THE ENVIRONMENT PARTNERSHIP







GROWING MANCHESTER'S TREES:

MANCHESTER CITY COUNCIL

TREE PLANTING CAPACITY STUDY

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Executive Summary

1. This study was commissioned by Manchester City Council to provide the data and the decision-making tools that it needs to assess tree planting opportunities. The city's current tree canopy cover of 18.8% is above the 16.4% average for English towns and cities[1] but the distribution of trees between wards and across different land types is very variable.

2. The purpose of this study is not to define the maximum possible number of trees that could be planted or grown across the city. It is to describe the opportunities to continue patterns of tree planting that are already observed, and to explore the role of all stakeholders in the delivery of Manchester's future treescape.

3. A detailed analysis of the current distribution of tree canopy was undertaken. All land was classified by its use and surface type, and areas that cannot support trees, such as buildings or water bodies, were excluded. The percentage of tree canopy cover on each land class was measured and used to develop a model of 'canopy capacity' across each land class. This was modified where necessary to reflect local issues such as specific areas in which tree planting would not be practical. The capacity for tree cover was modelled in each ward, according to its land use composition, and these results were recombined to calculate an overall potential tree canopy cover for the city of 21.8%. This is supported by a detailed breakdown of how new planting could be distributed to deliver this objective.

4. In total, c.320 hectares of additional tree canopy could be established (about 450 football pitches); this would be equivalent to approximately 64,000 individual street trees[2]. The planting that is described by this study would not require new availability of land, precisely the opposite; it is a model based on the *current* land use. This is therefore an ostensibly ambitious but genuinely achievable goal that would deliver substantial benefits to the city. A proportion of this can also be achieved without tree planting, by changes to management and the growth of existing trees, particularly those that have been planted recently. This study explores the partnerships, leadership, investment, and innovative delivery that should support this ambition.

5. Manchester has a strong track record over recent decades of steadily increasing canopy cover that exceeds key regional and national averages. This success should be celebrated! The study also demonstrates that the distribution of tree cover varies across the city. This is due to both current land use as well as the historical development of neighbourhoods. This study highlights where additional tree planting could address this and help deliver thriving liveable places that are more resilient to climate change. Opportunities to plant and grow trees are widely available but many of the simpler solutions have been delivered already. Developing a deeply resilient, functional and loved treescape will require a significant culture shift, towards a collaborative and cross-sector approach; it will require broad public and political support; and the amalgamation of resources.

[1] Doick et al., The Canopy Cover of England's Towns and Cities: baselining and setting targets to improve human health and well-being

[2] Manchester currently has 2,170.6ha of tree canopy cover on 11,564.8ha of land

1.0 Scope

1.1 This report is the result of a study into the capacity of The City of Manchester to accommodate additional trees. The study looks at where the existing trees are, and the suitability of all land to support tree cover. It describes a future scenario that is achievable, and where resources would be required.

1.2 The many benefits provided by trees are explored in detail elsewhere and this report does not seek to re-establish a justification for tree planting in an urban context. It is noted that tree planting or natural regeneration must be appropriate to the location, and balanced with other objectives; there are places within the city where it is not desirable to establish trees. However, in general terms the evidence supports increasing tree canopy cover within cities. This study explores how and where that could be done in Manchester.

1.3 This work was commissioned by Manchester City Council and focusses on the 32 wards within the local authority area. It is acknowledged that the benefits provided by trees do not observe such boundaries; The City of Manchester is part of a family of authorities within Greater Manchester, which enjoy mutual benefits from the green infrastructure and strategic planning within the region. This report does not presume that Manchester City Council should, or even could, deliver all of its recommendations. Instead, it is intended to crystallise a shared vision within which the council can act as a leader, a catalyst, and a coordinator.

1.4 The starting point for this study is to model where trees are now. How many trees are there? Who owns them? What functions do they serve? Importantly, this exercise is not limited to council land, but covers the whole city. Secondly, the distribution of trees across different types of land is used to measure what level of tree cover is realistic within this city wherever such land types are found. Finally, an analysis of the composition of each ward is used to assess future tree planting opportunities, and where resources would need to be focussed to deliver them.

1.5 For simplicity, this report talks about tree planting, although planting is not the only way to increase tree canopy cover. References to opportunities or capacity for planting should be taken to mean increases in tree cover that might be delivered in a range of ways, some of which are explored briefly later in the report. The main alternatives to tree planting are natural regeneration and self-seeding, increases in the size of existing trees (especially young trees), improvement to the growing environment of existing trees to increase their potential, and changes to management practices such as pruning or pollarding.

1.6 The purpose of this study is not to define the maximum possible amount of trees that could be planted or grown across the city, come what may. It is to explore how tree cover could be enhanced by continuing the types of planting that are already observed across the city, in all areas; and it is to explore what role a wide range of stakeholders can play in this.

2.0 Methodology

2.1 This section describes the study that was done which underpins the analysis, recommendations, and the ward descriptions in the following sections.

Baseline analysis

2.2 The first part of the study was to map tree cover and make inferences about the land on which trees are growing, based on available datasets. The essence of the approach was to identify all land that is beneath a tree, and to categorise that land according to what it is used for, and what the ground is made of.

2.3 The process of land classification is designed to aggregate land with similar characteristics in order to draw reasonable conclusions about what could be done in other similar locations, and how. In particular, land classification is used as a proxy for four things:

(i) Who the key stakeholders are in that location?

(ii) What other priorities might exist in that location

(iii) How difficult it might be to increase tree canopy in that location

(iv) How much land is unavailable for planting irrespective of resources?

GIS mapping

2.4 The analysis was undertaken using GIS software and was based on three primary datasets: Ordnance Survey Mastermap®; Bluesky National Tree Map™; and Manchester City Council's own land ownership mapping layers.

