	£379,961
Ealing	Greenford FAS	15%	£229,242	£1,345,642	40%	£628,251	£946,633	25%	£387,377	£1,187,507	17%	£262,289	£1,312,595
Hounslow	Hounslow Town Centre	34%	£170,322	£327,820	141%	£498,142	£0	56%	£280,237	£217,905	40%	£197,835	£300,307
Harrow	Whitchurch Lane	10%	£84,666	£797,220	22%	£191,441	£690,445	12%	£107,302	£774,584	14%	£121,304	£760,582

Table A5: Scheme Costs & Benefits Summary – Sensitivity 3 (Reduce future costs by 50%)

Borough	Scheme Name	Costs		Benefits										Scheme Benefit-Cost Ratio
				Flood Damages Avoided (Compared to 'Do Nothing' Baseline)							SuDS Benefits		Whole Life Benefit (using factored SuDS Benefits)	
		Whole Life Cost	Capital Cost (PV Cost for Approval)	Residential & Business		Infrastructure			Factored	Unfactored				
Buildings & Contents	Mental Health			Critical & High Risk	Electricity	Water & Wastewater Treatment	Roads	Rail						
Ealing	Carr Road	£857,243	£556,947	£4,803,997	£123,417	£0	N/A	N/A	N/A	N/A	£103,443	£121,408	£5,030,857	5.9
Ealing	Greenford FAS	£2,064,520	£1,574,884	£5,375,148	£170,376	£0	N/A	N/A	N/A	N/A	£238,231	£254,627	£5,783,755	2.8
Hounslow	Hounslow Town Centre	£872,932	£498,142	£6,256,615	£248,463	£0	N/A	N/A	N/A	N/A	£116,597	£125,429	£6,621,675	7.6
Harrow	Whitchurch Lane	£1,227,644	£881,886	£1,802,554	£262,337	£0	N/A	N/A	N/A	N/A	£279,592	£351,738	£2,344,483	1.9

Table A6: PFC Outcome Comparison - Sensitivity 3 (Reduce future costs by 50%)

Borough	Scheme Name	PFC 2011			UPFC (based on PFC 2011) - Modified PF Score calc (PFC = Max GiA / Cost for approval)			UPFC (based on PFC 2011) - Standard PF Score calc (PFC = Max GiA / WLC)			PFC 2020		
		Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required	Raw PF Score	GiA Eligibility	Contributions Required
Ealing	Carr Road	33%	£181,585	£375,362	53%	£294,434	£262,513	34%	£191,292	£365,655	37%	£207,337	£349,610
Ealing	Greenford FAS	16%	£245,113	£1,329,771	23%	£355,731	£1,219,153	17%	£271,363	£1,303,521	18%	£282,917	£1,291,967
Hounslow	Hounslow Town Centre	42%	£209,927	£288,215	77%	£384,713	£113,429	44%	£219,538	£278,604	49%	£246,571	£251,571
Harrow	Whitchurch Lane	11%	£96,354	£785,532	20%	£174,517	£707,369	14%	£125,365	£756,521	16%	£142,339	£739,547

Urban PF Calculator – Benefit Quantification Method

Date July 2020 (v1.2)
To LSSP – Partnership Funding (PF) Working Group
From Metis Consultants

Circulation List

Name	Organisation
George Warren	LoDEG / GLA
Ian Russell	Enfield Council
Michael Bradshaw	Harrow Council
Andy Sparks	Thames Flood Advisors
Charles Snead	Transport for London
Graeme Kasselmann	Thames Water

Purpose

The purpose of this document is to detail the benefit quantification approach for SuDS and infrastructure Outcome Measures within the Urban Partnership Funding Calculator. The document also justifies the approach for managing double counting.

