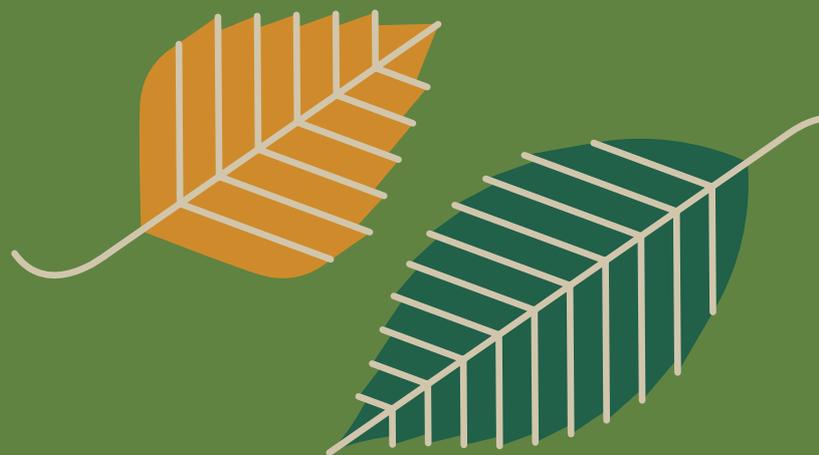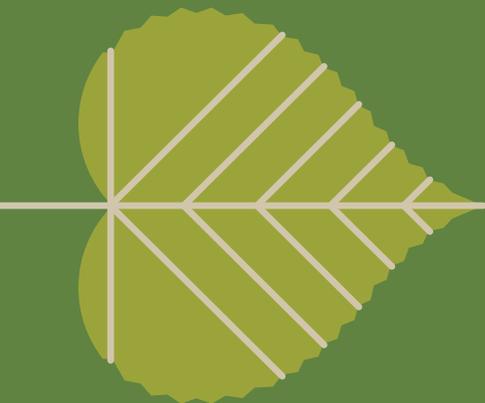# Sheffield Street Tree Partnership Working Strategy

Promoting and enhancing a network of street trees that Sheffield can be proud of

July 2020

Swedish Whitebeam
(*Sorbus Intermedia*) in flower

Foreword

We set out to develop an exemplary Partnership Street Tree Strategy for Sheffield that values street trees for the benefits they bring to people, the city and the wider environment. And we believe this Working Strategy is just that. As a group we wanted to produce something positive and visionary - for the city to collectively view street trees as an asset, helping us to improve air quality, reduce flood risk, support wildlife and store carbon. This strategy aims to learn from the past in order to deliver our vision for the future of Sheffield's street trees.

In developing this strategy we have recognised that a partnership approach to positively, actively and sustainably manage our street trees, both now and in the long-term, means we are more likely to achieve our ambitions. Sharing time, expertise and resources means we can deliver so much more.

Of course, our street trees are just a part of all the city's trees and woodlands and so we have tried to ensure that this strategy is a supplement to Sheffield City Council's Trees and Woodlands Strategy.

We have also commissioned and collated baseline data so that progress towards our ambitions can be measured and is transparent. For more details about some of the baseline data please also refer to our 'Sheffield Street Tree Inventory Report'.

This Strategy needs the support and involvement of many more people and organisations than those on our Development Group. And so we are launching this document as a Working Strategy. Over the coming year we will be seeking your views, comments and commitment to the proposals set out here. When the wider community has had the opportunity to say what they think, the future Partnership Delivery Group will review the comments at the end of the year and finalise the Strategy. The partners on the strategy development group have committed to their individual actions as set out under each of the six outcomes.

So it is now over to you. Please tell us what you think and if you can help deliver any of the actions. We will shortly be sending out a questionnaire to interested groups and an online survey will be posted on the Sheffield City Council website. Please do take part and find out how you can get involved.
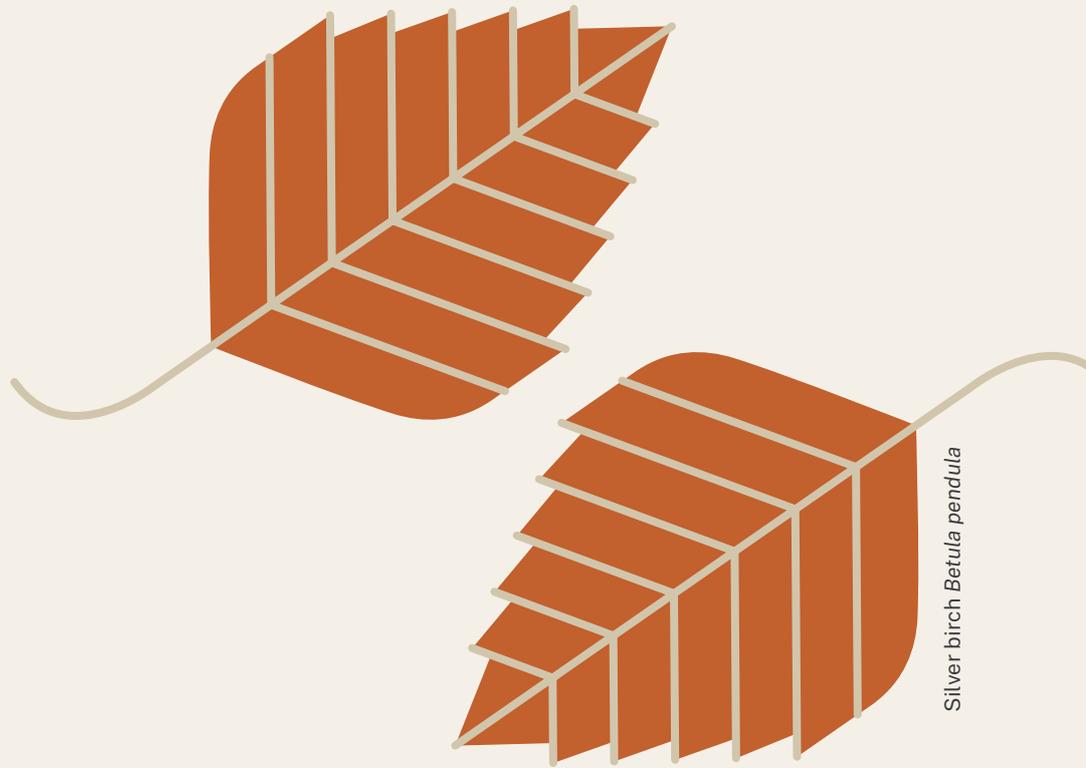
On a personal note, I would like to thank the organisations and individuals involved in the development of this strategy for their commitment, passion, knowledge and expertise, without which my job would have been much harder.

Liz Ballard

Chair, Sheffield Street Tree Strategy Development Group

Introduction

Why street trees are important

Sheffield's trees and woodlands are one of the city's greatest natural assets and contribute to its reputation as one of the greenest cities in the UK. They provide benefits for the people of Sheffield, as well as making urban areas and local neighbourhoods attractive and healthy places to live and work. Trees are a valuable asset and there is strong and growing evidence that exposure to them increases physical and mental health wellbeing[1], as well as supporting the ecology and biodiversity of the city.

Street trees are a crucial part of the city's urban forest and provide numerous benefits including shade and shelter, introducing nature to otherwise barren areas, helping to clean the air and reduce the risk of flooding. Street trees form an important and much loved part of the city's tree stock that we want to improve, maintain and sustain for future generations to enjoy.

Opportunities and challenges of managing street trees

Street trees live a tough life and they need to be able to cope with drought, compacted soils, road salt and traffic pollution. The choice of street tree species needs to be appropriate for them to thrive in their environment: close to houses, roads and people. Sheffield already benefits from a relatively high diversity of street tree species, with 187 identified. This strategy addresses how we can continue to increase street tree diversity to help increase the overall resilience of the street tree stock. In addition, we need to identify trees that can grow to reach an optimum canopy size to contribute the most benefits to the surrounding urban communities.

Street trees are managed somewhat differently from woodland trees. Their value needs to be balanced against the reality that they need to be managed for safety. For example, street trees that are diseased or dying need to be removed if they create a hazard for people, property and other street infrastructure.

In Sheffield, the Council acts as the local highway authority. Its duty to maintain the city's highways is delivered through the Streets Ahead citywide highways maintenance contract between the Council and Amey. The Council needs to make sure that the city's roads and pavements are safe and accessible for all members of the public, and that people and property are protected from the dangers of any hazards on the roads or pavements. Street tree management and maintenance form part of the routine programme of the highway maintenance work alongside gritting and snow clearance, street sweeping and litter collection, gully cleaning and grass cutting.
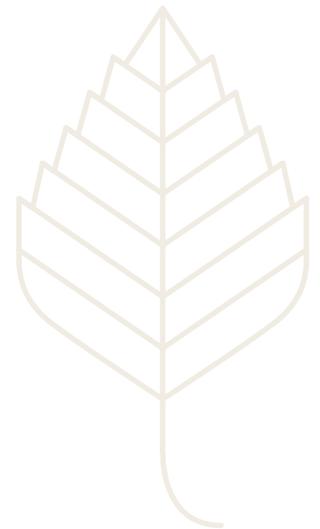
[1] Astell-Burt, T. & Feng, X. (2019) Association of urban green space with mental health and general health among adults in Australia. JAMA Network Open. 2019;2(7):e198209. doi:10.1001/jamanetworkopen.2019.8209

Rouquette, J.R. and Holt, A.R. (2017). The benefits to people of trees outside woods (TOWs). Report for the Woodland Trust. Natural Capital Solutions.

O'Brien, L., Williams, K. & Stewart, A. (2010) Urban health and health inequalities and the role of urban forestry in Britain: A review. Forest Research.

Van den Berg, A.E., Koole S.L., and van der Wulp N.Y. 2003. Environmental preferences and restoration: (how) are they related? Journal of Environmental Psychology 23, 135-146.

Amey Streets Ahead has contractual responsibility for all trees located within the boundary of the Sheffield adopted highway network. This is a 'wall to wall', all-encompassing responsibility for trees on the highway, whether they are the formally designed planting schemes in the City Centre, the Victorian tree lined suburbs or on one of the many rural roads that lie within the Peak District National Park. Any tree within the highway is managed by and is the responsibility of Amey until 2037 under the Streets Ahead contract. In addition, Amey have responsibility for trees on Other Designated Land (public land considered near to or part of the network) but only from a safety perspective.

When the Streets Ahead contract commenced in August 2012, Amey began recording and inspecting Sheffield's highway trees. This was the first systematic inspection of the highway tree estate since a survey in 2006-07 which had recorded 35,038 individual highway trees. It was known that this was not exhaustive; there were many trees in shelterbelts, cluster and woodlands which were not recorded and it seems that in time '36,000' trees became a shorthand for the highway tree stock as a whole.

The highway network itself is subject to continual change. Roads are added, removed or subject to change through design; trees have died, fallen, been removed and replaced, and additional planting has added trees in some areas.

Therefore, at the time of writing (December 2019) there are 35,259 individual street trees on the highway network for which Amey Streets Ahead has responsibility. This excludes any woodland, tree clusters or trees along the rural network, which whilst not plotted are all the responsibility of Amey until contract conclusion in 2037.

Removing diseased trees from the roadside

Credit: Christine King
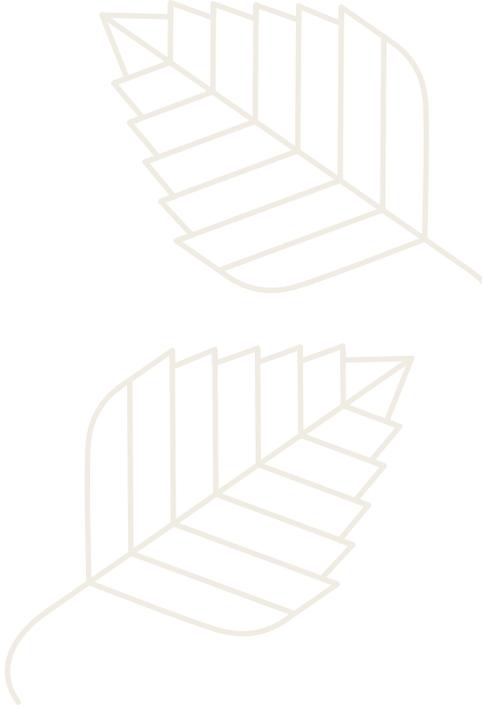
Why is there a need for a new Street Tree Strategy?

At the start of the Streets Ahead contract in 2012, a five year tree management strategy was produced setting out Amey's approach to delivering the street tree management element of the highway maintenance service. This document was published, reviewed each year and updated accordingly. The last five year tree management strategy published was for 2018-2023. No further updates of this document have been published while the new approach to street tree management has been in discussion and development with partners.

Over the last seven years there has been high profile public interest in Sheffield's street trees. A number of the city's residents formed local action groups to protest against the approach to felling and replacing street trees as part of the Streets Ahead contract.

In 2018, Amey, Sheffield City Council and Sheffield Tree Action Groups (STAG) came together through a series of mediated talks to explore and understand the different positions and find a way forward. This started to rebuild trust and confidence and provided a new starting point for the next phase of work. As a result of these talks, a Joint Position Statement was agreed and published in December 2018[2].
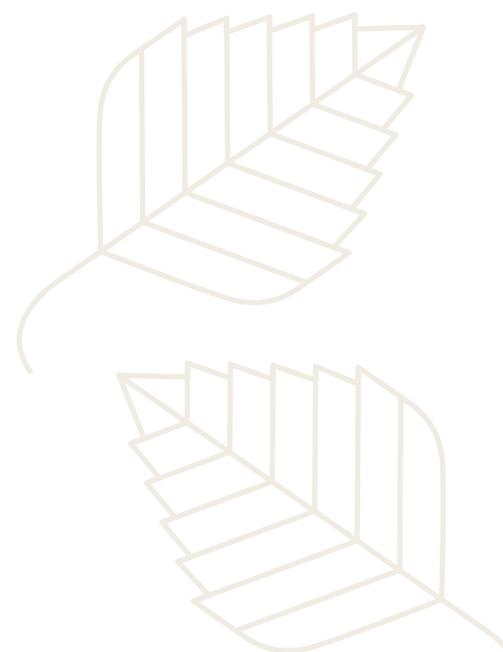
Work began in January 2019 on an approach to assess and retain many of the street trees previously threatened with removal. This was made possible through the efforts of the street tree campaigners, the willingness by Amey to fund additional works outside the contract, and the Council temporarily suspending some elements of the contract without affecting the long term aims of Streets Ahead. Joint inspection work involving Amey, STAG representatives and the Council was carried out during the summer of 2019. A review of lessons learned[3] from the early joint inspections was published in December 2019 and this shaped the inspections that restarted in January 2020.

The approach set out in this strategy is rooted in retaining street trees where possible by using a flexible combination of highway engineering solutions, enhanced monitoring and maintenance of street trees and decisions on the removal and replacement of trees made on a case-by-case basis. This, along with appropriate tree species selection, should enable street trees to be safely retained for longer while still delivering the long-term benefits from the investment in the city's highway network.

[2] https://www.sheffield.gov.uk/content/dam/sheffield/docs/roads-and-pavements/managingtrees/Joint%20position%20statement%20SCC%20Amey%20&%20STAG%20updated.pdf

[3] https://www.sheffield.gov.uk/content/dam/sheffield/docs/roads-and-pavements/managingtrees/Review%20of%20Tree%20Investigations%20Lessons%20Learned%20and%20Actions.pdf

Inspiring future generations to care for our urban forest

Partnership approach to developing the Sheffield Street Tree Working Strategy

This Sheffield Street Tree Strategy has been developed through true partnership, discussion and dialogue. It is based on a review of current street tree management practices and an independent assessment of Sheffield's street trees in terms of the benefits, or 'ecosystem services', that these trees provide to people living in urban areas. It supplements the Sheffield Trees and Woodlands Strategy 2018-2033 published in December 2018[4].

A partnership group to develop the new street tree strategy was established in August 2019. The terms of reference for the group are attached as **Appendix 1**. Membership of the group includes representatives from Amey, Sheffield City Council, STAG, The Woodland Trust, tree valuation experts, and a tree officer from a neighbouring local authority. The group is chaired independently by the Chief Executive of Sheffield and Rotherham Wildlife Trust.

The group has developed the high level vision and outcomes for the management of Sheffield's street trees as well as considering the value of street trees, the decision process for street tree management and species selection, and community involvement.