OS Mastermap®

2.5 Mastermap® is the most detailed mapping product produced by Ordnance Survey. The polygons within this mapping product were used as the basic units of measurement for this study. This methodology assumes that the characteristics within any individual polygon are consistent.

National Tree Map™

2.6 Bluesky International Limited produces National Tree Map (NTM™) from high resolution national aerial photography, accurate terrain and surface data, and colour infrared imagery. The dataset includes canopy area polygons, which were used for this study.

Figure 1 National Tree Map™ example (Ardwick)

National Tree Mapping - © Bluesky International Limited.[3]

2.7 The dataset was processed to remove the distinction between individual trees, which it approximates, and a single tree canopy layer was generated for use in this study. This layer comprises areas of connected tree canopy, and individual trees or smaller groups of trees where they are growing in isolation.

2.8 NTM™ does not include trees that are less than 3m in height, which are therefore not included in this study. Being based on processing of aerial photography the dataset also tends to exclude very recently changes to the treescape, such as new trees that are too small to be captured by the methodology, or changes that post-date the aerial imagery used.

[3] Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, and the GIS User Community

Figure 2 Mastermap® and NTM™ define the basic 'units' used by this study

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National Tree Mapping - © Bluesky International Limited.[4]

Land Ownership

2.9 Manchester City Council provided mapping and registry data for land that it owns. Highways were also assumed to be under authority control and a small proportion of non-adopted highways was disregarded.

2.10 No further breakdown of land ownership beyond 'council land' and 'non-council land' was made.

Measuring Tree Cover

2.11 All measurements of tree cover are derived from NTM™. The basic unit of measurement used by this study is the *area of tree canopy* (typically measured in hectares). This measurement is based on the amount of 'overlap' between the tree canopy layer and other mapping layers.

[4] Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, and the GIS User Community

2.12 The measurement of tree canopy cover does not pay any regard for where a tree is growing. The amount of tree canopy that is above each land parcel was measured, irrespective of whether the tree is attached to that land or adjacent land. Trees that are large or leaning may therefore make significant contributions to the canopy cover on adjacent land.

2.13 In the example image below three trees are highlighted. The tree identified by a pale blue circle is wholly within a plot of land, therefore it would contribute entirely to the total figure for tree canopy within that plot. The trees identified by yellow circles are less straightforward.

2.14 The northernmost yellow tree in the figure below is growing between Smeaton Street and the Metrolink line; a proportion of its canopy area is above the highway, a proportion is above a grass verge, and a proportion overhangs the tram line. This tree would therefore be broken into three parts and counted separately. In this case, all parts of the tree are associated with transport networks, but some are above a soft verge, and some are above hard surfaces.

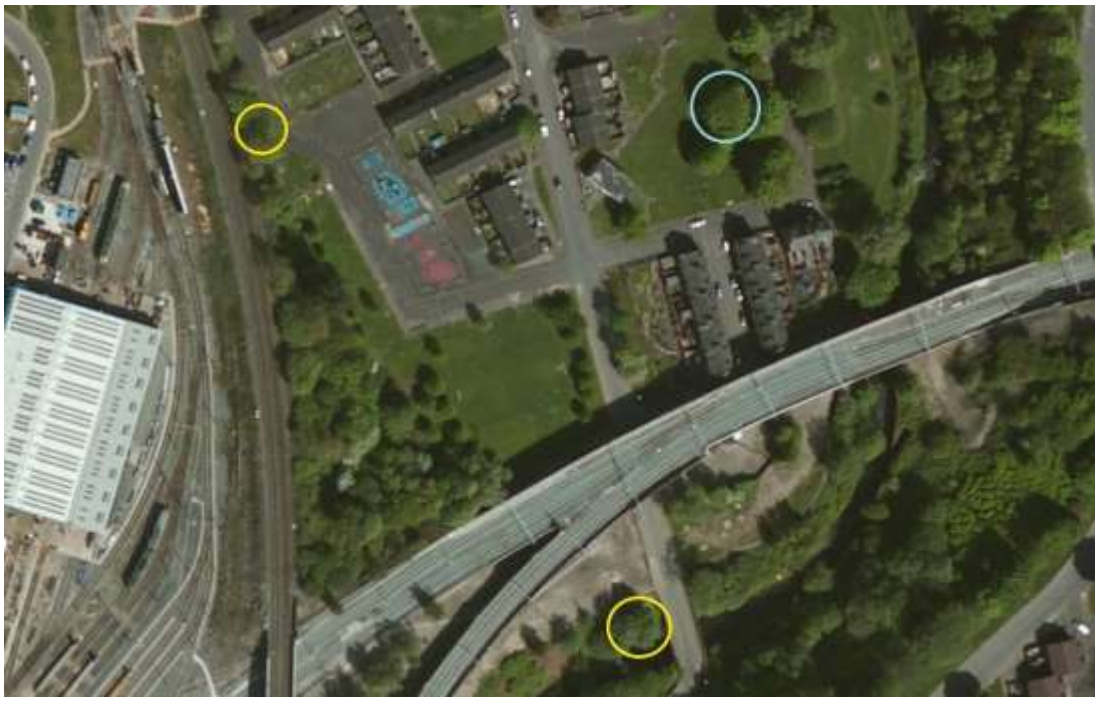

Figure 3 Aerial image illustrating tree canopy spread across adjacent land types

Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

2.15 The southernmost yellow tree in the figure above is growing in green space adjacent to Smedley Road and the River Irk. A proportion of its canopy is overhanging both and therefore it would contribute to the overall canopy cover measurement for a range of different land use categories.

Location of tree stems

2.16 The location of the stems of trees within their canopy spread was not estimated. There is no practical means to model this reliably at the scale of this study.