SuDS Outcome Measures – Quantification

Outcome Measure	Benefit Quantification (BEST Tool ¹)	Comments
SuDS OM1a - Baseflow	<p>This benefit can be assessed in the same way as water quality (OM1b below). If the “condition of the river channel and flow of water” component is expected to be improved as a result of the SuDS scheme, then a proportion (one-sixth) of the appropriate monetary value from the National Water Environment Benefits Survey (NWEBS) can be applied to the waterbody length over which this improvement is expected to occur – improvement of baseflow is one of the six NWEBS water quality improvement categories. The other five are addressed in water quality (OM1b below). Use BEST QW1-F2 with the following parameters:</p> <ul style="list-style-type: none"> • Change in WFD Classification = Poor to Moderate • Region – Thames • Monetary Value – Lower • Length of Watercourse – Use urban catchment equivalent approach of 100ha of catchment runoff quality improvement is equivalent to 1km of watercourse improvement • No. of NWEBS categories improved = 1 (condition of the river channel and flow of water only) • Confidence - Valuation – 75% (benefits are equivalent to evidence base used to derive value) • Confidence - Quantity – 25% (quantity estimation is based on an assumed transfer of benefit from catchment size treated to watercourse length) 	<p>The exact link between SuDS and baseflow improvements has not clearly been demonstrated through research to date. The BEST parameters proposed address this by applying a low confidence value to the ‘Quantity’ to account for the urban catchment equivalent approach and a ‘lower’ monetary value of the change achieved.</p> <p><i>The benefit of this measure could also be quantified in simple terms as a conversion of impervious to pervious surface, then the benefit monetised using the Thames Water ‘20 for 20’ rate of ~£70/m² for disconnection from a (combined?) sewer. The basis for this is that the runoff no longer directly enters the sewer system and is either attenuated or infiltrated – which achieves a similar outcome to disconnection.</i></p>
SuDS OM1b – Water Quality	<p>This addresses the other five non-baseflow related component of water quality improvement. These include:</p> <ol style="list-style-type: none"> 1. Fish 2. Other animals such as invertebrates 3. Plant communities 4. The clarity of water 5. The safety of the water for recreational contact <p>Use BEST WQ2 with the following parameters:</p> <ul style="list-style-type: none"> • Change in WFD Classification = Poor to Moderate • Region – Thames 	<p>BEST WQ2 benefit estimation is based on work done for River Basin Management Plans and achievement of WFD goals. This is a reasonable proxy for improvements on non-Main Rivers – to accommodate this, the lower range benefit values are recommended.</p>

¹ <https://www.susdrain.org/resources/best.html> [February 2019 release]

Outcome Measure	Benefit Quantification (BEST Tool ¹)	Comments
	<ul style="list-style-type: none"> • Monetary Value – Lower • Length of Watercourse – Use urban catchment equivalent approach of 100ha of catchment runoff quality improvement is equivalent to 1km of watercourse improvement • No. of NWEBS categories improved = 2 (assuming the SuDS system conservatively improves water clarity and safety for recreational contact only) • Confidence - Valuation – 75% (benefits are equivalent to evidence base used to derive value) • Confidence - Quantity – 25% (quantity estimation is based on an assumed transfer of benefit from catchment size treated to watercourse length) 	
SuDS OM2a – Air Quality	<p>Use BEST AQ2 with the following parameters:</p> <ul style="list-style-type: none"> • Vegetative SuDS excluding trees – Areas (Ha) provided by proposed scheme • New Trees Planted – Estimate total trees and proportion into small (70%), medium (20%) and large (10%) – or use actual if available. • Use ‘Central’ benefit rates for all parameters • Confidence - Valuation – 100% (benefits are directly equivalent to evidence base used to derive value) • Confidence - Quantity – 75% (if estimated) or 100% (if based on scheme details) 	Benefit can be quickly estimated based on readily available scheme data (or quickly based on detailed scheme information if available)
SUDS OM2b – Amenity	<p>Use BEST AM2 (Street improvement through greening) only (inclusion of other parameters increases double counting overlap with other SUDS OMs) with the following parameters:</p> <ul style="list-style-type: none"> • Estimated no. of residents: Use National Receptor Database to calculate number of properties on targeted streets and multiply by 2.4 (average household size in England) – Census 2011²) • Monetary Values – Select based on current and proposed scenarios (based on type of current & proposed level of greening) • Confidence - Valuation – 75% for residential and 50% for non-residential (for combined areas select the dominant landuse type) • Confidence - Quantity – 75% (quantity estimation is based on a proposed scheme) 	<p>Significant benefit value can also be derived by accounting for increase property values in benefitting areas – but this type of benefit is not permitted for FCRM GiA as the benefit does not accrue to ‘society’, but to individual home owners. However, this has potential to link with internal LLFA business cases as the benefit would increase Borough Tax revenues in the medium to long term.</p> <p>Potential double counting needs to be accounted for between SuDS OM1b (Water Quality), SuDS</p>