The Sheffield Street Tree Partnership Working Strategy recommends a number of actions to achieve each of the high-level outcomes as well as a proposal for an ongoing Sheffield Street Tree Partnership to drive delivery of these actions and keep the strategy under review.

RESIDENTS TO HAVE SAY ON CITY'S TREES
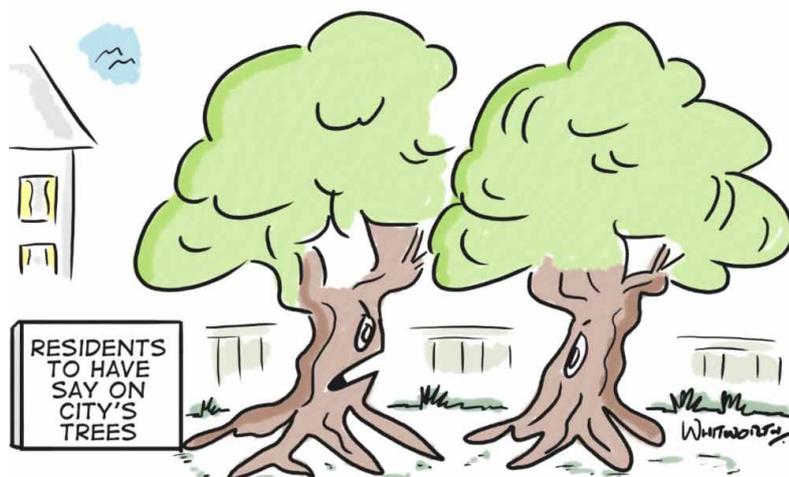
"I'VE LIVED HERE FOR OVER A HUNDRED YEARS AND NO ONE'S EVER ASKED ME FOR MY OPINION."

www.whitworthcartoons.com
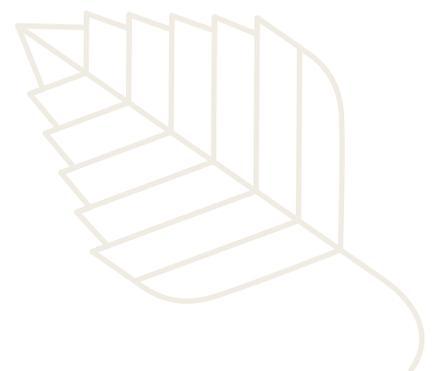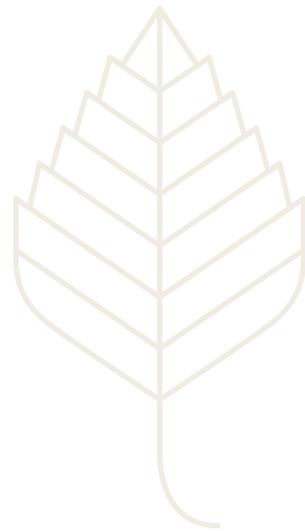
The Benefits of Trees

Rowan *Sorbus aucuparia*

The Benefits of Trees

Treeconomics

- Bio-diversity and habitat
- Carbon storage
- Reduced stress
- Health and wellbeing benefits
- Social cohesion
- Sense of place
- Cultural links to the past
- Food
- Winter windbreak
- Oxygen production
- Timber Fuel and building materials
- Encourages outdoor recreation
- Improved concentration and productivity
- Reduced heating costs
- Reduced air-conditioning costs
- Evaporative cooling in hot weather
- Air quality Pollution filtration
- Traffic calming and journey quality
- Attractive high streets Increase in consumer spending and restaurant patronage
- Increased property value and rental value
- Improved recovery times from illness
- Stormwater attenuation
- Noise reduction
- Summer shade
- UV protection
- Reduced surface flooding
- Soil infiltration
- Soil conservation

Vision

We want to see:

A network of street trees that Sheffield can be proud of: well-maintained and cared for; resistant to the threats of disease and climate change; and delivering many benefits for people and our environment. These benefits include:

— Supporting our wildlife

— Enhancing our city

— Cleaning the air that we breathe

— Improving our health and wellbeing

— Helping to reduce our carbon emissions

— Helping combat the effects of climate change such as flash floods and rising temperatures.

In support of the Sheffield City Council Trees and Woodlands Strategy 2018-2033, we will promote and enhance Sheffield's street trees and their long-term benefits for the public, wildlife and the wider environment by:

1. Sustainably and carefully managing our street trees in accordance with best practice.

2. Ensuring our street trees are more resilient through the type and age of trees we plant and also how we manage the current street tree stock.

3. Increasing the value and benefits that flow from our street trees.

4. Contributing to a more equal distribution of urban forest across the city to promote health and wellbeing.

5. Increasing street tree canopy cover.

6. Involving the wider community in caring for and valuing street trees.

In the following sections each of the above six bullet points is developed further into an Outcome – the impact we want to see in the future. Each Outcome has measures so that we know what our starting point, or baseline, is as well as our longer term aim. There are action tables to help us move towards our Outcome.

In some Outcome sections, the action tables have both development actions and delivery actions. The development actions are areas that the Strategy Development Group were unable to fully complete within the timescale for producing the Working Strategy and still need to be taken forward in order to establish a baseline. Delivery actions are those that the group recommend in order to implement the strategy and achieve the Outcomes.
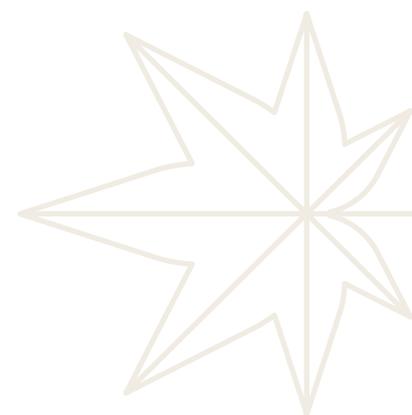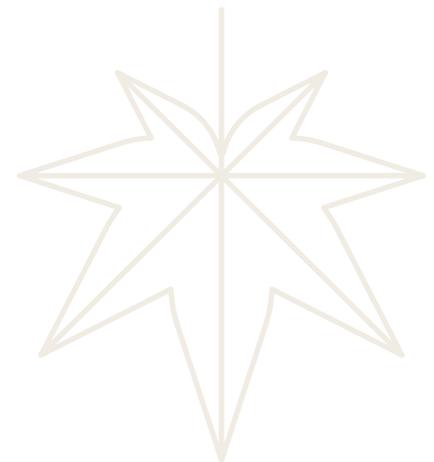
Outcomes, Measures, Actions and Resources
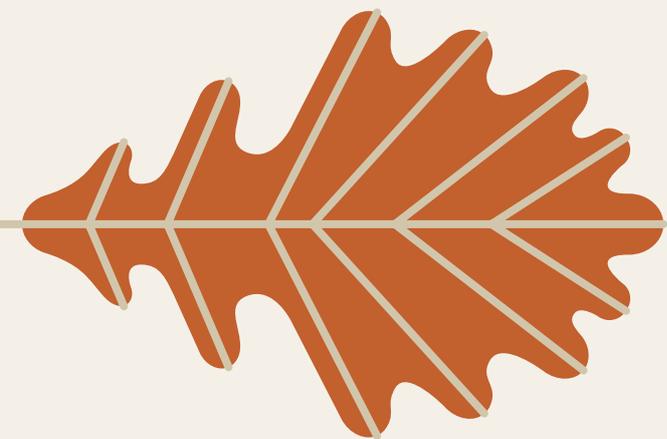
English Oak *Quercus robur*

OUTCOME 1

Our street trees are sustainably and carefully managed in accordance with best practice

We want to ensure that our street trees are looked after as valuable assets for the city. As part of this approach to management, we focused on the need for transparency in decision making and community consultation in the process. This allows local people the opportunity to understand and if necessary challenge a tree management decision through a clear and open process.

In relation to tree management, Amey currently work to industry standards and contract requirements as summarised in **Appendix 9**. However, there is no independent assessment of compliance to this standard. There is also no requirement to undertake any stakeholder consultation. Both of these issues mean there is a lack of transparency about how our street trees are being managed that can lead to conflict and misunderstanding on all sides.

We agreed that independent accreditation would be a good step forward in ensuring transparency and quality of tree management. There are a number of schemes we are exploring including developing an accreditation scheme that is bespoke for Sheffield, and the 'Trees Outside Forests'[5] international independent certification scheme under development by the Programme for Endorsement of Forest Certification (PEFC)[6].

[5] https://www.pefc.org/what-we-do/our-collective-impact/our-projects/exploring-certification-solutions-for-trees-outside-forests

[6] http://ukwas.org.uk/

Modifying kerbs can help retain valuable trees

Credit: Christine King

How will we know our street trees are sustainably and carefully managed in accordance with best practice?

The management of Sheffield's Street Trees will meet best practice when independently assessed against internationally recognised criteria.

Baseline Figures

We do not currently have a baseline to work from until the first independent assessment has taken place.

So what are we going to do?

Development Actions	How will this help?	Who?	By when?	Resources
Work towards developing an independent accreditation of street trees	Offers a structured approach to assessing compliance with best practice verified by an independent third party	PEFC STAG Amey SCC		Annual fee estimated <£500 (SCC)
Promote and have oversight of the city's approach to street tree management **Please refer to Appendix 5 for Management of Sheffield's Street Trees**	Provides transparency about what the Council and Amey will and won't do when managing trees	SCC, Amey, STAG, SRWT, WdT, other partners	July 2020	
Review, refine and publish decision making process for managing Sheffield's street trees **Please refer to Appendix 5 for Management of Sheffield's Street Trees**	Provides transparency of the decision making process adopted by the Council and Amey for the management of street trees	SCC, Amey	July 2020	
Updated contract methods statements and management documents	To ensure Streets Ahead practice is in line with the working strategy	Amey	Latter part of 2020	

Credit: Christine King

Mature trees provide valuable shade that will help cool our cities in future

OUTCOME 2

Our street trees are more resilient through the type and age of trees we plant and how we manage the current street tree stock

If we want our street trees to be more resilient to climate change, threats from pests and diseases etc then we need:

— Existing trees to be in the best possible condition.

— A good age profile of trees across all the street tree stock including leaving deadwood for its biodiversity value where safe to do so.

— Diversity of tree species, including species that can thrive in future climates.

We agreed that we must work towards the protection and retention of the existing tree stock we have alongside additional planting to improve the age profile and diversity.

How will we know our street trees are more resilient?

There will be an increasing trend over five year intervals in:

— Tree condition scores moving increasingly up the scale from poor to fair to good.

— Tree valuation scores (quality) moving increasingly from low to moderate to high quality.

— Improving tree age profile (yet to be defined).

Diversity of tree types moving towards a profile of 10% 20% 30%[7] by:

— Reducing the reliance on Rosaceae family down from 38% to below 30%.

— Maintaining the current profile of <20% of any single genera.

— Reducing the reliance on species choices from Acer pseudoplatanus (11%), Tilia europaea (9%) whilst managing the reduction in Fraxinus excelsior (7%) resulting from Ash dieback.

— Reduce the percentage of cultivars planted each year from the current level of above 70% to reflect the 10:20:30 rule.

[7] https://pdfs.semanticscholar.org/26a2/4c5361ce6d6e618a9fa307c4a34a3169e309.pdf - A broader diversity of trees is needed in our urban landscapes to guard against the possibility of large-scale devastation by both native and introduced insect and disease pests. Urban foresters and municipal arborists should use the following guidelines for tree diversity within their areas of jurisdiction: (1) plant no more than 10% of any species, (2) no more than 20% of any genus, and (3) no more than 30% of any family. Strips or blocks of uniformity (species, cultivars, or clones of proven adaptability) should be scattered throughout the city to achieve spatial as well as biological diversity.

Baseline Figures

Please see further more detailed information and charts in **Appendix 3
Baseline Analysis of the Current Sheffield Street Tree Stock**.

Measure	Baseline (August 2019)
Tree condition	Good (15%), Fair (69%), Poor (7%), Senescent (0%) and Not available (8%)
Tree valuation (quality)	High CAT A (2%), Moderate CAT B (47%), Low CAT C (48%) Unable to remain CAT U (1%)
Age classification	New (16%), Young (9%), Semi-mature (17%), Early mature (20%), Mature (38%) 62% of the tree stock are maturing trees but not yet mature
Diversity of tree type	Family: Rosaceae (38%) Genera: Acer (15%), Prunus (17%), Tilia (12%) Species: Acer pseudoplatanus (11%), Tilia europaea (9%), Fraxinus excelsior (7%) Percentage cultivars planted in 2018 = 405 trees out of 559 = 72%

Credit: Geoff Cookmartin
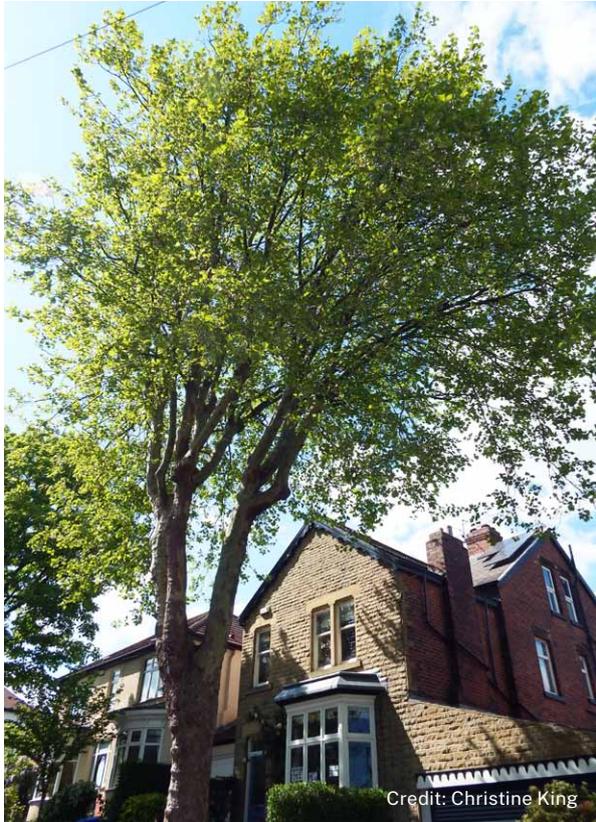
Credit: Christine King

A good start leads to a long life

So what are we going to do?

Development Actions	How will this help?	Who?	By when?	Resources
Annual review of all measures	So that we can monitor progress	Amey Partners	Yearly	Amey to undertake review
Cyclical tree inspection of at least once every 3-5 years – with inspection frequency increasing with worsening condition and risk to record: Age, condition, size, form, risk, presence of wildlife, special feature e.g. rarity, cultural value	To monitor condition, diversity, age, quality etc and inform priorities for tree works	Amey	Ongoing	Amey to undertake inspections with reference to the local community and other stakeholders for input on cultural value
Review the current age profile and consider approaches to increase resilience	To develop proposal for how to improve resilience and age diversity	Partners	2020-21	Partner time, some additional resource for analysis may be needed
Through species selection process for replacements **NB:** Please refer to **species selection process in Appendix 2** and **indication of relative benefits provided by different tree species Appendix 7**	To improve the tree species diversity over time	Amey	Ongoing	Tree Design Advisory Guide[8]
Through species selection process for additional planting **NB:** Please refer to **species selection process in Appendix 2** and **indication of relative benefits provided by different tree species Appendix 7**	To improve the tree species diversity over time	Amey	Ongoing	Amey time
Monitor and report the planting of cultivars on the network with the aim of minimising their use	Cultivars lack the natural genetic diversity that can confer resistance to pathogens, e.g. small percentage of Fraxinus trees thought to be naturally resistant to Ash dieback	Amey	Ongoing	Amey time

[8]Tree Species Selection for Green Infrastructure: A Guide for Specifiers
http://www.tdag.org.uk/species-selection-for-green-infrastructure.html

Increasing canopy cover particularly in the uplands can reduce the risk of flash flooding

OUTCOME 3

Increase the value and benefits that flow from our street trees

As illustrated so well in the 'Benefits of Trees' image found on page 12 (credit Treeconomics), our urban trees provide many benefits. As part of the strategy development, we considered all the benefits trees provide including:

— Improved air quality by removing pollutants from the air

— Storing and taking up carbon

— Reduced surface flooding

— Providing habitats for biodiversity e.g. a range of birds, insects, and other species

— Providing timber for fuel and building material

— Increased oxygen production

— Improved health and wellbeing and reduced stress

— More attractive streets and neighbourhoods

— Encouragement of outdoor recreation

— Noise reduction, summer shade and UV protection

— Food

— Increased property and rental values.

