

**Box 3.4 Summary of the Severn Trent Water Ripple Effect investigation : benefits of retrofitting SuDS to create green streets in Coventry (AECOM & Severn Trent Water, 2013).**



**Sewer flooding** – During heavy rainfall, the sewer system can be overwhelmed, flooding properties. Retrofitting with SuDS would reduce and slow surface water runoff to sewers. Severn Trent Water (STW) and Coventry City Council suggest that in an average year, city wide sewer flooding compensation costs amount to £3.6-million, or £83-million over 40 years. Reducing this will create financial benefits in terms of damage avoided.

**Improved river water quality** – Diffuse pollution from urban runoff and CSOs affects the quality of urban rivers. By using SuDS, this will significantly reduce. Currently, the EA consider the Quality of the River Sherbourne to be of 'poor' quality. Improving the River to 'moderate' quality is worth £17,900 per km per year. Assuming the delivery of SuDS could significantly improve the water quality along the full length of the Sherbourne (10km), the potential benefit would be approximately £4.1-million over 40 years.

**Reduction in surface water runoff** – STW allows customers to claim back surface water drainage charges, if they disconnect. This is £30-£90 depending on property type. If all households in Coventry were to do this, there would be a total benefit of more than £5.7-million in bill reductions for householders. Over a 40 year lifetime, this equates to approximately £131-million.

**Reduced wastewater pumping and treatment costs** – Much of Coventry has combined sewers. By removing surface water it reduces pumping and treatment costs. Rainfall in Coventry is approximately 600mm per year. For a 60m<sup>2</sup> roof the surface water runoff would be 36m<sup>3</sup> per year. Using costs for pumping and treating wastewater estimated by STW, and assuming half of Coventry is served by combined sewers, the total value is calculated to be as high as £296,000 per year, or £6.9- million over 40 years.

**Property values** – Worldwide research has found uplifts in property values from treelined streets, of 3-15%. With the lower uplift in areas where there is already plentiful amounts of greenery. An average value of 7% has been assumed here, as Coventry does not have a high proportion of greenery in streets. Average homes on Stoney Road are valued at approximately £230,000; this is a £16,100 uplift per property. Rain garden tree pits will deliver two street trees every 33m on Stoney Road (one on either side of the road) with a combined value of £805,000 for the uplift for the 50 properties. For Coventry as a whole this would be £1.2-billion, with more than 66,000 trees. However, if all streets in Coventry were retrofitted as green streets, the high demand might prevent this figure from being achieved.

#### Box 3.4 continued

**Reduced energy costs** – The energy savings per tree from wind protection in the winter and shade in the summer as £32 per tree. The benefit in Stoney Road could be £800 per year or £18,500 over 40 years (not accounting for likely increases in energy costs). Across Coventry as a whole this gives £2.1 million per year, or more than £48.8-million over 40 years.

**Carbon dioxide sequestration** – Assuming 132,000 properties in Coventry, and one tree for every two properties, some 66,000 trees would be planted. Approximately 1.5 tonnes of CO<sub>2</sub> is sequestered for every hectare of trees. With 1,000 trees per ha, some 66 ha of sequestration value is delivered. Using a carbon offset value of £46 per tonne of CO<sub>2</sub>, the value of carbon dioxide sequestration is up to £4,550 or more than £100,000 over 40 years.

**Air quality improvements** –for every m<sup>2</sup> of tree canopy, some 10 - 14 g of pollution are avoided annually (particulate matter, ozone, sulphur dioxide, nitrogen dioxide, and carbon monoxide). The damage of air pollution has been estimated in the UK for SO<sub>x</sub> (£1,633/tonne), NO<sub>x</sub> (£955/tonne) and particulate matter (117,900/tonne); this equates to £0.03/g of pollution (excluding the proportions for ozone and carbon monoxide which could not be monetised). With 66,000 trees planted, each with a 2.5m radius canopy, 15.8 tonnes of pollutants worth nearly £517,000/yr would be removed. This is worth £12 million over 40 years and over £4,500 for the retrofitted section of Stoney Road alone.

**Local job creation** – Creating green streets would require maintenance and care of the landscaped areas. One job is equivalent to eliminating job-seekers allowance for one person. At £65.45 per week for a year, this is £3,403.40. If the value of housing benefit is included of £63/week this would be an additional annual cost saving of £3,276. Combined, this is £6,679. Scaled across Coventry this is equivalent to 48 jobs created, or roughly £320,592 benefit to the city. Over 40 years these jobs are worth more than £7.4 million.

**Biodiversity** – When street trees are planted on a citywide scale, functional ecological corridors can be established, improving habitats.

**Pedestrian movement and recreation** – Greener streets could be combined with home zone initiatives and the creation of more pedestrian friendly streets to improve the walkability of Coventry. One study found that residents that live in walkable neighbourhoods do 30-45 minutes more of activity per week and are less likely to be obese or overweight.

**Urban heat island** – There are an estimated 15 heat wave days in Coventry by 2080, resulting in a predicted 6.4 lives lost. A 10% increase in tree canopy would reduce expected surface temperatures in the urban area by 2.5°C.

**Groundwater recharge and water re-use** – SuDS can be designed to recharge local aquifers or be stored and used locally as an alternative water supply. As new water sources are scarce in the catchment, the cost of developing a new source is significant. By either replenishing groundwater supplies for re-extraction or extracting a portion of treated runoff for reuse, a new water source could be created. By retrofitting SuDS to capture and treat runoff from the roofs and roads, significant amounts of water would be available as a water supply. Assuming 15% is lost to evaporation and plant uptake and if only 50% of the available runoff is used as a water supply, the value of that water source could be up to £6.7-billion over 40 years based on the offset of the cost of developing new sources elsewhere in the area. Storage tanks, final treatment and pipework have not been costed in the case study and would need to be included to gain this benefit.

**In total**, from the quantifiable benefits above (not including the benefits relating to heat-related deaths, biodiversity and health), the city-wide benefits of retrofitting green SuDS is valued at in excess of £1.5-billion over 40 years. For the site at Stoney Road, there is a benefit of over £906,000 or 7.5 times the site costs of £121,000. If water reuse infrastructure was added to store and recycle runoff locally for irrigation and toilet flushing, the benefits would increase dramatically to nearly £8.3-billion across the city and nearly £3-million at the site scale.