2.17 An assumption has been made that the number of trees actually growing within a parcel of land (i.e. whose stem is within that parcel) is directly proportional to the amount of tree canopy cover above that land category. This assumption could be weaker for some land types than others, and any such effects could vary between wards.

2.18 For example, are some types of land that are more likely to benefit from overhanging branches from adjacent but different land uses and less likely to actually contain trees (for example, hardstanding and pavements). This would tend to skew the assessment of the number of trees growing on that land. Under the methodology used, it would be possible for a land category to record a positive figure for tree canopy but have no trees actually growing within some of the constituent land parcels.

2.19 If the reason for any such disparity was due to an inherent difficulty in planting trees on that particular type of land (and therefore over-reliance on adjacent land to provide branch overhang), it is possible that this methodology would overestimate the capacity for tree cover on that land category. However, there are three reasons to discount this possibility as a significant weakness in the methodology:

(i) This study works towards an assessment of capacity and makes recommendations on that basis. It is reasonable to expect that tree planting would contribute to multiple land categories in broadly similar proportions to that observed in the baseline. Furthermore, where land already benefits from significant amounts of overhanging branches, no capacity for new tree cover would be recorded.

(ii) An analysis of land that is 'unsuitable' for tree planting[5] found a very low level of tree canopy cover. Since this category almost entirely comprises overhanging branches, the low figure gives reason for confidence in that the methodology is not excessively sensitive to this effect.

(iii) All measurements are based on areas, not on tree numbers. If the mapping exercise was repeated after a period of canopy cover change, any changes in tree cover comprising overhanging branches would be captured and could be compared to the baseline for the same land category.

Trees and Woodland

2.20 The combined tree canopy layer was subdivided into *Trees* and *Woodland* in order to give an approximation of the proportion of individually planted or grown trees and larger areas of contiguous tree canopy within the data.

2.21 All tree canopy was defined as individual Trees and then Woodland was identified using a range of data sources. For the purposes of this study, parts of the combined tree canopy layer were defined as Woodland if they appeared in any of the following:

(i) Ordnance Survey woodland parcels

(ii) Natural England Ancient Woodland Inventory

[5] See 'Suitability for planting' section below

(iii) Natural England Habitats of Principal Importance (Deciduous Woodland, Traditional Orchard or Wood Pasture and Parkland)

(iv) Forestry Commission National Forest Inventory

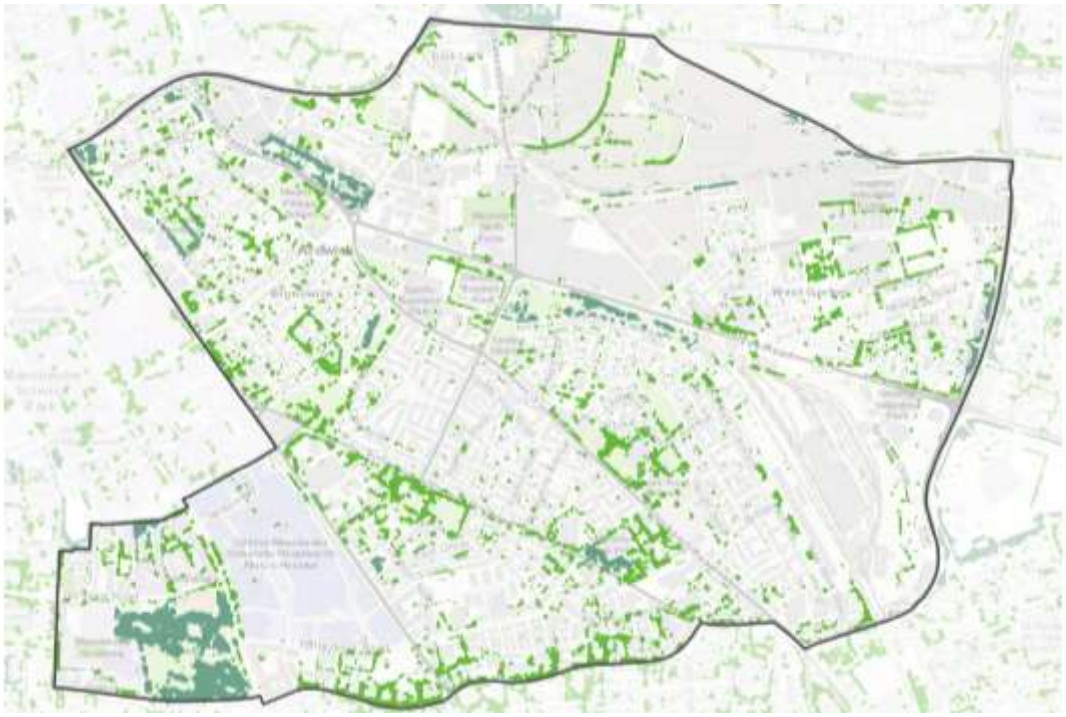

Figure 4 Sample of Trees and Woodland within the combined tree canopy layer (Ardwick)[6]

2.22 Whilst trees and woodland have differences in composition and characteristics that are self-evident, for the purposes of this study the primary distinction is that individual trees are unlikely to be capable of naturally regenerating, particularly in an urban context. Woodland and larger areas of tree canopy cover on natural or semi-natural ground can be expected to support a level of regeneration that, subject to appropriate management, would maintain the level of tree canopy cover without further intervention.

Land Use

2.23 Land Use is a reflection of what each parcel of land, including any structure or building on it[8], is used for. In this study, Land Use is used as a way of estimating two things:

(i) What competing priorities might exist on any given land parcel that would influence a reasonable ambition for tree canopy cover; and

[6] See Appendices for full version with Key and equivalent plan for Manchester

[7] Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, and the GIS User Community

[8] NB: Buildings and structures were later removed from this assessment (see 'Suitability for planting' below)

(ii) What stakeholder groups would be involved in making decisions about any given type of land and how might they be engaged.