We decided to focus on the key benefits below as we felt they were particularly relevant to street trees[9] because:

— It is well documented that street trees have a particularly important role to play in improving the visual attractiveness of a street.

— Street trees have a specific and positive impact on air quality because they are so near to a major source of air pollution ie traffic fumes[10].

— Storm water alleviation (slowing down rain water) is critical in helping to keep the city moving in time of high rainfall and flood.

The one exception to this approach is the measure for carbon take up and storage. This is a benefit of trees, not just street trees. However, due to the climate emergency it was agreed that we should look at every opportunity to help reduce our carbon emissions.

[9] https://www.forestresearch.gov.uk/tools-and-resources/urban-tree-manual/
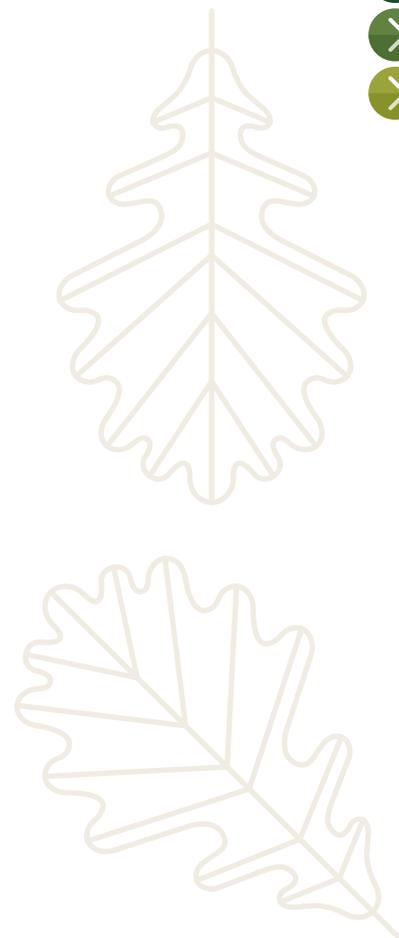
[10] Role of trees & other green infrastructure in urban air quality, Inst. of Environmental Science magazine, 2019: https://www.the-ies.org/analysis/role-trees-other-green

https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/using-green-infrastructure-protect-people-air-pollution

How will we know we are increasing the value and benefits that flow from our street trees?

There will be an increasing trend averaged over five years across the following indicators:

a) Capital Asset Valuation of Amenity Trees (CAVAT) – please refer to the Sheffield Street Tree Strategy Development Group Report 'i-tree eco stratified inventory report' by Treeconomics for an explanation of CAVAT.

b) Tonnes per year of air pollution removal (ozone, carbon monoxide, nitrogen dioxide, sulphur dioxide and particulates by street trees and financial value of this service).

c) Tonnes per year of carbon stored and sequestered by street trees and financial value of this service.

d) Cubic metres per year of storm water alleviation by street trees and financial value of this service.

Baseline Figures

To estimate the benefits and values that flow from Sheffield's current stock of street trees in 2019, the Group commissioned Treeconomics to undertake an i-Tree Eco Inventory Report. This report was based on the street tree management database used by Amey.

The Sheffield street tree inventory contains 35,274 records. For each tree the data collected includes tree species, diameter at breast height (dbh), tree height, tree condition and tree location.

Of this data set, Treeconomics removed 166 records due to insufficient data for species or diameter at breast height (dbh). Therefore the analysis drew on data from 35,108 trees.

The table below presents the headline figures from the Treeconomics report, with some additional analysis (see '*Methodology' below the table) by Natural Capital Solutions. The benefits of street trees are expressed as a monetary value. For more details on the data, assumptions and the process used, please refer to the Sheffield Street Tree Strategy Development Group Report '**i-Tree Eco stratified Inventory Report**' by Treeconomics.

Ecosystem service	Level of service provided each year (Annual physical flows)	Value of service provided each year (Annual monetary flows)	Present financial value*
Capital Asset Valuation of Amenity Trees (CAVAT)			£340,746,149
Tonnes per year of air pollution removal (ozone, carbon monoxide, nitrogen dioxide, sulphur dioxide and particulates by street trees) and financial value of this service	3.0 tonnes	£39,198	£1,175,641
Tonnes per year of carbon sequestered (taken up) by street trees and financial value of this service	302 tonnes	£74,246	£6,049,720
Cubic metres per year of storm water alleviation by street trees and financial value of this service	10,415m	£18,039	£541,032
Total		**£131,483**	**£7,766,393**

	Natural capital stock (2019)	Total value (£2019 prices)	
Tonnes of carbon currently stored by street trees and financial value of this service	12,313 tonnes	£3,025,104	

*Methodology

The CAVAT amenity value is calculated over 80 years, so we have estimated the present value for air pollution regulation, carbon sequestration, and storm water alleviation in 2019 prices over 80 years. This ensures that there is some comparability between these values, although it is not clear from the literature if the CAVAT value is equivalent to a present value.

The present value was calculated for the total monetary flow value across all pollutants due to time constraints. The HM Treasury Green Book (2019) discount rate of 3.5% was used, and the price was assumed constant over the 80-year period. This gives an indication of the present value. Ideally this would have been done for each pollutant individually and using the Defra air quality damage cost guidance (2019) 2% damage cost uplift per year. As a result the actual present value over 80 years is likely to be much higher.

The present value of the ability of the street trees to sequester carbon into the future was calculated by using the Government's non-traded central carbon price estimates (DBEIS 2019) (that had been used to calculate the monetary flow in 2019) for each following year for the next 80 years, and using the discount rate suggested in HM Treasury Green Book (2019) discount rate of 3.5%.

The storm water alleviation present value was also calculated over 80 years using the HM Treasury Green Book (2019) discount rate of 3.5%, and assuming a constant price.

So what are we going to do?

Development Actions	How will this help?	Who?	By when?	Resources
I-Tree Eco recalculated in spring every year and reported as a five year moving average	So that we can monitor progress	Amey	Yearly	£1,500 per year (estimated)
Training of Streets Ahead staff to use species selection toolkit Please refer to **Appendix 2**	To ensure the toolkit is used and applied consistently	Amey	Yearly	Amey time
Undertake equivalent planting in advance of felling mature trees	So that we can continue to increase benefits even as large trees are replaced	Amey	Ongoing	Time to find locations Cost of planting
Under plant trees with hedges in appropriate locations	To increase the amount of benefits within any given space	Amey	Ongoing	Amey time to find locations Cost of planting
Improve the data for the 166 street tree records lacking dbh and species information and so not included in the Treeconomics analysis	Collecting more data will Improve the accuracy and our understanding of the amenity value of our street trees	Amey	2020	Amey time
Increasing the tree condition dataset for street trees from 17% by training and co-ordinating volunteers and Amey staff to undertake surveys	The baseline measure for CAVAT is an estimate. Collecting more data will Improve the accuracy and our understanding of the amenity value of our street trees	Amey Partners	Yearly	Volunteer time (tree wardens - see **Outcome 6** and **Appendix 6**) Survey co-ordination
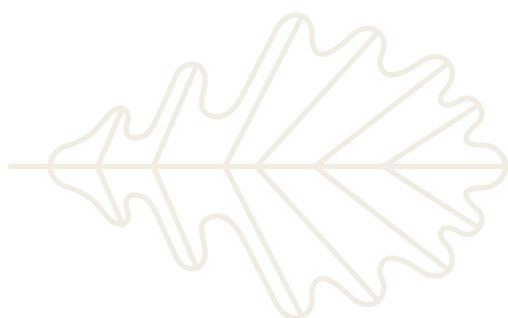
Planting new trees provides succession and continuity to the urban forest

OUTCOME 4

Contribute to a more equal distribution of urban forest across the city to promote health and wellbeing

There is growing evidence to support the health and wellbeing benefits of being in close proximity to trees including reducing stress and improving the physical, mental and spiritual wellbeing of individuals and communities. Trees also have an important role to play in improving air quality. The city's street trees remove three tonnes of air-borne pollutants each year including fine particles[11] (particulate matter less than 2.5 microns also known as $PM_{2.5}$) which can affect a person's lungs and heart. Leaf area is an important measure for the contribution trees make to improving air quality as the larger the canopy, the greater the amount of air pollution that can be captured in the canopy of the tree.

Across Sheffield, there are disparities in the leaf area of street trees measured in each ward. Stannington has the largest leaf area at over 912,000m² followed by Firth Park with over 479,000m² and Fulwood with nearly 436,000m². East Ecclesfield, Walkley, Birley, Park and Arbourthorne and Broomhill and Sharrow Vale have the smallest leaf areas. Unsurprisingly, the total air-borne pollution removal is lower in these wards than other parts of the city with larger leaf areas.

To understand where existing or new street trees could have the most impact in terms of promoting health and wellbeing, we need to better understand the relationship between the presence of trees, in particular trees with larger leaf areas, and health outcomes of people living in different parts of the city. This could help us to pinpoint areas where it would be beneficial to maintain leaf area or to introduce new planting. The choice of species is also important as this affects the level of air-borne pollutants a tree can hold in its canopy.

How will we know we are contributing to a more equal distribution of urban forest across the city to promote health and wellbeing ?

A greater number of new street trees will have been planted in areas of lower canopy cover across the city that also have poorer air quality and Indices of Multiple Deprivation (IMD) ranking (baseline 2019).

[11] i-Tree Eco Stratified Inventory Report, Treeconomics, November 2019

Baseline Figures

Natural Capital Solutions reviewed canopy cover against indices of multiple deprivation and air quality data across the city (see **Appendix 8**) and the following are the top five wards with the lowest IMD respective to low street tree canopy cover (% canopy cover is the percentage of the total network covered in that ward) and higher air pollution ($PM_{2.5}$):

1. Manor Castle – deprivation rank 4/28, canopy cover 4%, average $PM_{2.5}$ 7.17 ug/m3

2. Darnall - deprivation rank 6/28, 3% canopy cover, average $PM_{2.5}$ 7.99 ug/m3 (the highest level of pollution across all 28 wards)

3. Woodhouse - deprivation rank 1028, 4% canopy cover, average $PM_{2.5}$ 7.62 ug/m3

4. Richmond - deprivation rank 11/28, 4% canopy cover, average $PM_{2.5}$ 7.35 ug/m3

5. Walkley - deprivation rank 13/28, 2% canopy cover, average $PM_{2.5}$ 7.22 ug/m3.

Overall the trend is not necessarily that more deprived wards have the lowest canopy cover. The most deprived ward (Firth Park) has the highest canopy cover of all wards in Sheffield (19%).

Taken together it seems that the most affluent wards do have a consistently high canopy cover (see below). However, the most deprived, the above and below average wards for deprivation all have similar mean canopy covers. The areas with average deprivation have a lower canopy cover than the most deprived wards of Sheffield.

— Most deprived wards: mean = 6%, canopy area - 277,030m^2.

— Wards with above average deprivation: mean = 7%, canopy area - 226,396m^2.

— Wards with average deprivation: mean = 5%, canopy area 188,302m^2.

— Wards with below average deprivation: mean = 8%, canopy area 383,893m^2.

— Affluent wards (Ecclesall, Dore and Totley, Crookes, Fulwood): mean of 12%, canopy area - 462,333m^2.

Further analysis is needed.

So what are we going to do?

Development Actions	How will this help?	Who?	By when?	Resources
Analyse the contribution of street trees AND other trees and woodlands across the city to further refine the main opportunities for trees to contribute in promoting health and wellbeing	To better understand the relationship between canopy cover in the city and air quality and the potential for targeted planting	Partnership	2020-21	Partners' time, some additional resource may be needed
Target additional planting in areas of low canopy cover and higher IMD ranking, including through community funded planting – see **Appendix 8**	So that we can target planting where it can provide the most benefits	Amey, Partnership	Yearly	Partner's time, including Street Tree Wardens
Target additional planting in areas of high air pollution – see **Appendix 8**	So that we can target planting where it can provide the most benefits	Amey, Delivery Partnership	Yearly	Development action completed Cost of planting

The right tree can greatly enhance our built environment

Credit: Susan Unwin

OUTCOME 5

Increase street tree canopy cover

Tree cover in Sheffield is 18.4% overall, and 21.6% in the urban area[12]. Street trees form a small but important part of the whole tree canopy that covers the city. Canopy cover is an indication of whether the whole biomass of our street trees is increasing over time. More tree biomass generally equates to more benefits and value flowing from our street trees. In particular, this should benefit biodiversity, providing more habitats for bats, birds, insects and other wildlife.

We recognise that there might be variations in canopy cover from one year to the next depending on particular management issues that might arise. Therefore we intend to measure canopy cover averaged over a 5-year period. Our aim is to see an increasing trend in average canopy cover over a rolling 5-year period.

How will we know we are increasing street tree canopy cover?

There will be an increasing trend in average canopy cover over a 5-yearly rolling period using the i-Tree canopy calculations.

Baseline Figures

The current street tree canopy cover as a percentage of the total road network* is 7% (1,537,954m^2)

*The total network is the area of grass, paths and roads combined.

[12] Sheffield Trees and Woodlands Strategy 2018-2033, p9, Sheffield City Council, December 2018

So what are we going to do?

Development Actions	How will this help?	Who?	By when?	Resources
Calculate canopy cover annually in spring/early summer	We can extrapolate that street tree biomass is increasing over a period of years	Amey	May/June 2021 next calculation	Amey time
See **Outcome 3** and **Outcome 5** actions				

OUTCOME 6

The wider community is involved in caring for and valuing street trees

By involving more people, we hope to increase the resources (funds and time) available to care for our street trees. There is also an opportunity to improve our shared understanding of the benefits and challenges that come from managing street trees.

Better communication could help to ensure we work together across the city to improve our street trees and not repeat the mistakes of our past.

How will we know the wider community is involved in caring for and valuing street trees?

There will be more people actively and positively engaged with the Council, Amey and other partners to help look after and care for our street trees.

Baseline Figures

The following is not a complete list of current community engagement in tree planting and management but provides an indication of levels of activity:

— Sheffield City Council community tree scheme – Council Officers supporting tree planting projects at schools and with community projects across the city.

— STAG's involvement in tree inspections and making Amey aware of any maintenance or contract related issues, potentially exploring nurseries for local provenance.

— Sheffield and Rotherham Wildlife Trust have regular community volunteer days and conservation volunteers who helps look after trees and woodlands on their Nature Reserves and partner sites.

— Individuals and 'Friends of...' groups occasionally undertake tree planting.

So what are we going to do?