²

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/populationandhouseholdestimatesfortheunitedkingdom/2011-03-21#average-household-size>

Outcome Measure	Benefit Quantification (BEST Tool ¹)	Comments
		OM2d (Health) and SuDS OM3a/b (Biodiversity & Ecology).
SuDS OM2c – Education	<p>Use BEST Edu2 with the following parameters:</p> <ul style="list-style-type: none"> • No. of Student Visits per year – <ul style="list-style-type: none"> ○ Scheme within school = Assume one lesson per term per student (if education support is provided) or one lesson per year per student (if no support is provided) ○ Scheme not within school = Assume 20% of students from schools within 1km visit one per year • Monetary Value - Mid • Confidence - Valuation – 75% (value estimation closely aligned with proposed scheme) • Confidence - Quantity – 25% (actual number of visits proportional to level of buy-in by local schools) 	<p>Educational benefits are closely related to the number of nature-based school trips generated by the scheme – within or externally to a school. Higher numbers of ‘trips’ could be estimated for schemes targeted within schools (and higher benefit values derived). Also note that these types of benefits would only be fully realised if direct engagement with local schools is undertaken to raise awareness and potentially provide educational resources.</p> <p>Low risk of double counting with other OMs</p>
SuDS OM2d - Health	<p>Use BEST H2b (Physical activity) and H3 (Emotional wellbeing -view over green space from homes) – others not proposed to minimise double counting with other OMs - with the following parameters:</p> <ul style="list-style-type: none"> • H2b (physical activity) <ul style="list-style-type: none"> ○ Estimated no. of adults (baseline) – Zero ○ Estimated no. of adults (proposed option) – As for OM2b multiplied by 25% (approximate percentage of UK adults who are sedentary) multiplied by 1% (to give no. of adults becoming more active) ○ Monetary value – Use default (there is only one option currently) ○ Confidence - Valuation – 50% ○ Confidence - Quantity – 75% (quantity estimation is based on a proposed scheme) • H3 (Emotional wellbeing – view over green space) <ul style="list-style-type: none"> ○ Estimated no. of adults (baseline) – As for OM2b ○ Estimated no. of adults (proposed option) – As for OM2b (no change in no. of people – but improved monetary value in proposed scenario) ○ Monetary Value – Select based on quality of space within current and proposed scenarios ○ Confidence - Valuation – 50% 	<p>Other health benefits can be derived from access to permanent water bodies and non-countryside green spaces. It is recommended that these are assessed on a case by case basis and included in Defra OM1 (total benefits) with relevant adjustments to allow for double counting.</p>