2.24 Land use was classified on the basis of National Land Use Database[9]. The Land Use Nomenclature proposed by the Database was condensed into eight Land Use categories. This was done to aggregate land into a manageable number of categories whilst preserving meaningful resolution.

2.25 The eight definitions of Land Use derived from the National Land Use Database were applied to land parcels (polygons) as defined by Ordnance Survey Mastermap® (OSMM). These polygons were allocated to the Land Use categories on the basis of attributes within the Mastermap® dataset, as well as other datasets where available.

2.26 Not all Land Use categories were found in all wards. Only 7 wards contained any Agricultural land.

Table 1 Land Use classification used by this study

Land Use	Description	Source data
Agriculture	Agricultural fields and associated margins	OSMM
Parks and Recreation	Open space for recreation including public parks, sports pitches and golf courses	OSMM; OS Open Greenspace
Travel and Transport Routes	Roads, footpaths, pavements, railways, tramways and the airport, including verges, embankments and other land within the highway curtilage	OSMM; OS Zoomstack
Education and Healthcare Facilities[10]	Schools and associated playing fields, hospitals, universities, smaller healthcare facilities	OSMM; OS Zoomstack
Natural Environment	Natural grassland, water, woodland and river corridors, where not in formal open spaces or parks	OSMM

[9] National Land Use Database: Land Use and Land Cover Classification Version 4.4, February 2006 via https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/11493/144275.pdf

[10] Referred to as 'Community' on graphics at Appendix A

Land Use	Description	Source data
Private Gardens	Residential gardens, patios, driveways, communal gardens	OSMM
Hardstanding Areas	Other private land uses, including retail, commercial and industrial; car parks not associated with other land uses, and storage yards	OSMM
Other *[excluded from study]*	Unclassified land, including development in progress	n/a

2.27 The naming convention above is deliberately narrow in the way that it defines some land uses. For example, *Private Gardens* comprises all residential land, including dwellings. Features that could not accommodate support tree planting (such as buildings, or waterbodies) were filtered from the data at a later stage; it is therefore more useful for the naming convention to describe each land use in a way that reflects its capacity to support trees, rather than in broader terms (e.g. 'Private Gardens' rather than 'Residential').

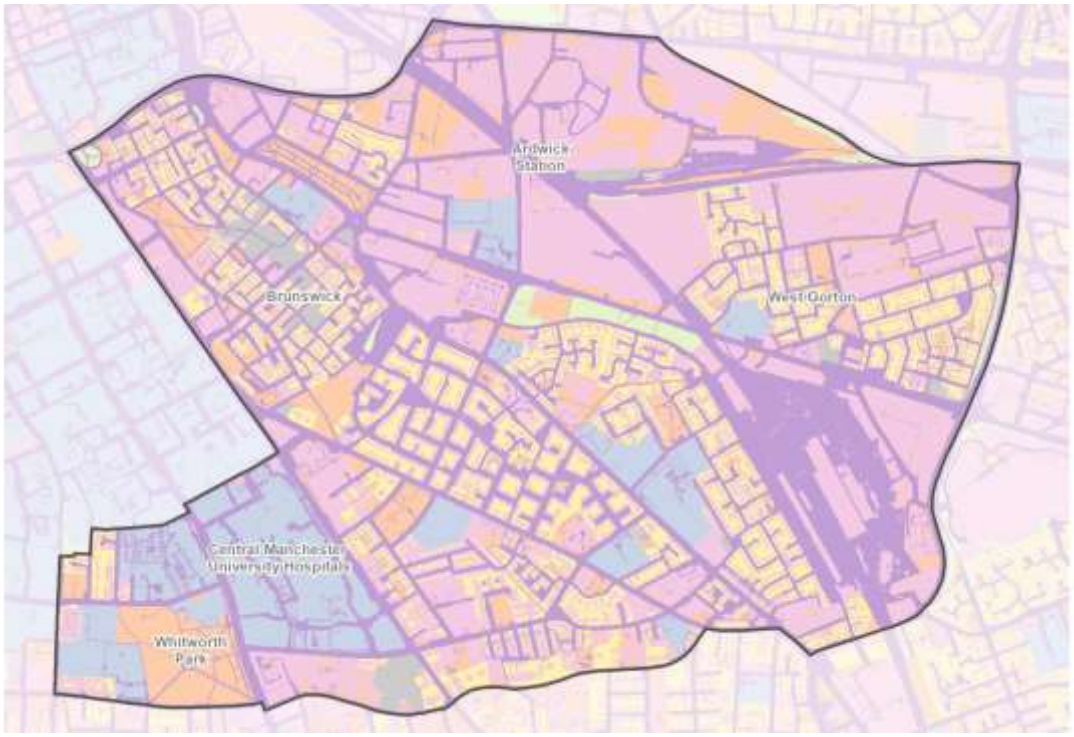

Figure 5 Sample of Land use mapping in Ardwick[11]

2.28 In all wards except six, Land Use classification covered more than 99% of the total ward area. In six wards the proportion of *Other* Land Uses, which were not included in this study exceeded 1%. This land was treated as unavailable for tree planting because of insufficient data to characterise it. This may lead to a slightly conservative estimate of tree planting capacity in those wards.

Table 2 Wards with highest proportion of unclassifiable Land Use

Ward	Proportion of *Other* Land Uses
Deansgate	4.4%
Ancoats and Beswick	2.7%
Cheetham	2.4%
Piccadilly	1.9%
Ardwick	1.6%
Whalley Range	1.1%

[11] See Appendices for full version with Key and equivalent plan for Manchester

Land Cover

2.29 Land cover is a description of what is actually on the ground, rather than what the location is used for or how it is managed. For example, grass might be found across a range of Land Uses, including sports, highway verges and gardens.