Development Actions	How will this help?	Who?	By when?	Resources
Establish a Sheffield Street Tree Partnership to take forward this Strategy Please refer to the draft Terms of Reference in **Appendix 4**	1. To deliver the Sheffield Street Tree Strategy 2. To work in partnership to contribute and secure skills, resources and funds to deliver the strategy 3. To develop and evolve the strategy over time in response to the needs of the people of Sheffield, the climate and ecological emergency	SCC, Amey, SRWT, WdT, others	May 2020	Partners' time
Promote the new process that allows residents and community groups to fund additional street tree planting	To provide additional tree planting	SCC, Amey, STAG, SRWT, WdT, other partners	March 2021 onwards	Partners time, social media, web pages
Develop a Street Tree Warden scheme (or similar) for Sheffield Please refer to **Appendix 6 proposal for a Sheffield Street Tree Warden scheme**	To provide a structured approach, as part of a national scheme, to engage local people in looking after street trees To develop opportunities for community groups and schools to engaging in tree planting and care.	SRWT, Amey, STAG	May 2020	Support from Amey to help with co-ordination and training

Credit: Celia
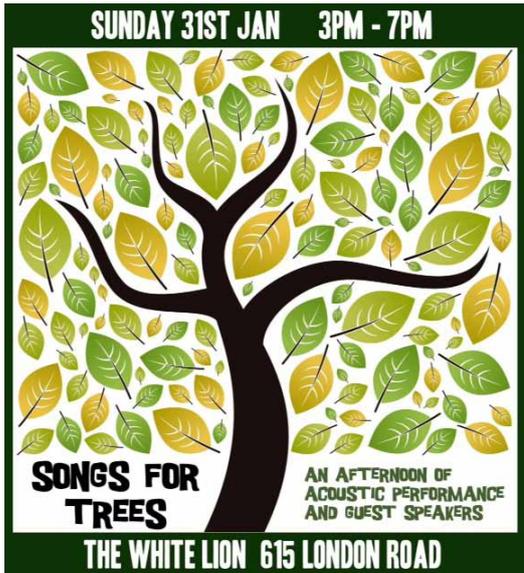
Credit: Sally Weston

Increasing awareness of the value of trees through community events

Credit: Dr Deepa Shetty, SORT (Save Our Roadside Trees)

Campaigners and experts promoting a green future
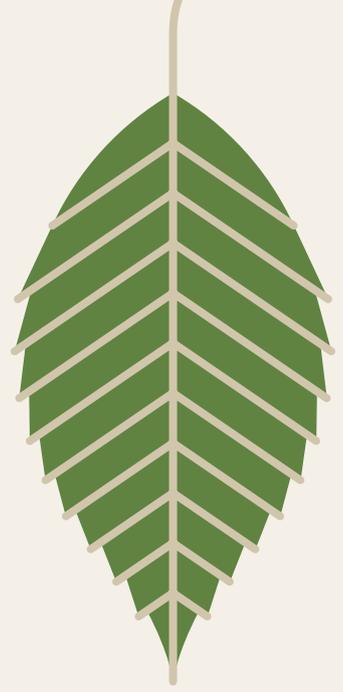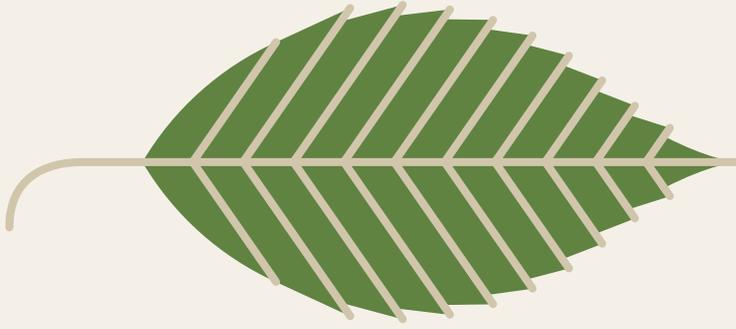
Going Forwards

Wild cherry *Prunus avium*

Going forwards

The Sheffield Street Tree Strategy Development Group set out to:

> Develop an exemplary Sheffield Street Tree Partnership Strategy that values street trees for the benefits they bring to people, the city and the wider environment.

The production of this Working Strategy, and its adoption by all partners involved in its development, is the result of the work undertaken by the group since August 2019. It completes this initial task.

Critically, the Working Strategy now needs the support and involvement of many more people and organisations than those on the Strategy Development Group. It also needs to be led by those partner organisations who can deliver the actions and take the Strategy forward in the longer term.

Therefore, two key next steps for this work are as follows:

1 From April 2020, establish a Sheffield Street Tree Partnership that will deliver and further develop this strategy.

— The proposed Membership and Terms of reference of this new Partnership are set out in **Appendix 4**.

2 From now until Spring 2021, the new Partnership will be seeking views, comments and commitment on the proposals set out here in order to refine and finalise this Working Strategy.

— Comments on the Working Strategy will be sought through:

— Online survey

— Survey sent to interested groups

— Sheffield Tree Celebration Event and Discussion Panel (November 2020)

— Comments and feedback will be collated and used by the new Sheffield Street Tree Partnership to inform, amend and finalise this Working Strategy.
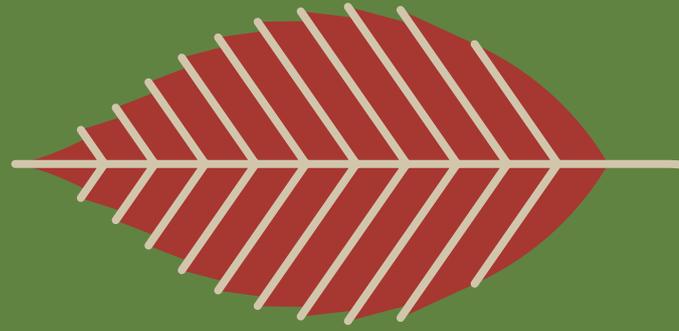
Appendices
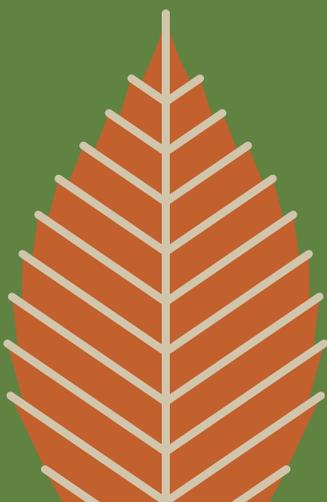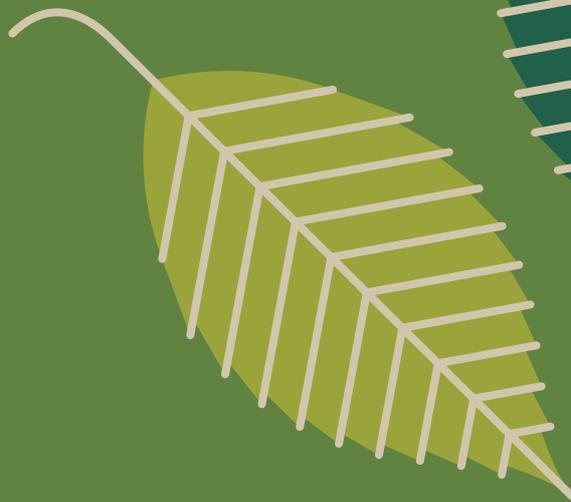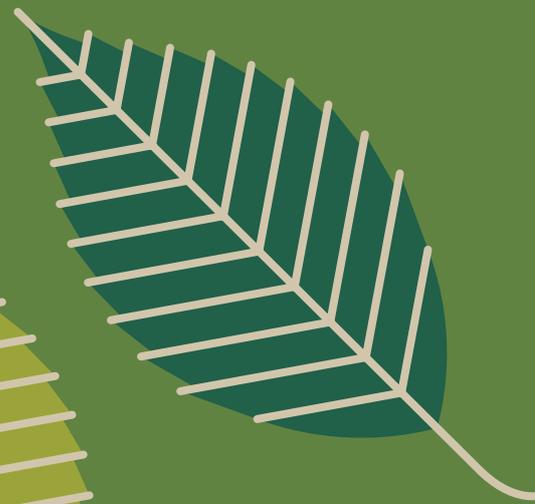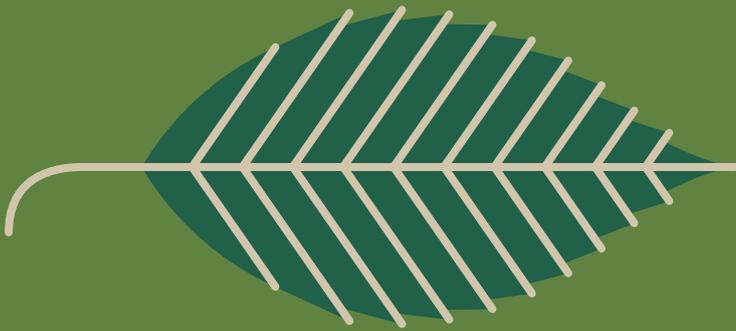
Appendix 1 - Sheffield Street Tree Strategy Development Group terms of reference

Developing a Partnership Sheffield City Street Tree Strategy Steering Group Terms of reference

Through the life of the project, the Steering Group will:

— Work to the agreed scope as set out in the *Developing Sheffield's Street Tree Strategy Project Set Up Sheet*

— Steer and guide the programme of development to ensure outputs and priorities are delivered on time as planned in the project set up

— Attend a majority of the Steering Group meetings, and deliver any agreed tasks or actions in a timely manner as requested

— Support and assist partners in carrying out their agreed tasks

— Offer time, skills, knowledge, networks and expertise to enable the efficient and effective development and delivery of the partnership's work

— Submit any relevant information, data or evidence in a timely manner to help support the process

— Champion the Street Tree Strategy as it develops, at a local, sub-regional and regional level, to ensure that maximum benefit is achieved for the people and environment of Sheffield

— Work together to resolve conflicts that may arise and to manage risks and realise opportunities

— Disclose any conflict of interest and maintain high professional standards and integrity at all times

— Raise any concerns and complaints about the process with the Chair in the first instance so as to provide an opportunity to reconcile issues within the Steering Group prior to any public statements

— Accept that when a consensus cannot be reached the Chair will make a decision that they believe to be in the best interest of the project aims

— Seek opportunities for additional funds and resources to the Strategy as it develops.

We recognise and support the role of the Chair, Liz Ballard, Sheffield and Rotherham Wildlife Trust, who will:

— Oversee the development and delivery of the Strategy

— Lead and co-ordinate the Steering Group, preparing the agenda and subjects to be worked on as set out in the scope

— Impartially and objectively direct the meetings, workshops etc, ensuring that all views are heard

— Foster consensus-based decision-making amongst the Steering Group wherever possible

— Promote a professional and respectful culture

— Ensure that Group members have the appropriate expertise to contribute effectively to the Group

— Summarise and confirm key decisions and actions, clarifying with individuals any allocated key tasks and the agreed timelines for completion

— Ensure that resources are used efficiently to further the development of the Strategy

— Ensure that any Strategy publicity is approved collectively by the Steering Group prior to release and signed off by the Chair.

Ways of working

— Attendance, should wherever possible, be in person. It is accepted that occasionally group members may be unable to attend in person and conference call facilities will be provided where practicable

— If the person who normally represents an organisation cannot attend, they should send their alternative in their place

— People will be free to respectfully express their personal and organisational views during group meetings and workshops

— Meetings may not be captured through detailed minutes but through decision and action notes, workshop papers etc, that will be circulated shortly after the meeting

— Sharing of Steering Group papers, discussions held and the work of the group beyond the immediate individuals involved must first be agreed with the Chair

— Group members identified by the Chair to have breached these terms of reference and ways of working will have their involvement reviewed. The Chair will be the decision-maker about continued membership of the group.
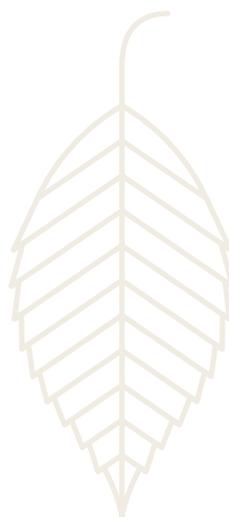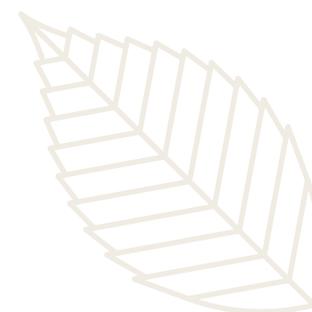
Each Steering Group Partner confirms their commitment to these Terms of Reference:

Organisation	Name	Signed
Sheffield and Rotherham Wildlife Trust (SRWT)	Liz Ballard (Chair)	
Amey	Darren Butt	
	Brian Stock	
Sheffield City Council (SCC)	Mick Crofts	
	Karen Ramsay	
STAG	Paul Selby	
	Deepa Shetty	
	Christine King	
The Woodland Trust	Joe Coles	
Independent Advisers	Dr Alison Holt	
	Glen Gorner	

Trees can have a positive impact on pollution, especially in areas of heavy traffic

Appendix 2: Draft guidance for selecting tree species in Sheffield

1. Should the replacement be placed elsewhere in the city, to meet our objective of equalising canopy cover across the city? Refer back to canopy cover targets etc.

2. If still planting in same location, are there any constraints preventing the use of the old tree pit? For example:

   a) Proximity to buildings, gardens, garden trees, other street trees, signs, street lights or junction sight lines

   b) Site conditions unfavourable (exposed, windy, dry, wet, waterlogged, shaded, compacted, busy footfall)

   c) Subsidence having led to previous tree being felled

3. Are there specific considerations on species selection? For example:

   a) Tree disease risk in that location/area

   b) Consideration relating to National Parks, Conservation Areas, Important Landscapes, Memorial Trees, Veteran Trees, Woodland

   c) Strong community preference

   d) Specific species selected by SCC or others

4. Can species diversity be increased, whilst meeting constraints of Step 3? If so, reduce species options list

5. Rank remaining species on the list according to their ability to deliver one or all of the following:

   a) Air quality improvements (especially in high air pollution streets)

   b) Carbon take up (sequestration)

   c) Storm water attenuation (if localised flooding is a problem)

   Please refer to table in **Appendix 7** Indication of Relative Benefits Provide by Different Tree Species

6. Do site conditions or location constraints cross a specific threshold to mean that only species on specific sub-lists can be used? (eg Fastigiate sub-list or Small Species sub-list). (Note: We will define those specific thresholds for site conditions and location constraints through further refinement on the decision-making framework)

7. Of the remaining trees on the list (or sub-list), pick the largest canopy, longest lived, and preferably native tree species, that can be sourced locally or in the UK wherever possible.

Appendix 3: Baseline analysis of the current Sheffield street tree stock (as at August 2019)

Tree condition scores and tree valuation scores (see below)

Tree condition	Tree valuation A, B, C, U

Current position, August 2019.

Categories used are: **Good**, **Fair**, **Poor**, **Senescent**, **Dead**, **Vandalised**.

These categories draw on the standard survey technique in the British Standard *5837 Trees in relation to design, demolition and construction*.

This describes the current condition profile or 'baseline'.

The majority of the highway trees are fair or 'OK', neither outstandingly good nor especially poor specimens.

- ■ Good **15%**
- □ Vandalised **0%**
- ■ Fair **69%**
- □ Senescent **0%**
- ■ Poor **7%**
- ■ Dead **1%**
- ■ Not available **8%**
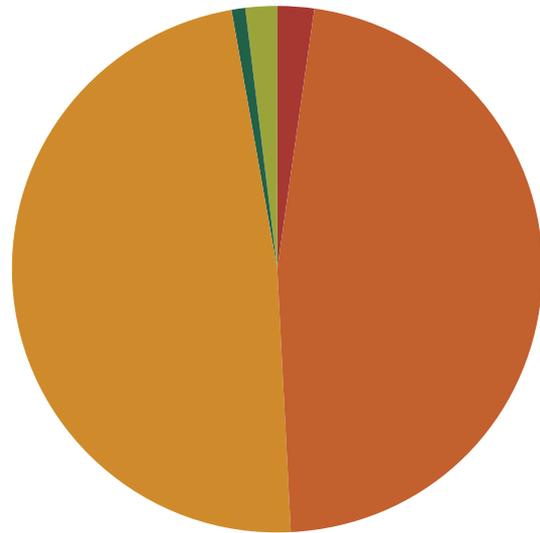
Current position, August 2019

Valuation categorised in line with British Standard *5837:2012 – Trees in relation to design, demolition and construction*.