Outcome Measure	Benefit Quantification (BEST Tool ¹)	Comments
	<ul style="list-style-type: none"> ○ Confidence - Quantity – 75% (quantity estimation is based on a proposed scheme) 	
SuDS OM3 – Biodiversity & Ecology	<p>Use BEST BE2 for each distinct SuDS feature type used in the proposed scheme (one per ‘land use type’):</p> <ul style="list-style-type: none"> ● Type or area or intervention: Select the most appropriate habitat type based on the type of SuDS being used from the list below: <ul style="list-style-type: none"> ○ Improved grassland (such as grassed swales or dry storage areas without high planting density or diversity) ○ Hedgerows (most other SuDS types incorporating more diverse vegetation) ○ Wet reed beds (for any permanent water bodies) ● Confidence - Valuation – 75% (valuation basis is closely aligned with scheme proposals) ● Confidence - Quantity – 100% (quantity estimation is based on a proposed scheme) 	<p>Potential for double counting with amenity, health and water quality OMs.</p> <p>The recent revision of BEST removed the most appropriate monetary value for urban SuDS (biodiversity preservation). In the newer version of BEST, standard habitat classifications are used, none of which align well with an urban environment. To accommodate this change, it is proposed to use ‘hedgerows’, ‘improved grassland’ and ‘wet reed beds’ as proxies for urban biodiversity & ecology benefits achieved by vegetated SuDS systems.</p>

SuDS Outcome Measures – Double Counting

As noted in the ‘comments’ column in the table above, there are several Outcome Measures that are sufficiently similar that double counting of benefits could occur. These are summarised in the diagram below along with the proposed factor to be applied to the benefits of each parameter to address double counting.

Outcome Measure	SuDS OM1a - Baseflow	SuDS OM1b – Water Quality	SuDS OM2a – Air Quality	SUDS OM2b – Amenity	SuDS OM2c – Education	SuDS OM2d - Health	SuDS OM3 – Biodiversity & Ecology
SuDS OM1a - Baseflow							
SuDS OM1b – Water Quality							
SuDS OM2a – Air Quality							
SUDS OM2b – Amenity							
SuDS OM2c – Education							
SuDS OM2d - Health							
SuDS OM3 – Biodiversity & Ecology							
Double Count Factor	0.5	0.5	1	0.3	1	0.7	0.5
Justification	Adjust for double count with water quality, amenity and biodiversity & ecology)	Adjust for double count with baseflow, amenity and biodiversity & ecology)	No double count with other OMs	Adjust for double count with baseflow, water quality, health and biodiversity & ecology	No double count with other OMs	Adjust for double count with amenity	Adjust for double count with water quality and baseflow and amenity

Infrastructure Outcome Measures

Investigation into quantification of benefits related to reduced flood risk to these types of assets has shown that the following sub-categories fit best with available data:

- Infra OM1a: Critical & High Risk Infrastructure
- Infra OM1b: Electricity sub-stations
- Infra OM1c: Water & Wastewater facilities
- Infra OM1d: Transportation

Flood risk reduction benefit estimation methods for each of these items vary from non-existent (site specific study required) and straight forward to very complex. Each of the methods then requires a range of data inputs, some of which are readily available and others that are challenging (such as specific usage of a classified site or population served by a certain asset) or require site specific study to obtain.

To manage this variability and maintain the ‘simple’ approach used by the current OMs, a similar method to Defra OM2 (number of residential properties moved from one risk category to a lower one) is used to provide a consistent measure of reduced risk to infrastructure. This supplemented with quantified benefit where this is a straight forward appraisal exercise based on readily available data.