2.30 This study uses Land Cover as a way of estimating two things:

(i) Whether it might be *possible* to plant a tree in a location; and

(ii) How difficult and/or expensive planting might be.

2.31 A highly simplified model of Land Cover was employed. Broad Habitat Type mapping as part of the Manchester River Valleys project[12] were aggregated into three basic Land Cover categories: *Grey*, *Blue* and *Green*.

Table 3 Land Cover definitions

Land Cover	Broad Habitat Types	Description
Grey	Urban and Unclassified	Paving, buildings, roads, car parks
Blue	Water	Rivers, reservoirs, canals, ponds
Green	Agricultural Land, Greenspace, Semi Natural Grassland, Woodland	All soft landscape, semi-natural and otherwise unsurfaced land

[12] See https://mappinggm.org.uk/gmodin/?lyrs=v_tep_ecosystem_services_2019#os_maps_light/11/53.5138/-2.1890 GM Ecosystem Service Opportunity > Broad Habitat type

Figure 6 Sample of Land Cover mapping in Ardwick[13]

Suitability for planting

2.32 Land parcels on which there was strong confidence that tree planting would not be possible or desirable under any circumstances was identified. The purpose of this final step in characterising the baseline was to provide a means of filtering results so that only the land that is actually capable of supporting tree cover appears in the data.

2.33 This filtering removed things like buildings, bridges, water, roads and railway lines from the data so that only those parts of a land parcel that could contain trees were measured. For example, within a residential property, the garden would be included but the dwelling would be excluded.

2.34 Land that is Suitable for planting in this analysis can be understood to mean all land on which tree planting is theoretically possible. It should not be taken to mean that *all* Suitable land can or should be covered with trees.

[13] See Appendices for full version with Key and equivalent plan for Manchester

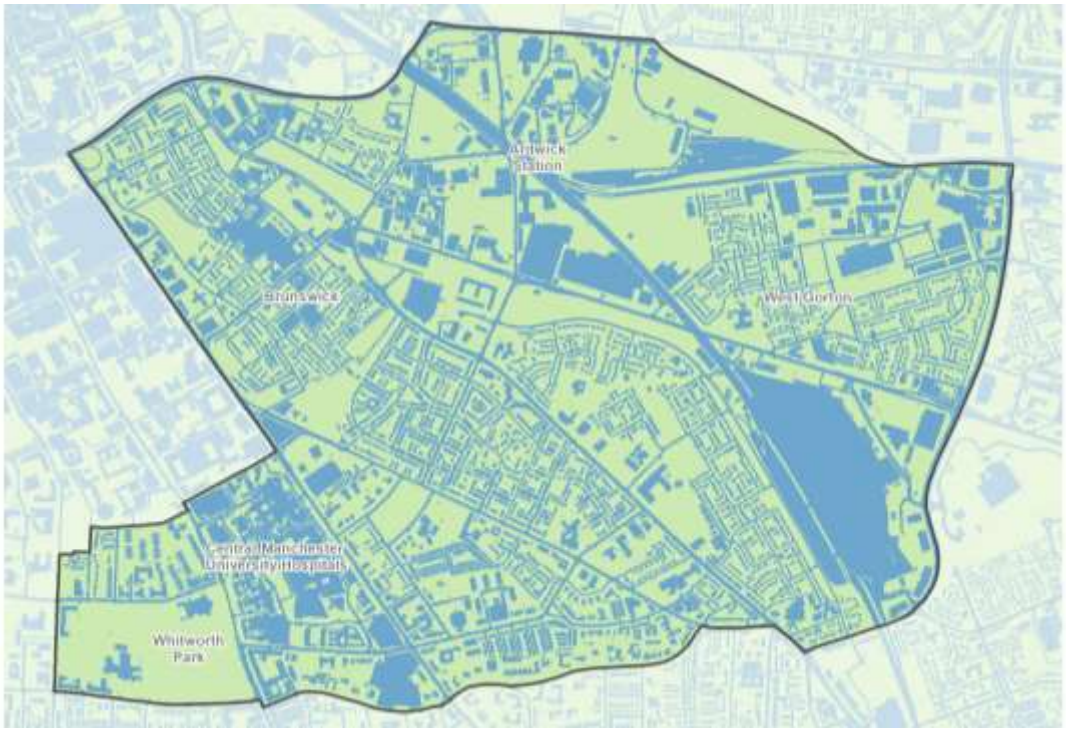

Figure 7 Sample of Suitability mapping within Ardwick[14]

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2.35 The suitability assessment introduces an additional variable to this study, which would need to be corrected for in any future repeat. For example, if the amount of Unsuitable land increased in a ward due to significant development, this would reduce the capacity for tree planting and any local targets might need to be adjusted downwards.

2.36 The benefit of this filtering process is that the results of the analysis are more relatable and accessible because they more closely describe the parts of sites that, by a common-sense interpretation, could support existing or new trees. For example, figures for tree cover along transport corridors describe the proportion of the pavements, verges and embankments that are under tree canopy, whilst excluding the actual road surface, railway or tram line, which could not be planted. Similarly, the figures for residential land exclude buildings and report only the proportion of the garden that support tree cover.

2.37 The assessment of suitability was made on the basis of the Manchester River Valleys project habitat mapping, using the Sub-habitat types. Sub-habitat types that prevent the establishment of new trees were defined as Unsuitable. Those on which tree planting is possible (albeit not necessarily desirable) were defined as Suitable.