Category A: High quality trees, at least 40 yrs remaining – 705 trees

Category B: Moderate quality trees, at least 20 yrs remaining - 16555

Category C: Low quality trees, at least 10 yrs remaining - 16908

Category U: Unable to realistically remain for more than 10 yrs - 352

- ■ Category A **2%**
- ■ Category B **47%**
- ■ Category C **48%**
- ■ Category U **1%**
- ■ Not available **2%**
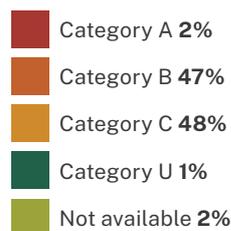
Age classification
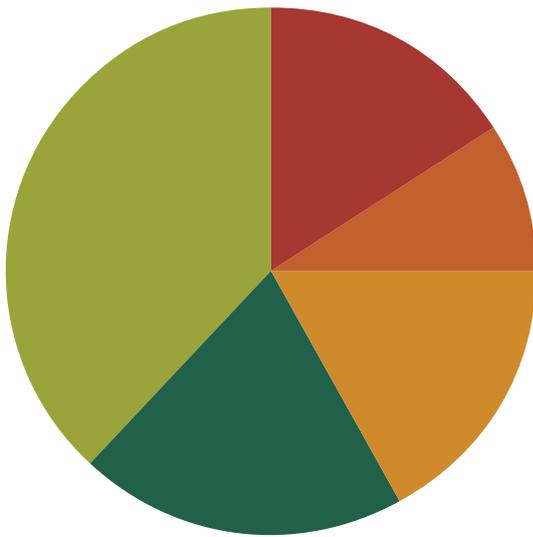
Current position, August 2019

Approximately two thirds of the tree stock are currently maturing trees (62%), i.e. not yet mature

New planting **16%**

Young **9%**

Semi mature **17%**

Early mature **20%**

Mature **38%**
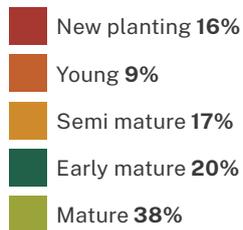
Street trees by family
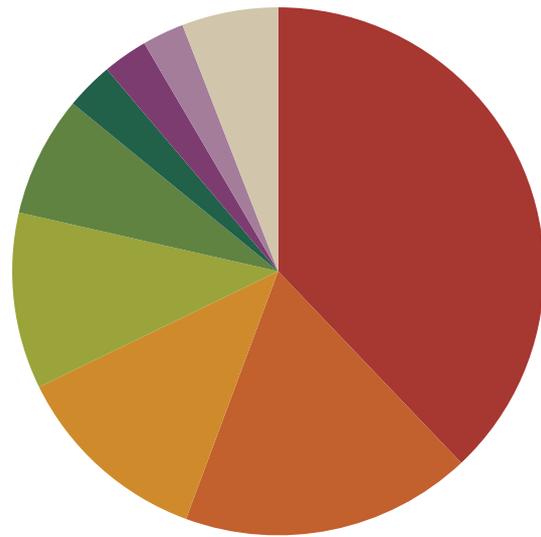
Current Species Diversity Position as of August 2019

If we refer to the 10% 20% 30% guide[13] when we select trees to plant (or the even higher ambition of 15-10-5) then:

Family – over 30%: Rosaceae are 38%

Four families (Rosaceae, Sapindaceae, Malvaceae and Fagaceae) make up 79% of all street trees.

Rosaceae

Sapindaceae

Malvaceae

Fagaceae

Oleaceae

Betulaceae

Platanaceae

Salicaceae

All others combined

[13] https://pdfs.semanticscholar.org/26a2/4c5361ce6d6e618a9fa307c4a34a3169e309.pdf - A broader diversity of trees is needed in our urban landscapes to guard against the possibility of large-scale devastation by both native and introduced insect and disease pests. Urban foresters and municipal arborists should use the following guidelines for tree diversity within their areas of jurisdiction: (1) plant no more than 10% of any species, (2) no more than 20% of any genus, and (3) no more than 30% of any family. Strips or blocks of uniformity (species, cultivars, or clones of proven adaptability) should be scattered throughout the city to achieve spatial as well as biological diversity

Top 10 tree genera
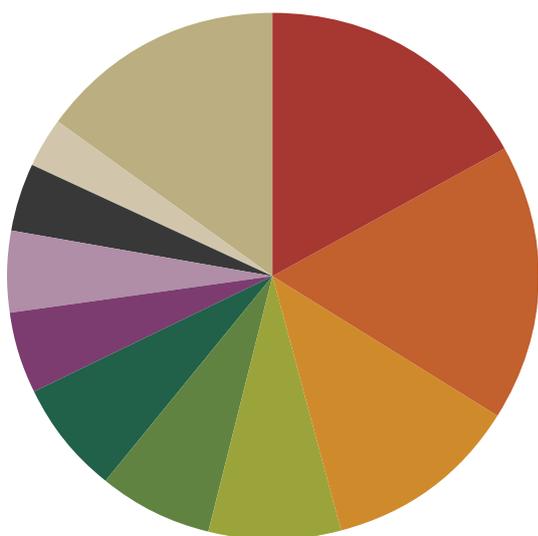
Genus – all below 20%: Prunus (17%), Acer (17%), Tilia (12%)

Top 10 Genera make up **85%** of all trees.

Top 5 Genera make up **61%** of all trees.

222 individual species or cultivars

59 different Genera

Species – one over 10%: Acer pseudoplatanus (11%), Tilia europaea (9%), Fraxinus excelsior (7%)

Therefore, we need to aim to:

— Reduce the reliance on the family Rosaceae

— Maintain approach to genera

— Reduce the reliance on species choices from Acer pseudoplatanus (11%), Tilia europaea (9%) whilst managing the reduction in Fraxinus excelsior (7%) resulting from Ash dieback.

■	Acer **17%**	■	Quercus **5%**
■	Prunus **17%**	■	Crataegus **5%**
■	Tilia **12%**	■	Betula **4%**
■	Sorbus **8%**	■	Platanus **3%**
■	Fraxinus **7%**	■	Other **15%**
■	Malus **7%**		
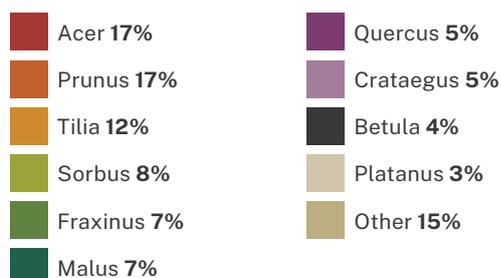
Appendix 4: Sheffield Street Tree Partnership draft terms of reference

Purpose

1. To deliver the Sheffield Street Tree Strategy

2. To work in partnership to contribute and secure skills, resources and funds to deliver the strategy

3. To develop and evolve the strategy over time in response to the needs of the people of Sheffield, the climate and ecological emergency

4. To encourage and direct donations with reference to this strategy – including funds for new tree planting and to support the retention of existing trees.

Membership and Representation

Any group or organisation that can positively contribute to the Street Tree Strategy can become a member of the partnership.

Groups and organisations may nominate one person to act as their key representative and to regularly attend meetings.

Group decisions will be achieved, wherever possible, by consensus. This will include decisions around membership and progression of the strategy. Where consensus cannot be achieved the Chair will consider a vote or hold the final decision making responsibility.

Founding members: Sheffield City Council, Amey, STAG and other local community groups, Sheffield and Rotherham Wildlife Trust, Woodland Trust

Expert advisers: Leeds City Council, Tree Officers Group

If the group membership becomes too unwieldy then these Terms of reference will be revised to support a Committee structure.

Leadership

The Partnership will elect a Chair each year who will set the agenda, direct and guide the work of the group. They will also represent the Partnership in a formal capacity when appropriate.

The Chair may respond to external queries on behalf of the partnership, and in doing so will make every attempt to consult with the wider group, if time allows.
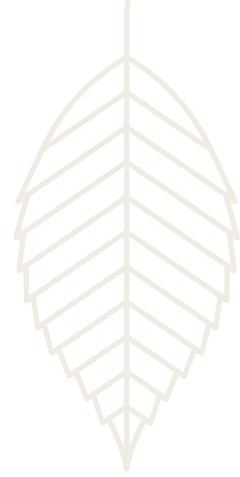
Community engagement is vital

Meetings

The Partnership will meet at least four times and there will be a wider stakeholder and general public event once a year.

Secretariat support will be provided by SCC.

Communications

Any press statements will be agreed in advance by the whole partnership.

Securing Resources

The Partnership will not be an independent body constituted in its own right at this time.

The Partnership will actively seek funds and resources to support delivery of the strategy. Funds will be held in a restricted account by the most appropriate organisation in relation to the grant funder e.g. SCC, SRWT, local residents group etc.

Any funds held on behalf of the partnership will be fully accounted for and must be distributed in accordance with the priorities of the Strategy as agreed by the Partnership and relevant funders.

Donations for additional street tree planting

To allow individual residents, community groups, and other interested stakeholders to pay for additional street trees to be planted, donations will be accepted by the partnership and held in a restricted account by SCC or SRWT (there is the added benefit of securing 'Gift Aid' for donations to charities as opposed to Local Authorities).

Through this strategy opportunities for additional planting will be identified and recommended to the Council by the Street Tree Partnership. Donations will be sought to support the delivery of these new planting schemes. New tree planting will include both tree planting adjacent to or near the highway ie in the pavement. Donations will be used to pay for a tree, the cost of a tree pit, any related engineering works required and ongoing establishment for a minimum of three years. A tree will not be planted unless all of these costs can be covered up front.

The costs will be calculated at cost by Amey and agreed with the Partnership before any works commence.

A system (web based) would be set up to manage the process of donations. This will set out the terms and conditions and any restrictions on the donation. For example:

— Donors can indicate their preferred location for planting a new tree but this cannot always be guaranteed as the Partnership will identify priorities that reference this strategy

— The tree once purchased becomes the property of SCC which holds all rights over it.

— Whilst Sheffield Council will care for the tree and maintain it for as long as it is safe to do so, some trees will have to be felled, for a variety of different reasons, every year. Those paying for the tree will not be entitled to compensation, even if the tree is felled/ removed very quickly after planting.

— Sheffield Council will however always publish clear and transparent reasons for felling a donated tree.

Transparency

Minutes and actions logs will be taken at all meetings. All papers, presentations, financial information and minutes will be available online to the public.
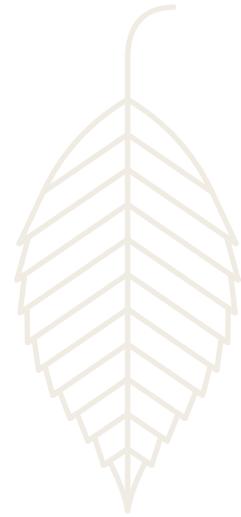
Good working practice helps retain green infrastructure

Credit: Simon Crump

Removing diseased trees; after this the area will be cleaned to prevent transmission

Appendix 5: Management of Sheffield's Street Trees

Note on Appendix 5

The approach to managing Sheffield's street trees set out in this appendix will be piloted during year one of the working strategy. Operational aspects of the process, including things like timescales for consultation, will be tested by partners. The process then will be refined and agreed by the Sheffield Street Tree Partnership for inclusion in the final street tree strategy to be published in spring 2021.

Overview

The management of Sheffield's street trees takes account of the long-term improvement of the quality of the city's street tree stock and the Council's statutory duty to maintain the integrity and safety of the city's highways[14]. The Council has a legal duty of care to make sure that all identified tree-related risks to people and property are reduced or eliminated so that everyone can safely enjoy the benefits and ecosystem services provided by a healthy tree canopy. This duty is delivered through the Streets Ahead highways maintenance contract between the Council and Amey.

Existing infrastructure can limit solutions   Credit: Christine King
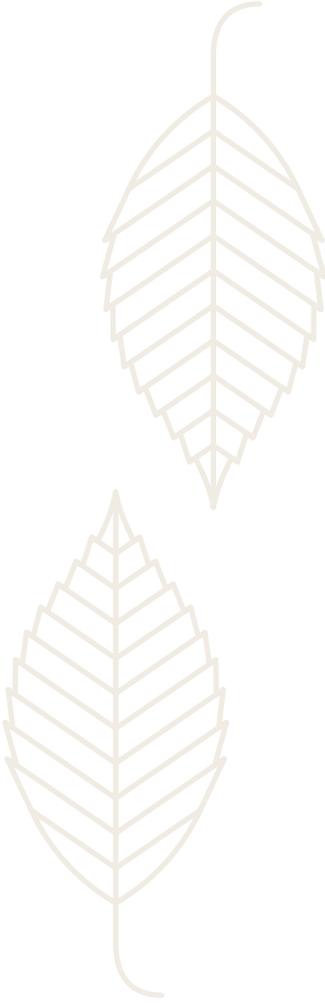
[14] Under the Highways Act 1980

Principles

The management of Sheffield's street trees is guided by the following principles:

1. Removal and replacement of a street tree is considered on a case-by-case basis.

2. Street trees **will be** removed and replaced under the following circumstances:

    — Where trees are dead, dying or have structural defects that render them dangerous

    — Where a diseased tree in managed decline has progressed to the stage where it is now dead, dying or dangerous as above.

3. Street trees **may be** removed and replaced under the following circumstances:

    — Where a tree is causing an unacceptable risk to road or pavement users that cannot be reasonably mitigated

    — Where a tree is causing proven damage to third party structures.

4. Any street tree removed will be replaced on at least a 1:1 basis (depending on the circumstances) with a suitable species for the location in as close to the original site as possible unless there are good reasons to do otherwise.

5. Integration of green infrastructure, including street trees, to be considered in the design of all highways and other development schemes in the city.

6. Trees are not removed and pruning works are not carried out for any of the following reasons:

    — Construction or widening of driveways

    — Casting of shade

    — Fall of leaves, honeydew, blossom, seeds or berries

    — Nesting birds

    — Where a tree is touching a telephone wire

    — Poor television reception.
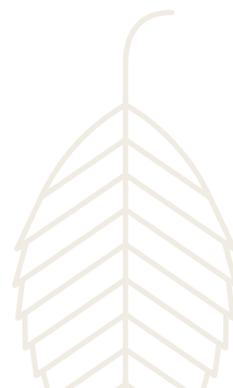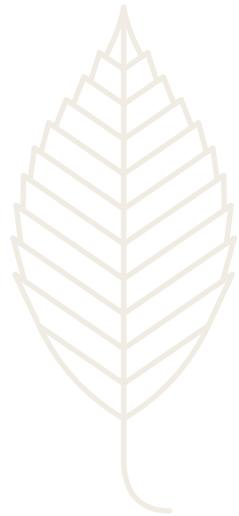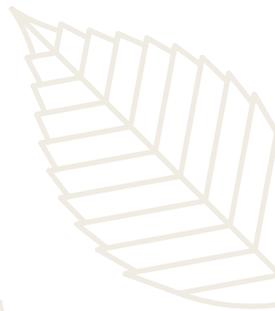
Public engagement

Fig. 1 below summarises the framework for delivering the actions to achieve the outcomes in the street tree working strategy and the Streets Ahead contractual obligations:

Figure 1:

Strategy	Five Year Plan	Annual Programme
Sheffield Street Tree Partnership Strategy	**Five Year Street Tree Management Plan**	**Annual Street Tree Management Plan**
Currently a one year working strategy	To achieve the outcomes of the Partnership Sheffield Street Tree Strategy and the Streets Ahead contractual obligations	Sets out the programme of street tree works for the year ahead
To be finalised by Spring 2021	*Published and reviewed annually*	*Published and reviewed at six months*

ONGOING PUBLIC ENGAGEMENT

One of the six outcomes in the Street Tree Working Strategy is that the wider community is involved in caring for and valuing street trees. Opportunities for public engagement will be created to improve shared understanding of the benefits and challenges that come from managing street trees including the establishment of a Sheffield Street Tree Partnership, promoting a way for a residents and community groups to provide additional tree planting, and by developing a Street Tree Warden Scheme.

These arrangements will involve residents and stakeholders in taking care of Sheffield's street trees as well as providing an ongoing way of gathering views on the street tree strategy, the five year street tree management plan and the annual street tree management programme, as well as proposals for specific trees.

Strategy

During the first year of the working strategy, individuals and organisations will have opportunities to provide their views as well as offer support for the delivery of the proposed outcomes and actions. This will inform a final strategy to be published in spring 2021.

Five Year Plan

The strategy will inform the development of a new five year street tree management plan setting out Amey's approach to delivering the street tree management element of the highway maintenance service. This document will be reviewed and published annually with partners to ensure it is line with the outcomes of the street tree strategy.

Annual programme

The annual street tree management programme will be published each year. This will include recommendations for specific streets trees or groups of street trees based on the assessment process and checklist below where the relevant information is known at the start of the programme year. There will be an opportunity at this point for individuals and organisations to provide their views on the proposed annual programme.

If further or additional decisions are needed during the year, these will be made by following the process below with opportunities for individuals and organisations to provide their views.

The annual programme will be reviewed at six months.

The Vernon Oak - once a field tree now provides benefits to the suburbs

Credit: Susan Unwin

Decision process

Assessment of a street tree

If a street tree is determined as immediately dangerous to life and/or property, Amey must attend and make the tree safe as an urgent defect (within one hour during the day and within two hours during the night). In this situation, there is no consultation and Amey does not need the approval of the Council prior to removal. Amey must notify the Council of the removal as soon as is reasonably practical.

For trees that are not immediately dangerous to life and/or property, the street tree condition-impact matrix (**STCIM - Fig 2**) is used as a guide by Amey to help assess:

— The likely impact or extent of damage to people or property by a street tree

— Whether the likely impact or extent of damage can be remediated or mitigated, either through arboricultural or engineering means

— The likelihood of repetitive repairs within a five year period

— The safe useful life expectancy (SULE) of the tree

— Options for retaining the tree and carrying out a risk assessment on each option

— Relative costs of repair compared to all the benefits that flow from the tree.