Outcome Measure	Benefit Quantification	Reference Material	Comments
Infra OM1a: Critical & High Risk Infrastructure	Study area specific count of assets using National Receptor Database (NRD), OS Mapping and local knowledge combined with available 1 in 200yr return period flood mapping: <ul style="list-style-type: none"> • Critical Infrastructure <ul style="list-style-type: none"> ○ Hospitals ○ Ambulance stations ○ Fire stations ○ Police stations • High Risk Infrastructure – All require site specific analysis for benefit quantification <ul style="list-style-type: none"> ○ Nuclear power stations ○ Key transport hubs (ports, airports, major train stations etc.) ○ Defence bases 	Multi-Coloured Manual (MCM) - Chapter 6 (generally MCM Code = 6) Specialist advice is required	Critical infrastructure benefits are straight forward to quantify using MCM methods (similar to residential properties). Benefit value must be separated from Defra OM1. High Risk Infrastructure benefits are very sensitive to site specific characteristics and need site specific analyses in all circumstances. As above, if quantified, these benefits need to be separated from other OMs.
Infra OM1b: Electricity sub-stations	Identify sub-stations using NRD and estimate site perimeters using OS Mapping. MCM then provides an estimation of population serviced based on site perimeter. Estimate impact based on population serviced and reduced risk due to scheme (noting the standard of protection required is a 1 in 200yr return period)	Multi-Coloured Manual (MCM) - Chapter 6 (MCM Code = 960)	Some consultation with utility provider(s) may be required to determine transferability of service and confirm the population served. The financial impact of the disruption can be estimated using MCM methods but needs to be site specific.
Infra OM1c: Water & Wastewater facilities	Study area specific count of assets using National Receptor Database (NRD), OS Mapping and local knowledge combined with available 1 in 200yr return period flood mapping: <ul style="list-style-type: none"> • Water Supply <ul style="list-style-type: none"> ○ No. of facilities ○ Population supplied (estimated from three options) ○ No specific benefit value quantification approach as site specific analysis is required • Wastewater Treatment <ul style="list-style-type: none"> ○ No. of facilities 	Specialist advice is required Multi-Coloured Manual (MCM) - Chapter 6	Sensitive to site specific characteristics and need site specific analyses in all circumstances. As above, if quantified, these benefits need to be separated from other OMs. As for electricity, some consultation with water company may be required to determine

Outcome Measure	Benefit Quantification	Reference Material	Comments
	<ul style="list-style-type: none"> ○ Dry weather flow (estimated from three options) ○ Benefit quantification – estimate direct damage avoided from defined damage curves 		<p>transferability of service and confirm the population served / dry weather flows.</p> <p>Financial impact of flooding to wastewater treatment facilities is reasonably well understood and straight forward to quantify – but water supply would require site specific studies.</p> <p>No available reference material on impacts to local pump station assets for water / wastewater. It may be possible to expand this to include local pumping assets if relevant data were made available.</p>
<p>Infra OM1d: Transportation</p>	<p>Impacts to roads:</p> <ul style="list-style-type: none"> ● Length of road flooded categories by return period (>300mm flood depth only) ● Road usage grade (based on Local Highway Management Hierarchy) ● Quantify benefit achieved using combination of direct damages (£/m2 provided by the MCM manual) and indirect based on the ‘Delayed hour’ method <p>Impacts to rail:</p> <ul style="list-style-type: none"> ● No. of services on the line in question (National Rail timetable) ● Maximum flood depth predicted relative to lowest point on alignment and the ‘top’ of the rail at this point: <ul style="list-style-type: none"> ○ Within 50mm of top of rail, but less than 100mm above rail – Delays likely ○ More than 100mm above rail – Cancellations likely ● Quantify benefit achieved using indirect (delay / compensation) damages only (direct damages are highly variable depending on local context). This should be done using the ‘compensation method’ detailed by the MCM manual. 	<p>Multi-Coloured Manual (MCM) - Chapter 6</p> <p>Local Highway Management Hierarchy (for road usage grades) – refer Well-managed Highway Infrastructure Code of Practice</p>	<p>Easily quantifiable based on readily available information. Various methods are available to estimate level of benefit achieved – the lowest effort methods are recommended to ensure consistency and minimise appraisal cost. Further appraisal work can then be undertaken if justified by the low effort approach.</p> <p>It is noted that a proportional approach needs to be taken in assessing these damages avoided / benefits gained. For example, it is only anticipated that the assessment will be undertaken for Motorway / Strategic ('A' Roads) and Main Distributor ('B' Roads) routes. Similarly, for impacts to rail, the benefit assessment should only be undertaken for locations likely to show significant impacts (not the entire rail network within a study area).</p>