Table 4 Suitability for tree cover, based on Sub-habitat types

[14] See Appendices for full version with Key and equivalent plan for Manchester

Suitable	Agriculture, allotments, amenity, institutional grounds, park or garden, private garden, religious grounds, sports grounds, transport, semi-natural grassland, hardstanding, coniferous woodland, mixed woodland, non-coniferous ancient woodland, non-coniferous woodland
Unsuitable	Unclassified, building, footpath, rail, road or track, canal, marsh, pond lake or reservoir, river or stream, airport

2.38 Across all Unsuitable land, there is an average rate of 1.5% tree canopy cover. This comprises trees that are overhanging from adjacent Suitable land and possibly a small number of trees growing in locations that would be regarded as Unsuitable for planting, such as out of river or canal walls. This low rate gives confidence that this component of the treescape is not large enough to significantly affect the results of recommendations of this study. However, it should be noted that in real terms, this does represent a large amount of tree canopy which benefits the city's buildings, transport links and waterways.

Tree planting capacity

2.39 The characteristics of the 32 wards in The City of Manchester vary significantly. The total size, proportions of different land uses, and the presence of large individual sites influences the composition of wards in terms of Land Use, Land Cover and Suitability for tree cover. In the absence of significant future changes in land use, which are not the subject of this study, the theoretical capacity for tree canopy cover is a function of these characteristics.

2.40 The underlying approach to quantifying capacity follows three steps:

(i) **Define** a reasonable ambition for tree canopy cover as a percentage for each class of land, based on what is measured for that class across all wards and using professional judgement and experience;

(ii) **Review** each ward in detail and make adjustments as appropriate, to reflect significant individual sites, local characteristics, or overriding ecological objectives that influence what would be appropriate in that ward;

(iii) **Extrapolate** from the resultant figures, using the proportions of each land class within each ward, to model what a future tree canopy distribution could look like, and how new planting should be distributed within each ward to achieve it.

2.41 The analysis of capacity was generally handled on the basis of *percentage canopy cover*. This equates to the overall proportion of land within each category that is beneath a tree, irrespective of whether that tree is large or small. This approach was preferred because it is easier to visualise land with a given *percentage* of tree canopy cover than a given *area* of tree canopy in hectares, particularly when that canopy may be relatively diffuse.

2.42 For example, the average canopy cover in Private Gardens is 19%. The capacity for this type of land in this study is **defined** as 20%, meaning a modest increase for an average ward. Harpurhey has canopy cover in Private Gardens of 10%. On **review**, it is noted that the ward contains a significant proportion of terraced housing with small yards that cannot accommodate trees. For this ward, the capacity is amended downwards to 15%, to better reflect the distribution and type of gardens and the amount of tree planting that is actually feasible. An increase of five percentage points is used as the basis for **extrapolating** to a possible future scenario, using the current amount of garden space in the ward.

2.43 Wherever estimates of the number of *individual trees* are given, they are based on actual canopy area and calculated using a defined tree size or spacing. This approach was not used to estimate the number of existing trees; only to generate a guide to the number of new trees that would be required to deliver additional tree canopy cover, if this was done entirely by planting specimen trees.

Table 5 Tree canopy and individual tree area conversion

1 hectare	10,000m^2
Typical urban tree branch spread	4m (radius)
Canopy area per tree	50m^2
Trees per hectare	200

2.44 The above approximation assumes a representative size for middle aged and mature trees based on an 8-metre crown diameter. A significant number of trees would exceed this size, if allowed to grow but equally, a high proportion would be either incapable or prevented from achieving this size due to above or below ground constraints. It should be noted that this approximation describes open grown trees and is not reliable for woodland planting, which is typically done at higher planting densities and results in a large number of trees, each with a narrower form. Woodland and group planting is best described in terms of hectares.

2.45 The total canopy cover in Manchester is 2,170.6 hectares. This comprises an estimated[15] 281,692 individual trees (excluding saplings and very small trees). On this basis, the average tree in Manchester covers approximately 77m^2. This supports 50m^2 as a reasonable projection of canopy cover per tree, which may be slightly conservative in the long term.

Ward tree canopy baseline

2.46 A measurement was taken of the amount of land in each ward within ten *Land Class* definitions, and the proportion of this *Land Class* that is currently under tree canopy.

[15] Based on Bluesky National Tree Map™

2.47 A *Land Class* is defined as any unique combination of a *Land Use* and a *Land Cover*, which is *Suitable* to support trees. *Land Classes* are the basis for the modelling of future tree canopy cover in this study. Except for 'Green Agriculture', all *Land Classes* appear in all wards.

2.48 The examples given below are not exhaustive but give an indication as to some of the more common types of land that would fall under each Land Class.

Table 6 Land Classes included in this study

Land Class	Examples
Green Agriculture	Grazed land, crops, hedgerow on farmland
Green Parks and Recreation	Public parks, sports pitches, golf courses
Grey Parks and Recreation	Footpaths, paved areas and car parking associated with public parks and sports; playgrounds
Green Natural Environment	River banks, woodland, meadow
Green Travel and Transport Routes	Soft verges, railway embankments, amenity grass around footpaths
Grey Travel and Transport Routes	Pavements, pedestrianised areas
Green Private Gardens	Residential gardens, communal gardens
Green Education and Healthcare Facilities	School fields, landscaped hospital grounds
Grey Education and Healthcare Facilities	School playgrounds, hospital car parks
Grey Hardstanding Areas	Logistics yards, paved areas around commercial buildings, internal courtyards

2.49 It should be noted that the above land classes do not include any buildings. All Unsuitable land is excluded from the analysis and the land classes that were measured and assessed only comprise the Suitable land within that class.

2.50 Some land classes (i.e. possible combinations of *Land Use* and *Land Cover*) were measured but are excluded from the results because they do not occur or are entirely Unsuitable for planting.