Bark damage can expose trees to disease and decay

Credit: Christine King
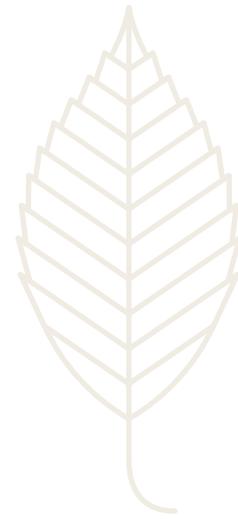
Figure 2 - Street Tree Condition-Impact Matrix (STCIM):

CONDITION OF TREE

Impact of tree (Impact score / Cost to remediate / Impact or extent of damage)	High, Category A — Good — 40 years + — Condition score 5	Moderate, Category B — Fair — 20-40 years — 4	Moderate, Category B — Fair — 10-20 years — 3	Low, Category C — Poor — 5-10 years — 2	Nil, Category U — Dead — <5 years — 1
6 / Nil / Nil	6 x 5 = **30** Retain	6 x 4 = **24** Retain	6 x 3 = **18** Retain	6 x 2 = **12** Retain, enhanced inspection frequency/detailed investigation	6 x 1 = **6** Retain, enhanced inspection frequency/detailed investigation
5 / Low / Low	5 x 5 = **25** Retain	5 x 4 = **20** Retain	5 x 3 = **15** Retain	5 x 2 = **10** Retain, enhanced inspection frequency/detailed investigation	5 x 1 = **5** Recommendation to Remove and Replace
4 / Moderate / Moderate	4 x 5 = **20** Retain	4 x 4 = **16** Retain	4 x 3 = **12** Cost/Benefit Analysis and Risk Assessed Solution	4 x 2 = **8** Cost/Benefit Analysis and Risk Assessed Solution	4 x 1 = **4** Recommendation to Remove and Replace
3 / High / High	3 x 5 = **15** Retain	3 x 4 = **12** Cost/Benefit Analysis and Risk Assessed Solution	3 x 3 = **9** Cost/Benefit Analysis and Risk Assessed Solution	3 x 2 = **6** Cost/Benefit Analysis and Risk Assessed Solution	3 x 1 = **3** Recommendation to Remove and Replace
2 / Unacceptable / Unacceptable	2 x 5 = **10** Cost/Benefit Analysis and Risk Assessed Solution	2 x 4 = **8** Cost/Benefit Analysis and Risk Assessed Solution	2 x 3 = **6** Cost/Benefit Analysis and Risk Assessed Solution	2 x 2 = **4** Recommendation to Remove and Replace	2 x 1 = **2** Recommendation to Remove and Replace
1 / Unacceptable / Unacceptable	1 x 5 = **5** Recommendation to Remove and Replace	1 x 4 = **4** Recommendation to Remove and Replace	1 x 3 = **3** Recommendation to Remove and Replace	1 x 2 = **2** Recommendation to Remove and Replace	1 x 1 = **1** Recommendation to Remove and Replace

Left-hand row labels (IMPACT OF TREE):

Impact score	Cost to remediate	Impact or extent of damage
6	Nil	Nil
5	Low	Low
4	Moderate	Moderate
3	High	High
2	Unacceptable	Unacceptable
1	Unacceptable	Unacceptable

Indicative scores given for tree condition or value vs the impact of the tree on infrastructure.

Values and boundaries

Outcome score: **> 15** retain tree   **14-6** tree subject to enhanced inspection and/or cost benefit analysis   **< 6** Remove and replace

For scores **14-6** follow decision tree

Guidance only, to aid a decision

Initial inspection

The first step in assessing a street tree is to conduct a thorough inspection to gather information about the tree quality, overall condition and remaining life expectancy. Based on this information, the street tree is given a condition score from 5 to 1 (horizontal axis of the STCIM). This is the arboricultural input into the assessment. The Amey officers who inspect street trees are experienced and qualified in tree assessments and are required to hold at least a minimum level of relevant arboriculture qualifications, e.g. Lantra[15] Professional Tree Inspection (PTI), level 3 or higher qualification in arboriculture.

STCIM scores

For the street tree being assessed, the STCIM generates a score from 1-30:

— A score <6 (denoted by the red squares in the STCIM): Street tree is dead or in poor condition and unsafe. Recommendation is to remove and replace. This represents the majority of the tree replacements that Amey undertake.

— A score between 6-14 (denoted by yellow and orange squares in the STCIM): Street tree is in poor, fair or good condition but may be causing significant direct or indirect damage to highway infrastructure or third party structures, e.g. subsidence, root pressure. Assessment of this damage is carried out in line with guidance in the Code of Practice for Well-Managed Highway Infrastructure[16]. Recommendation may be enhanced inspection frequency, detailed investigation or cost benefit analysis with a risk-assessed solution. This provides scope to find out if the impact or extent of damage can be remediated or mitigated through either arboricultural or engineering means.

— A score 15+ (denoted by green squares in the STCIM): Tree is retained.

The score for a street tree derived from the STCIM is used for guidance only to aid decision-making and to plan next steps. It is not prescriptive and in some cases street trees will fall between scores. Only through a considered assessment and open dialogue with all involved, including affected parties, can a decision or resolution be found, whether that is tree retention and repairs to structures or tree removal and replacement.

[15] One of the lead awarding bodies for land-based industries in the UK & Republic of Ireland: https://www.lantra.co.uk

[16] Produced by the UK Roads Liaison Group (UKRLG) which brings together national and local government from across the UK to consider roads infrastructure engineering and operations matters: http://www.ukroadsliaisongroup.org/

BS5837

The categories used in the STCIM for the condition of a tree reflect those used for tree quality assessment in BS 5837: 2012. BS 5837 provides recommendations relating to tree care, with a view to achieving a harmonious and sustainable relationship between new construction/existing structures and their surrounding trees. BS 5837 recognises that trees are important elements of green infrastructure through their contribution to:

— Climate change adaptation

— Providing visual amenity by softening or complementing the effect of the built environment and adding maturity to new developments

— Providing opportunities for wildlife in built-up areas

— Making places more comfortable in tangible ways by providing screening and shade, reducing wind speed and attenuating rainwater run-off[17].

Amey recommendation to the Council

Fig. 3 summarises the process used by Amey to reach a recommendation. The following checklist of information is provided to the Council by Amey for each tree under authority approval or for a request to remove and replace a tree:

— Unique asset ID

— Species listed by common name with a key provided for scientific names

— Height

— Stem diameter

— Branch spread taken as a minimum at the four cardinal points (North/South/East/West) to derive an accurate representation of the crown

— Existing height above ground level of:

  — First significant branch and direction of growth, e.g. 2.4m/North

  — Canopy (to ensure an appropriate level of ground clearance for pedestrians and vehicles; to calculate crown/stem ratio and extent of shading)

— Life stage, e.g. young, semi-mature, early mature, mature, over-mature

[17] British Standards Institution 2020: https://shop.bsigroup.com/en/ProductDetail/?pid=000000000030213642

— General observations particularly of structural and/or physiological condition, e.g. the presence of any decay or physical defect, and/or preliminary management recommendation

— Estimated remaining SULE in years, e.g. <10, 10+, 20+, 40+

— Condition category of the tree with reference to the condition-impact matrix (A, B, C or U)

— Value of the tree as determined using CAVAT

— Recommendation.

The information is provided to the Council's Head of Highway Maintenance or their nominated deputy for a decision.

Council decision

Once a recommendation has been received from Amey, the Council has 10 working days to respond to Amey with its decision.

The Council's Head of Highway Maintenance or their nominated deputy has three options when making a decision:

	Council decision	What happens next
1	Approve the Amey recommendation	STAG and the Sheffield Street Tree Partnership (SSTP) consulted on the decision prior to the street tree works being scheduled*.
		*To avoid a conflict of interest, Amey and Council representatives on the SSTP will not initially take part in this consultation.
		In cases where the decision is to remove and replace a tree and there is disagreement with this decision following consultation, works will be suspended to allow for relevant parties to examine the evidence, explore alternative options and reach a consensus. If a consensus cannot be reached, a view would be sought from an independent third party expert and/or further evidence would be examined.
2	Approve the Amey recommendation with comments	Comments from the Council to Amey may include specific conditions for carrying out the works, e.g. a specific species of tree to be planted as the replacement in keeping with the surrounding environment; householder has a planning application for a new driveway so replanting needs to be 2m to the right to avoid future conflict.
		STAG and the SSTP consulted on the decision prior to the street tree works being scheduled.*
		*To avoid a conflict of interest, Amey and Council representatives on the SSTP will not initially take part in the consultation.
		In cases where the decision is to remove and replace a tree and there is disagreement with this decision following consultation, works will be suspended to allow for relevant parties to examine the evidence, explore alternative options and reach a consensus. If a consensus cannot be reached, a view would be sought from an independent third party expert and/or further evidence would be examined.
3	Reject the Amey recommendation and refer this back to Amey with reasons	Amey reviews the options for the management of the street tree and makes a further recommendation to the Council.
		In cases where Amey recommend removal and replacement as essential and the Council disagrees, a view would be sought from an independent third party expert and/or further evidence would be examined.

Publication of decisions

Once a decision has been agreed following the process outlined above it will be published if it falls into one of the categories below:

— Enhanced inspection frequency

— Detailed investigation

— Cost benefit analysis and a risk-assessed solution

— Removal and replacement (*A tree will not be removed until the decision has been published).

Rivelin Valley, a fine example of Edwardian planting, links the city to its countryside and its past

Credit: Colin Brooks

Figure 3 - Decision flowchart:

Street tree condition-impact matrix score

- **15+**
- **6-14**
- **<6**

Can the risk or damage be realistically remediated or mitigated through either arboricultural or engineering means?

YES →

NO →

Would repair or repeat interventions be required in less than five years?

NO → Retain tree

YES →

Does the tree have a safe useful life expectancy (SULE) of more than five years?

YES → Risk assessment report – Highways risk and liability score and/or arboricultural risk assessment

NO →

Are there any other options that are realistic, affordable, legal?

YES → Risk assessment report – Highways risk and liability score and/or arboricultural risk assessment

NO → **Amey recommendation to the Council to remove and replace**

Cost/benefit analysis informed by risk assessment

YES → Retain tree

NO → **Amey recommendation to the Council to remove and replace**

Credit: Darren O'Brien

The fight to save Sheffield's street trees wasn't just about amenity value, but also about the connection people have with nature

Appendix 6: Street Tree Warden Scheme

Background

The Tree Warden Scheme[18,19] is a national initiative co-ordinated by The Tree Council. There are many Tree Warden Networks with Tree Warden Co-ordinators right across the UK helping local tree enthusiasts to get involved and care for the trees in their area. Tree Warden Volunteers are usually people who love trees and are willing to offer some of their time to help care for their local trees and woods, work with the local community, and/or be the eyes, ears and voice for the trees down their street. Tree Warden Schemes are usually co-ordinated by the local council or a local community organisation. Tree Warden activities and projects are often autonomous, and tailor-made to benefit the local area and community. Every year, The Tree Council invites Tree Wardens to Regional Forums where they can come together to network, share ideas and be inspired by presentations, workshops and the outdoor site visits and mini-training sessions.

Sheffield Street Tree Warden Proposal

A Street Tree Warden Scheme would be part of the Sheffield Street Tree Partnership. Investment would be needed to co-ordinate the scheme on behalf of the partnership and the direct involvement of Streets Ahead representatives would be critical for the scheme to work. Streets Ahead and SRWT could help co-ordinate the Street Tree Wardens by:

— Co-ordinating and leading the volunteer network

— Allocating 'patches' of a manageable size to volunteers

— Providing opportunities for volunteers to meet up, share experiences and training, promote their activities etc

— To ensure that all volunteers are fully knowledgeable and equipped to be able to spot signs of disease, danger or damage to trees.

Wardens would need specific training, support and direction to ensure their activities are valued and of value in taking forward the Sheffield Street Tree Strategy.

Activities a Street Tree Warden might undertake in Sheffield could include:

— Championing their local tree and woods

— Planting and caring for trees, setting up tree nurseries

— Monitoring trees in a 'patch'

— Liaising between neighbours, the community, Streets Ahead and the partnership

[18] https://www.treecouncil.org.uk/Take-Part/Tree-Wardens

[19] https://treecouncil.org.uk/take-action/tree-wardens/tree-warden-resources/

— Eyes and ears on the ground to report in any tree issues or concerns such as any signs of disease, danger, or damage to the tree e.g. identifying Ash dieback

— Undertaking and supporting other volunteers to carry out surveys of all types to improve our understanding of our street trees

— Getting together with other like-minded people for training and sharing ideas

— Coordinating any watering of young saplings in their first three years during long dry spells or the weeding of tree pits for new plantings, and/or placement of weed retardant mats

— Supporting the partnership on tree related projects and public events as they arise

A build out on a narrow street provides opportunity for a new tree

Credit Geoff Cookmartin

Appendix 7: Indication of relative benefits provide by different tree species

Table 1 Relative value of tree species commonly planted in urban areas of Britain and Europe for key ecosystem services including biodiversity value. Scores are assigned from previously published datasets and for each performance measure (except drought tolerance and winter hardiness) are allocated into three approximately equal sized groups, albeit with some adjustments to the size of each group to take tied ranks into account, with +, ++ and +++ respectively indicating low, medium and high performance. For drought tolerance and winter hardiness +, ++ and +++ respectively indicate problematic or not very suitable species, suitable and very suitable species.

Air quality regulation is assessed by tree species' net contribution to volatile organic compound (VOC) emissions (data from Donovan et al. 2005) and effectiveness in capturing PM (data from Sæbø et al. 2012). Drought tolerance and winter hardiness are linked to climate change resilience, but note that high performance in drought tolerance trades-off against water uptake rates and thus flood alleviation (data from Roloff et al. 2009). Biodiversity value incorporates data from Alexander et al. (2006) on value for mycorrhizal fungi, foliage invertebrates (richness and biomass), leaf litter communities, pollinators, provision of fruits and seeds and epiphyte communities

(data on value for rotten wood communities are excluded as rotten trees are removed from road verges). Performance in sequestering carbon is a function of growth rate (McHugh et al. 2015) and wood density (Tree Functional Attributes and Ecological Database 2016) whereby faster growth rates and high wood densities are advantageous. Only a few species are currently used for planting in urban verges in the UK, and these include many that score poorly for biodiversity or ecosystem service values - those approved for use in Sheffield (UK) are marked with a * for use in narrow verges and tree pits and ** for use only in wider grass verges – the majority (60%) of which are not native to the UK.