Table 7 Land Classes excluded from this study

Land class	Reason for exclusion in data
Blue Land Cover (all Land Uses)	Land Cover (i.e. water) defined as is Unsuitable for planting trees across all Land Uses
Grey Agriculture	Category comprises buildings, therefore entirely removed from data as Unsuitable for planting
Grey Natural Environment	No land in class
Grey Private Gardens	Category comprises buildings, therefore entirely removed from data as Unsuitable for planting. Not possible to differentiate small areas of patio and driveway in the data. Gardens inherently Suitable for planting therefore aggregated under Green Land Cover.
Green Hardstanding Areas	No land in class
Other (Land Use)	Limited data about class, therefore Land Use defined as Unsuitable for planting, irrespective of Land Cover

Modelling the capacity for additional tree cover

2.51 The current tree canopy cover was measured for each Land Class on a ward-by-ward basis.

2.52 The highest performing ward in each Land Class was identified (i.e. with the highest proportion of tree canopy cover in each Land Class). The mean average, range, and distribution of ward scores was also calculated.

2.53 The analysis of the ward data was combined with professional judgement to develop a Target tree canopy cover for each Land Class. Targets were identified on the basis that:

(i) There is a general ambition to increase tree cover

(ii) They should represent a modest improvement on the average

(iii) No target should exceed the 'highest performing' ward for the land class

(iv) Targets should not require significant changes in land use

2.54 Targets were set for each Land Class that are within the range defined by the ward average and the highest performing ward. Where in this range each target was set was determined on the basis of the current distribution of ward scores within the range, and professional judgement about where underutilised planting opportunities exist.

Ward target modifiers

2.55 Each ward was reviewed against the Targets that were set for the Land Classes across the city. Where systemic or significant constraints or opportunities to planting were identified in that ward, a *Target Modifier* was introduced.

2.56 Target Modifiers are simply a numeric variable within the data to suppress or augment the Target for a given Land Class within that particular ward. In other words, they increase or reduce the Target by a defined number of percentage points. Justifications were recorded wherever Target Modifiers were introduced.

2.57 For example, a Target Modifier of -5% was applied to Green Parks and Recreation land within Ancoats and Beswick. This is because the sports pitches at the Etihad campus represent a significant component of this Land Class within the ward; this land appears within the data, but it could not be planted. In Chorlton, the Target for Natural Environment was modified by -10% to reflect the presence of meadow habitats at Chorlton Ees Nature Reserve where substantial increases in canopy cover may be undesirable for ecological reasons.

2.58 Most ward Target Modifiers had the effect of suppressing rather than increasing Targets to take account of local constraints, including moderating unrealistically large increases. In a smaller number of cases, upward Target Modifiers were also applied. These were where no statistical capacity was found but specific planting locations were identified by desktop review, such as street tree planting in Chorlton and Rusholme, school field planting in Chorlton Park, and green space planting in Piccadilly.

A target for Manchester

2.59 The modified Targets for each Land Class were compared to the actual current tree canopy cover and the amount of additional tree canopy that would be required (i.e. that could be accommodated) to achieve each of them. This was calculated as a function of the amount of that Land Class in each ward. These figures were then aggregated at the level of Land Use, Ward, and City.

2.60 The existing tree canopy which is on Unsuitable land (for example branches that overhang buildings or railway lines) was re-incorporated into the data at current levels to model a future scenario based on the maintenance or replacement of existing trees, plus additional tree canopy distributed across wards and Land Classes as per the findings of the study.

2.61 The resultant calculation generates a figure for city-wide canopy cover that comprises a calibrated tapestry of smaller, variable component parts. This figure not only represents an aspiration but also a reliable description of capacity.

Manchester City Council

2.62 The proportion each Land Class that is under the control of Manchester City Council was also approximated. This is to provide a basis for estimating the proportion of the recommended increase in tree canopy cover that might be delivered or managed by the council. However, this analysis is limited in its application because it assumes equivalence between council and non-council owned land in terms of rates of tree canopy cover and capacity. Neither assumption has been tested rigorously; for example, whether privately owned or council owned residential gardens have similar levels of tree cover was not investigated. However, if the council owns 50% of a particular land class within a ward, it appears reasonable to take 50% as the basis for approximating how much of any increase in tree canopy might be delivered on council land.