Species name	Native Distribution	Air quality PM	Air quality VOCs	Drought tolerance	Winter Hardiness	Biodiversity value	Growth rates	Wood density
Field maple *Acer campestre***	Europe, N. Africa and W. Asia	++	+	+++	+++	++	+	+++
Norway maple *Acer platanoides*	Europe and W. Asia (not UK)	+	+	++	+++		+++	++
Sycamore *Acer pseudoplatanus*	Europe and W. Asia (not UK)	+	+++	+	+++	+++	+	+++
Horse chestnut *Aesculus hippocastanum*	Europe (not UK)	++		+	++	+	+	++
Italian alder *Alnus cordata#*	Europe (not UK)		++	++	++		+++	+
Alder *Alnus glutinosa*	Europe, N. Africa and W. Asia		+	+	++	++	+	+
Grey alder *Alnus incana*	Northern temperate (not UK)		++	+++	+++			+
Erman's birch *Betula ermanii***	E. Asia							++
Silver birch *Betula pendula***	Europe and W. Asia	+++	+	++	+++	+++	+++	++
Common hornbeam *Carpinus betulus***	Europe and W. Asia	++		++	+++	+	+	+++
Sweet Chestnut *Castanea sativa*	Europe and Asia Minor (not UK)			++	++	+		++
Indian Bean Tree *Catalpa bignonioides***	N. America			+	+			+
Atlas Cedar *Cedrus atlantica***	N. Africa			+++	+			+
Lawson cypress *Chamaecyparis lawsoniana*	N. America		+					+
Hazel *Corylus colurna**	Europe and W. Asia	++	++	++	++	++	++	++
Midland Hawthorn *Crataegus laevigata**	Europe			+	+++	+++	+++	+++
Common hawthorn *Crataegus monogyna***	Europe, N. Africa and W. Asia		+	++	+++	+++	+	+++

| Species name	Common name	Native Distribution	Air quality PM	Air quality VOCs	Drought tolerance	Winter Hardiness	Biodiversity value	Growth rates	Wood density
Cupressocyparis leylandii	**Leyland Cypress**	N. America		++	++	++		+++	
*Fagus sylvatica***	**Beech**	Europe	+		+	++	+++	+	+++
Fraxinus excelsior	**Ash**	Europe and W. Asia	+	+	++	++	++	++	+++
*Ginkgo biloba**	**Ginko**	E. Asia			+++	++			
*Gleditsia triacanthos**	**Honey Locust**	Central and N. America			+++	++			+++
*Gymnocladus dioica***	**Kentucky Coffeetree**	N. America			++	++			++
Ilex aquifolium	**Holly**	Europe, N. Africa and W. Asia		++			++	+	+++
Juglans nigra	**Walnut**	N. America	++				+		++
Larix decidua	**Larch**	Europe (not UK)		+					++
*Liquidambar styraciflua**	**Sweet Gum**	Central and N. America			++	+	++		++
*Liriodendron tulipifera***	**Tulip Tree**	N. America			+	++			+
*Malus**	**Apple**	Northern temperate		++	+	++	+++	+	+++
*Parrotia persica***	**Persian Ironwood**	Central Asia		++					
Picea abies	**Norway Spruce**	Europe (not UK)					++		+
Pinus nigra	**Black Pine**	Europe, N. Africa (not UK)	+++	+	+++	+++		+++	
*Pinus sylvestris***	**Scots Pine**	Europe and W. Asia			+++	+++	++	+++	+
*Platanus x hispanica**	**London Plane**	Hybrid - N. America/E. Asia			+++	++	+	++	+++
Populus tremula	**Aspen**	Europe and Asia	++	+++	++	+++	+	+++	+
Prunus cerasifera	**Plum**	Europe and Asia Minor (not UK)	+		+++	++	+++		++
*Prunus x hillieri**	**Cherry Hybrid**	Hybrid - E. Asia/E. Asia		++					
Prunus laurocerasus	**Laurel**	N. America		+	+	+++			
Prunus spp.	**Cherry Tree spp.**	Northern temperate		+			+++	+++	++
*Pterocarya fraxinifolia***	**Caucasian Walnut**	W. Asia			+	+			+
*Pyrus calleryana**	**Callery Pear**	E. Asia	++		+++	++		+++	+++
*Quercus cerris***	**Turkey Oak**	Europe and Asia Minor (not UK)			+++	++	+		+++
Quercus ilex	**Holm Oak**	Mediterranean Basin					+		
Quercus petraea	**Sessile Oak**	Europe and W. Asia		+++	++	++	+++		+++
*Quercus robur***	**English Oak**	Europe and W. Asia	++	+++	+	+++	+++	++	+++
Quercus rubra	**Red Oak**	N. America		+++	++	++			++
Robinia pseudoacacia var. frisia	**False acacia**	N. America	+		+	+++	+	+++	+++

Species name		Native Distribution	Air quality		Drought tolerance	Winter Hardiness	Biodiversity value	Growth rates	Wood density
			PM	VOCs					
Salix alba	White Willow	Europe and Asia		+++	+	+++	+++	++	+
Salix caprea	Goat Willow	Europe and Asia		+++	++	+++	+++	++	+
Salix fragilis	Crack Willow	Europe and W. Asia	+++	+++			+++	++	+
Sambucus nigra	Elder	Europe and W. Asia		++				+	++
Sequoiadendron giganteum**	Giant Redwood	N. America							+
Sorbus aucuparia	Mountain Ash	Europe, N. Africa and W. Asia		++	+	+++	++	++	++
Sorbus intermedia 'Brouwers'	Swedish Whitebeam	Northern Europe (not UK)	++		++	+++		++	++
Sorbus x arnoldiana*	Rowan Hybrid	Hybrid - East Asia/Europe, N. Africa and W. Asia			+	+++		++	++
Syringa vulgaris	Lilac	Europe (not UK)		+++	++	+++		+	
Taxus baccata**	Yew	Europe, N. Africa and W. Asia	++				+	+	++
Tilia	Lime spp.	Northern temperate		++			++	++	+
Tilia cordata 'Winter Orange'*	Small leaved lime variety	Europe and W. Asia	+		++	+++	++		+
Tilia cordata x mongolica*	Lime Hybrid	Hybrid - East Asia/Europe and W. Asia						++	+
Ulmus 'New Horizon'**	Elm Hybrid	Hybrid - E. Asia/E. Asia	++	++				+	+++
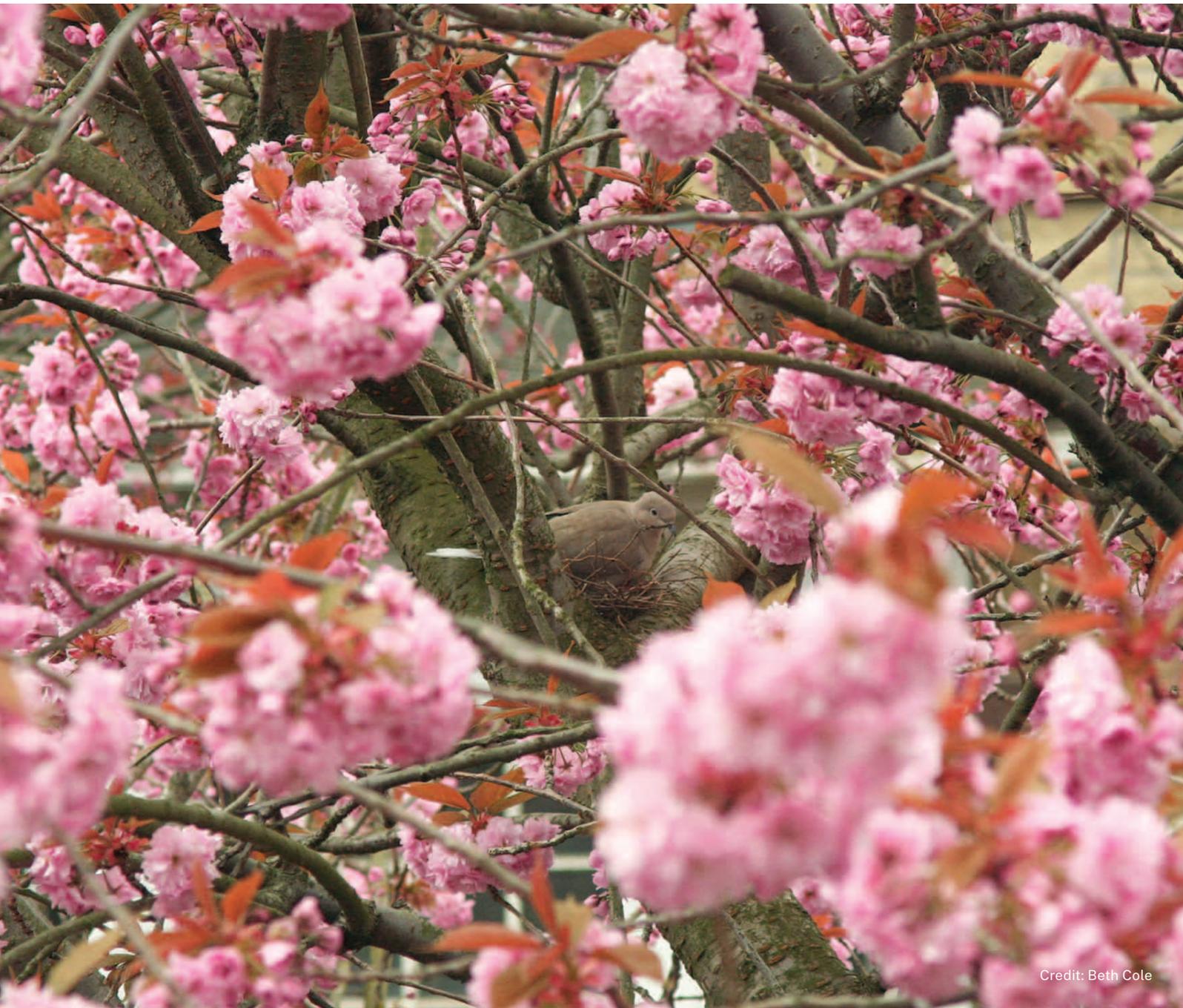
Credit: Beth Cole

Street trees aren't just loved by people; they provide nest sites, food and safe wildlife corridors to other parts of the city

Appendix 8: Air pollution data (particulate matter)

Table comparing Canopy cover, IMD score, IMD rank, deprivation description and PM$_{2.5}$ air pollution level by Sheffield ward.

Top wards for low canopy cover, high PM pollution and low IMD and are in bold

Sheffield Ward	Index of Multiple Deprivation (IMD)	IMD Ward Rank (1 = most deprived)	IMD description	Canopy Cover (% of ward road network)	Canopy Area (m²)	Average PM$_{2.5}$* (ug/m3) level by ward
Firth Park	52.28	1	Most Deprived	19%	114,621	6.92
Southey	51.06	2	Most Deprived	4%	29,270	6.48
Burngreave	50.69	3	Most Deprived	4%	39,992	7.01
Manor Castle	**47.71**	**4**	**Most Deprived**	**4%**	**34,129**	**7.17**
Arbourthorne	42.33	5	Most Deprived	4%	19911	7.11
Darnall	**41.79**	**6**	**Most Deprived**	**3%**	**39,107**	**7.99**
Shiregreen and Brightside	41.54	7	Above Average	12%	78,902	7.04
Gleadless Valley	36.49	8	Above Average	6%	35,659	7.09
Beauchief and Greenhill	32.51	9	Above Average	9%	64,217	6.26
Woodhouse	**29.91**	**10**	**Above Average**	**4%**	**23,160**	**7.62**
Richmond	**29.27**	**11**	**Above Average**	**4%**	**24,457**	**7.35**
Birley	24.75	12	Average	2%	15,117	6.95
Walkley	**23.50**	**13**	**Average**	**2%**	**13,913**	**7.22**
Nether Edge	23.01	14	Average	14%	74,877	6.9
Central	22.61	15	Average	5%	59,418	7.05
Mosborough	21.74	16	Average	3%	18,263	6.94
East Ecclesfield	19.85	17	Average	1%	6,713	7.01
Hillsborough	19.71	18	Below Average	6%	32,332	5.88
West Ecclesfield	19.07	19	Below Average	7%	41,352	6.32
Beighton	18.87	20	Below Average	4%	22,261	6.94
Stocksbridge and Upper Don	18.52	21	Below Average	7%	65,870	5.11
Stannington	15.08	22	Below Average	18%	222,078	5.15
Broomhill	14.33	23	Least Deprived	5%	19,615	6.68
Graves Park	13.29	24	Least Deprived	10%	63,951	6.82
Dore and Totley	7.81	25	Least Deprived	12%	97,978	5.2
Crookes	7.23	26	Least Deprived	14%	58,873	6.2
Fulwood	5.08	27	Least Deprived	15%	103,404	5.16
Ecclesall	4.56	28	Least Deprived	17%	118,512	6.22

The Chelsea Road Huntingdon Elm (*Ulmus x hollandica 'Vegeta'*), a precious survivor of Dutch Elm Disease and home to a colony of White-letter Hairstreak butterflies

Appendix 9: British standards and guidance pertaining to tree works and the Streets Ahead contract

The Streets Ahead Contract, Part G – The Services 31.
Obligation To Provide The Service And Performance Standards

31.1 Standard of Service

The Service Provider shall provide the Service continuously throughout the Term:

31.1.1 in accordance with Good Industry Practice;

31.1.2 in order to comply fully with Schedule 2 (Output Specification);

31.1.3 in accordance with Highway Standards;

31.1.4 in accordance with Schedule 3 (Method Statements);

Highway Tree Replacement Policy
Contains advice on: selection, aesthetics, ease of maintenance, tolerance to difficult conditions, due regard to disease prevalence, planting considerations.

Highway Tree Design Guide
Contains advice on: selection, root barriers, drainage, dealing with clay soils, anti-vandalism measures, trees in paving area – pit size

British Standards
BS3998:2010: Tree work – Recommendations

This is for work on trees, and covers:

Planning of works, biosecurity, site management, scheduling and risk control.

Root environment: mulching, aeration, treatments,

Damage/decay: wounds and other injuries, and the management of decay.

Pruning; deadwood, formative, crown thinning/lifting, pollarding, infrastructure.

BS8545:2014: Trees: from nursery to independence in the landscape – Recommendations

This covers the management of young trees including: selection, biosecurity, planting, assessment, ongoing maintenance

BS5837:2010: Trees in relation to design, demolition and construction – Recommendations

The main relevant points are: the zone in which machine digging is prohibited, protecting roots, the size that can be pruned, protecting roots from chemical damage from concrete, avoiding strimmer damage.

Department for Transport: Practical Guide to Street Works
This is a simple guide covering NJUG Vol 4 which covers: the zone in which machine digging is prohibited, avoiding damage to roots, size limit on root pruning (25mm diameter), using clean, sharp equipment.

The Trees and Design Action Group (TDAG) Trees in a Hard Landscape
Practical challenges and solutions to integrating trees in 21st century streets, civic spaces and surface car parks, detailing process, design and technical options.

Appendix 10: Case Studies

Case Study 1 – Lime on a quiet suburban street – Ostensibly high visible damage, but actually a relatively simple solution to retain a tree

The kerb line was significantly displaced and pavement significantly humped and cracked. Ostensibly, the tree was therefore causing significant damage.

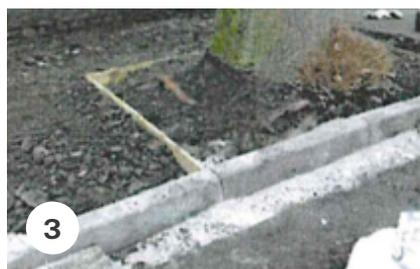**Using the Street Tree Condition Impact matrix, it was originally assessed as:**

Condition Score	Impact of Tree	Result
4 - Remaining life expectancy of 20 to 40 years and in Fair condition	**4** - Moderate Damage being caused and Moderate cost to remediate	**4 x 3 = 12** - Cost benefit analysis and risk assessment needed

A more detailed investigation of the damage was therefore carried out in order to feed into the risk assessment and cost benefit calculations. This identified that there were multiple layers of thick tarmac, which had been laid on top of each other, over many years. Once they had all been removed, it was clear that a single layer of tarmac could be used to create a flat pavement surface. Similarly, with some very minor root pruning, the old kerb stones could be put back in, to create a perfectly straight kerb line.

As a result, the repairs were carried out in situation and the Street Tree Condition Impact matrix was reassessed as:

Condition Score	Impact of Tree	Result
4 - Remaining life expectancy of 20 to 40 years and in Fair condition	**5** - Minor Damage being caused and Low cost to remediate	**4 x 5 = 20** - Retain tree

The tree was recommended for retention by Streets Ahead, a recommendation that the Council agreed with.

1. Before work showing humped tarmac and displaced kerb

2. Complete, flat tarmac on footway

3. Thick tarmac humped around tree removed

4. New kerb and tree pit

Photos: STAG Joint Investigation Team

Case Study 2 – Sycamore on a busy road – Deciding to fell as a result of the unacceptable risks

The tree was leaning into a busy road with the trunk encroaching into the carriageway from a height of about two metres above the ground. There was damage on the trunk from previously being hit by a high sided vehicle.

Using the Street Tree Condition Impact matrix, it was originally assessed as:

Condition Score	Impact of Tree	Result
3 - Remaining life expectancy of 10 to 20 years, and in Fair condition	**1** - Unacceptable Impact being caused on road users and Unacceptable cost to remediate	**3 x 1 = 3** - Remove and Replace

Therefore the recommendation by Streets Ahead was to fell the tree.

The Public Engagement exercise following this initial recommendation did include a few questions for clarity. For example, what were the alternative solutions that could be used to retain the tree? Streets Ahead outlined that theoretically the road could be narrowed with a build out and 'Give Way' traffic calming solution. But ultimately the encroachment into the road was obvious, and the theoretical solution was not practical on the busy road. The damage caused by the previous vehicle strike was also obvious evidence of the risk posed by the tree.

Streets Ahead therefore continued to recommend felling the tree to the Council, who agreed with the recommendation, and the tree was felled.

Photos: Google Street View

Case Study 3 – Huntingdon Elm on a suburban road junction – Taking into account special circumstances

The tree was causing significant damage to the road surface with roots visibly above tarmac in the carriageway. Initial survey suggested it would be impossible to repair the road surface properly, using standard solutions, without severing several significant roots.

Using the Street Tree Condition Impact matrix, it was originally assessed as:

Condition Score	Impact of Tree	Result
2 - Remaining life expectancy of 5 to 10 years, and in Poor condition	**1** - Unacceptable Damage being caused and Unacceptable cost to remediate	**2 x 1 = 3** - Remove and Replace

Therefore, the initial recommendation by Streets Ahead was to fell the tree.

The Public Engagement exercise following this initial recommendation highlighted the rarity of the tree, as well as it being host to a colony of the Biodiversity Action Plan (BAP) protected White-letter Hairstreak butterfly. Streets Ahead therefore explored whether more expensive non-standard solutions could be used, given the special nature of this tree, and the wildlife it was host to. This included deeper hand excavation of cobbles underneath the old tarmac, and careful hand pruning of some of the roots. It also included lifting the kerb line, to allow for the new road surface to be ramped over the remaining roots in the road, and re-grading of the slope of the pavement, to take into account the higher kerb line.

This solution, to retain the tree, was recommended by Streets Ahead to the Council. However it was done with the caveat that further problematic roots might be discovered during the excavation, and that depending on the severity of the root pruning needed, the tree might become unstable, and still need to be felled. The Council accepted the recommendation to carry out the excavation, and to try to implement the more expensive solution, noting the importance of the tree.

The engineering work was carried out, ultimately at relatively low cost, even though it was a non-standard solution. Some sensitive canopy pruning was also conducted.

Using the Street Tree Condition Impact matrix, it was re-assessed as:

Condition Score	Impact of Tree	Result
2 - Remaining life expectancy of 5 to 10 years, and in Fair condition	**5** - Minor Damage being caused and Low cost to remediate	**2 x 5 = 10** - Retain with enhanced inspection regime

Sheffield Council accepted this assessment and the tree is now being monitored by Streets Ahead more regularly.
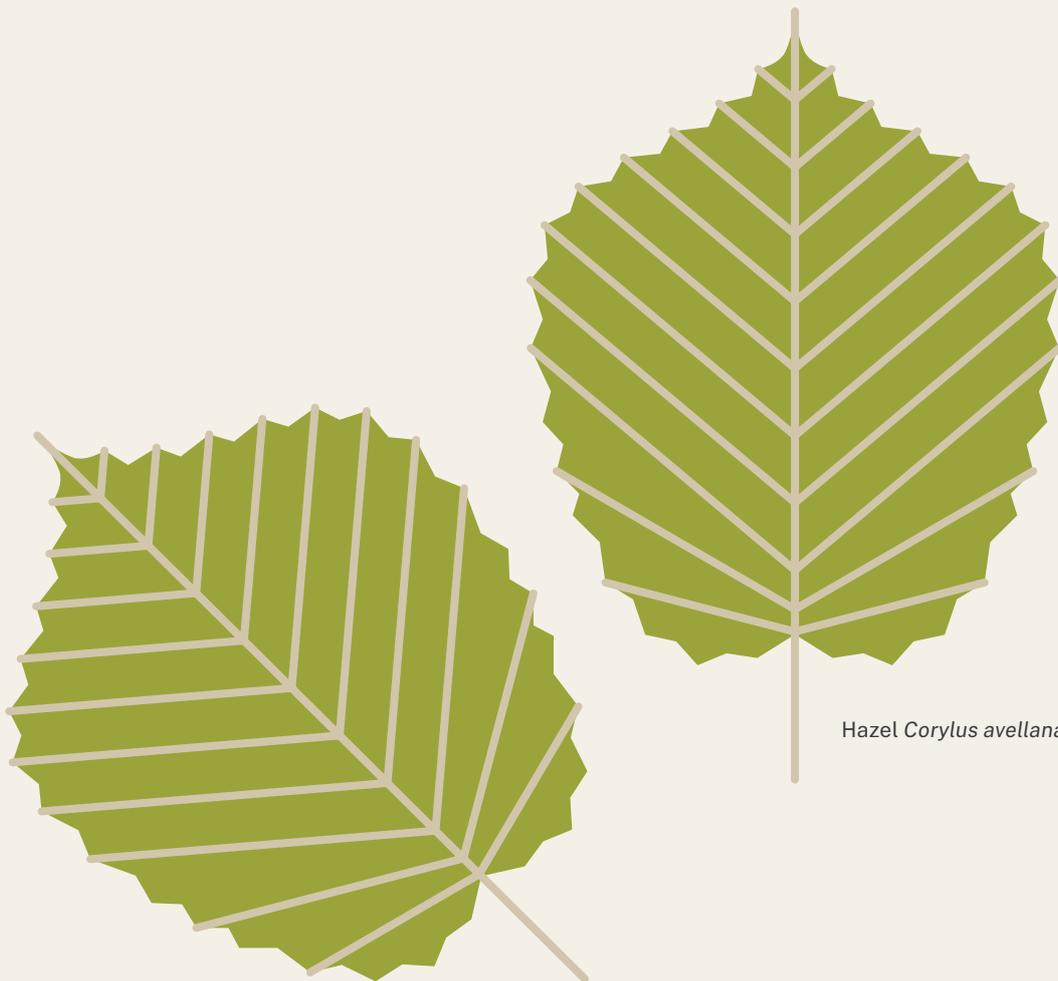
Photos: STAG Joint Investigation Team

1. Tree condemned because damaging. Rooting above tarmac in carriageway, completely unable to work round without severing roots.

2. Roots growing up through old cobbles and breaking through worn tarmac.

3. Kerb trough ready to reinstall ramped kerb.

4. New tree pit.

5. Kerb refitted.
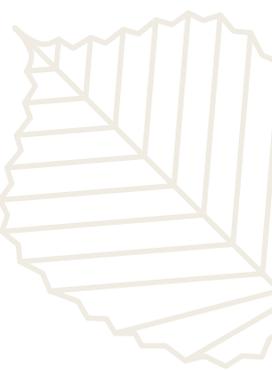
6. Pavement tarmac redone.

Glossary
& Acronyms

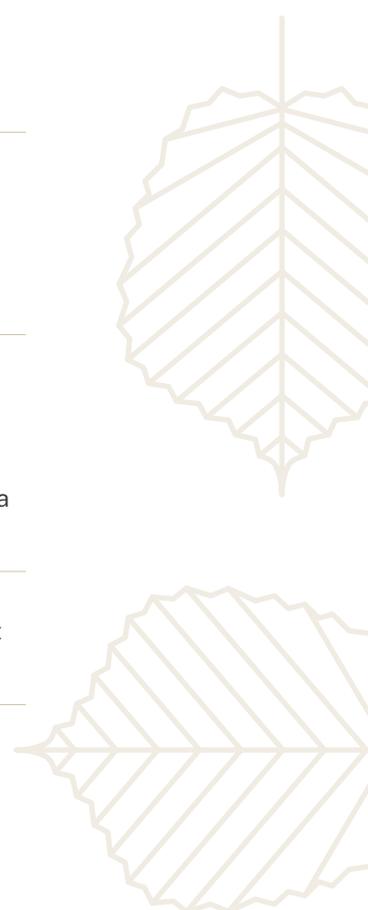Hazel *Corylus avellana*

Glossary and Acronyms

Amenity tree	Allowed to occupy a site and to serve its surroundings in a useful manner which culminates in the aid, protection, and comfort of humans[20].
Avoided runoff	Amount of water held in the tree canopy and re-evaporated after a rainfall event.
BS or British Standard	A series of professional standards covering a variety of works e.g. on trees. Please refer **Appendix 9** for more details.
Canopy cover	Area of leaves, branches and stems of trees covering the ground when viewed from above; commonly expressed as a percentage of total ground area, e.g. at 50% canopy cover, half of the total ground area is covered by the vertical projection of tree crowns.
Carbon sequestration	Annual removal of carbon dioxide from the air by plants.
Carbon storage	Amount of carbon bound up in the above-ground and below-ground parts of woody vegetation.
Capital Asset Valuation of Amenity Trees (CAVAT)	A valuation method developed in the UK to express a tree's relative contribution to public amenity and its prominence in the urban landscape.
Council of Tree and Landscape Appraisers (CTLA)	A method for assigning a monetary value to the amenity value of trees.
Cultivar	A tree or plant variety that has been produced in cultivation by selective breeding. They usually have no or low genetic diversity, with individuals of any particular cultivar usually being clones of one another.
Ecosystem services	Benefits provided by ecosystems that contribute to making human life both possible and worth living, e.g. products such as food and water, regulation of floods, soil erosion and disease outbreaks, and non-material benefits such as recreational and spiritual benefits in natural areas.
Epicormic	Of a shoot or branch, growing from a previously dormant bud on the trunk or a limb of a tree.
Epicormic growth	Epicormic growth is a plant response to damage or stress; the growth of new shoots from epicormic buds that lie dormant beneath the bark.

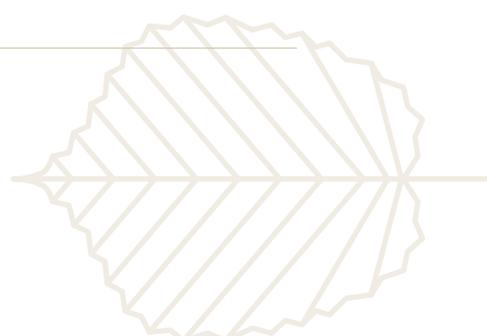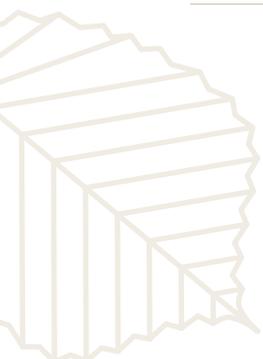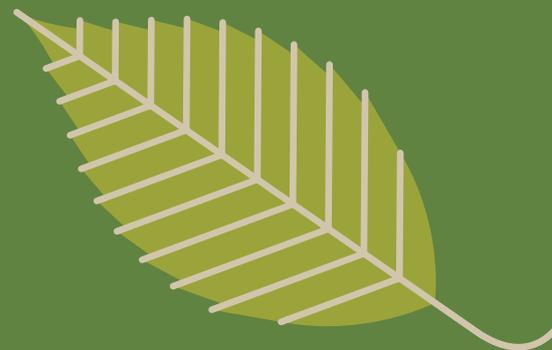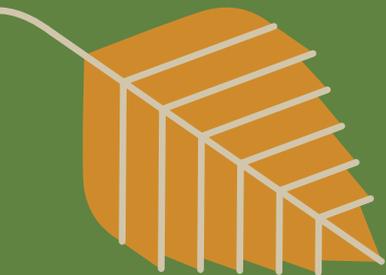[20] University of Georgia, Daniel B Warnell School of Forest Resources
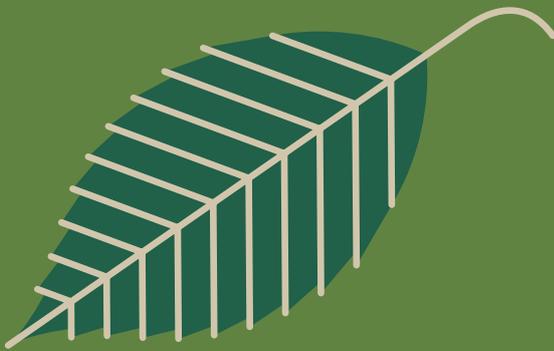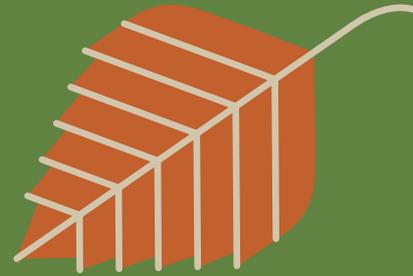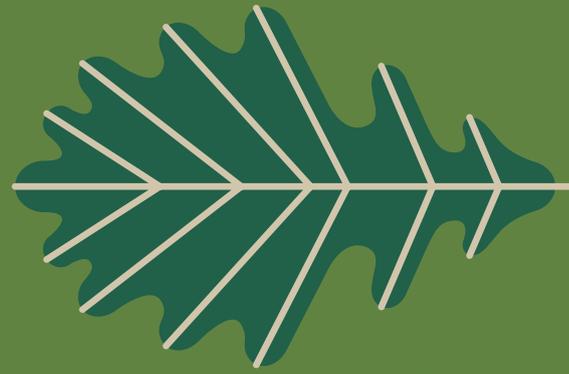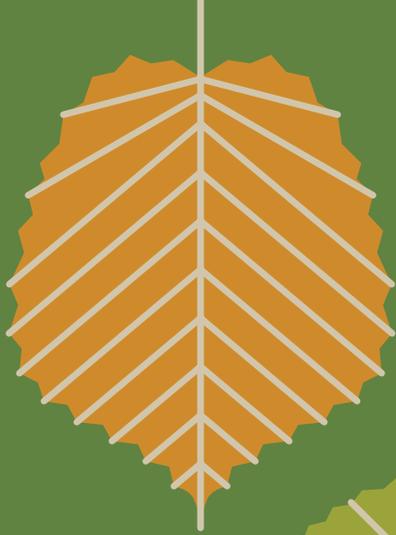
i-Tree Eco	A suite of open source, peer-reviewed and continuously improved software tools to help assess and manage urban tree populations and the benefits they can provide.
Indices of multiple deprivation (IMD)	The official measure of relative deprivation for small areas in England, and the most widely used of the Indices of Deprivation. Deprivation is measured in a broad way to encompass a wide range of aspects of an individual's living conditions; these are Income, Employment, Education, Skills and Training, Health and Disability, Crime, Barriers to Housing and Services, and Living Environment.
Landscape: National Park	Areas of relatively undeveloped and scenic landscape that are designated under the National Parks and Access to the Countryside Act 1949.
Landscape: Conservation Area	Conservation areas exist to manage and protect the special architectural and historic interest of a place - in other words, the features that make it unique.
Landscape: Important Landscape	Important landscapes are landscapes or features that aren't in national parks, or conservation areas, or memorials, or veteran, or woodland, but still deserve special consideration; for example, some historic avenues.
Landscape: Memorial Trees	Memorial trees celebrate or commemorate people or events. Typically in Sheffield, they commemorate those people of the area that fought in the two World Wars.
Landscape: Veteran Trees	Ancient trees are veteran trees, but not all veteran trees are old enough to be ancient. Veteran trees are survivors that have developed some of the features found on ancient trees. However, veteran trees are usually only in their second or mature stage of life.
Landscape: Woodland	Woodland is used in British woodland management to mean tree-covered areas which arose naturally and which are then managed, while forest is usually used in the British Isles to describe plantations, usually more extensive, or hunting Forests, which are a land use with a legal definition and may not be wooded at all.
Moving Average	A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

ODL	Other Designated Land (ODL) – Land outside the highway network which Amey is required to maintain in line with the Streets Ahead contract. Comprises land parcels identified in Schedule 20 of the contract. This effectively means land that is not a road, path or verge but a swathe of land that is incidental to the highway.
PEFC	Programme for the Endorsement of Forest Certification.
Replacement cost	Value based on the physical resource itself, e.g. the cost of having to replace a tree with a similar tree, using the CTLA methodology guidance from the Royal Institution of Chartered Surveyors.
Safe useful life expectancy (SULE)	Life expectancy of a tree modified first by its age, health, condition, safety and location then by economics, effects on better trees and sustained amenity.
SCC	Sheffield City Council
Shelterbelt	A barrier of trees and shrubs that provides protection (as for crops) from wind and storm and lessens erosion.
SRWT	Sheffield and Rotherham Wildlife Trust
STAG	Sheffield Tree Action Groups
Street tree	A tree located next to or within a public road; a tree on land forming or adjacent to a highway which affects, in some way, those using that highway.
TOF	Trees Outside Forests
Tree warden	Volunteers who love trees and are willing to offer some of their time to help care for their local trees and woods, work with the local community, and/or be the eyes, ears and voice for the trees down their street.
UKWAS	United Kingdom Woodland Assurance Scheme
Urban forest	Trees, woodlands, shrubs, hedges, open grass, green space and wetland in and around urban areas.
WdT	The Woodland Trust