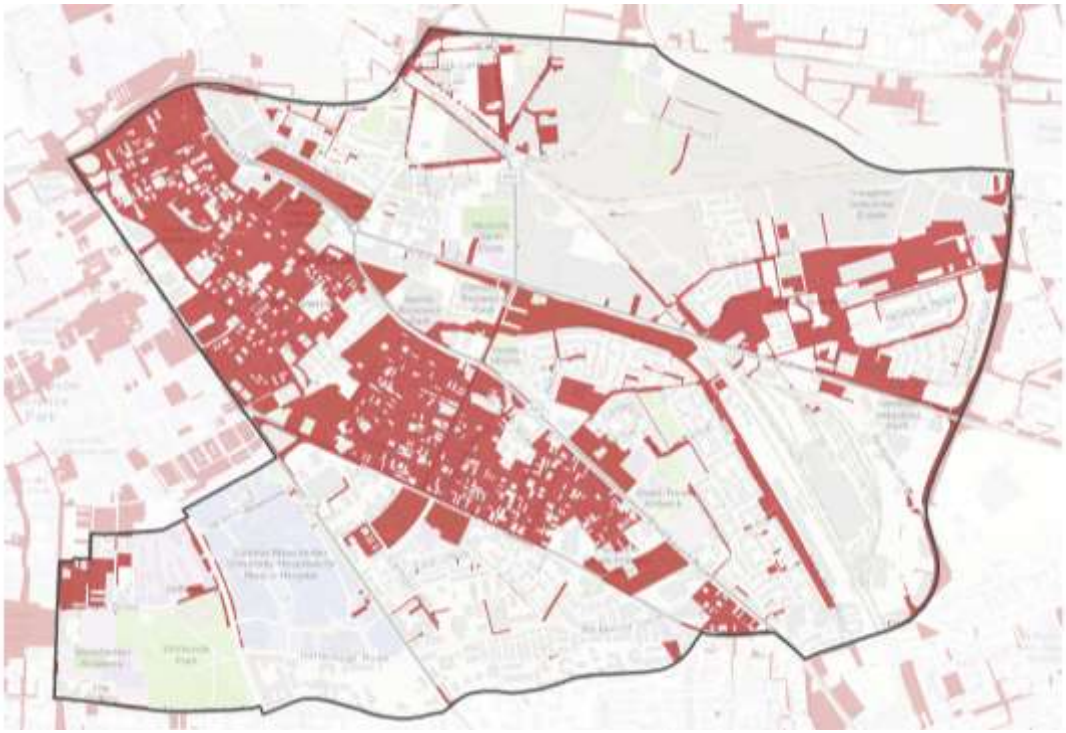

Figure 8 Sample of Land ownership mapping within Ardwick[16]

[16] See Appendices for full version with Key and equivalent plan for Manchester

3.0 Results and analysis

3.1 This section provides a summary and interpretation of the results at the city level. The following section and Appendices give more detail on individual wards.

Tree canopy cover analysis

3.2 The canopy cover across all of The City of Manchester is currently 18.8%. This is above average for large towns and cities in England, which has been reported to be 16.4%[17].

3.3 Analysis of the Bluesky National Tree Map™ dataset for the city found that it contains 281,692 trees. This is likely to be a reasonable estimate for larger trees but may underestimate smaller saplings and dense areas of trees in woodland. This figure agrees well with the estimates of canopy area and average tree size produced by other methods within this study.

3.4 The overwhelming body of evidence is that trees are beneficial to human health and wellbeing, environmental and ecosystem resilience, and the quality of life, place and economy in urban environments. Whilst trees may be found in inappropriate locations or present a risk of harm, these represent a tiny minority. The services trees provide are complex and multi-faceted, and they do include benefits to wide catchments, such as via carbon sequestration or water management. However, most are strongly associated with local effects. For the purposes of a *population level* study it is therefore reasonable to make three assumptions:

(i) That trees are inherently beneficial

(ii) That canopy cover is a reasonable proxy for benefits and services

(iii) That tree location is a reasonable proxy for *who* benefits

<u>Comparison to other analyses</u>

3.5 The headline finding of 18.8% tree cover is within the range of results found by similar studies over the past 15 years. A Red Rose Forest Survey in 2007, and two different i-Tree Canopy assessment methodologies in 2016/17 found tree cover of 21.1%, 17.0% and 15.5% respectively in Manchester. The boundaries and methodologies used in these studies differ from the current study and the figures are therefore not directly equivalent, but these studies are relatively recent which suggests some reliability.

3.6 This analysis does not use plot sampling or mapping data to identify the extent of tree cover; it is based on stereo aerial photographs which are processed to capture all trees above 3m in height. Modern digital technologies such as this allow analysis with a greater resolution and coverage than previous assessments, which tend to either focus on mapped habitats such as woodland, or on plot sampling and extrapolation.

[17] Doick et al.,The Canopy Cover of England's Towns and Cities: baselining and setting targets to improve human health and well-being

3.7 One benefit of mapping and measuring all trees is that there is no margin of error produced by extrapolation in the results. In terms of canopy cover assessment, the methodology used in this study is therefore likely to produce both more reliable and more accurate figures. This is especially useful when analysing smaller tree populations at the local level, where margins of error produced by statistical models can be more problematic. The primary shortcoming of this approach is that less is known about each tree (such as species and condition) than in some other methodologies, such as i-Tree Eco assessment. Combining the data produced by different assessments and relying on both to generate an evidence base for decision making is therefore a powerful approach.

3.8 An i-Tree Eco assessment for Greater Manchester was reported in the *All Our Trees Greater Manchester Tree and Woodland Strategy*. This includes a figure of 15.7% canopy cover across Greater Manchester, as well as detailed analysis of species composition, condition, and ecosystem services. The i-Tree study figure was lower than the 18.8% figure for the city of Manchester found by the current study. It is not known whether this is due to an increase in tree cover; a methodology that captured a lower proportion of existing trees and/or maps their size less accurately; or simply that the canopy cover in The City of Manchester is higher than in other parts of Greater Manchester. There are reasons to think that these may each be partly responsible for the difference.

3.9 There is a general historic upward trend in tree cover in England. The National Inventory of Woodland and Trees (NIWT), before it was discontinued in 1999, reported an increase in woodland cover in England from 7.3% in 1980 to 8.3% in 1998. The North West was relatively low in this regard, with only 6.8% woodland cover, but also experienced an increase of approximately one percentage point over the same period. By contrast, Greater Manchester experienced a 1.5% percentage point increase from a much lower base of 2.1%, an increase of about 100 hectares per annum over the period.

3.10 In 2016, the National Forest Inventory (NFI), the successor to the NIWT, reported 16.5% tree cover in urban areas in England. Of this, non-woodland trees comprised 11% of land area, approximately two thirds of overall urban tree cover. The NFI reported woodland cover in Greater Manchester as 7.8. Whilst the definitions used for woodland are not exactly the same between studies, the figures appear to suggest pattern of steadily increasing tree cover and that the city of Manchester tends to outperform the average for at least the region, if not England[18].

[18] This study used a somewhat broader definition of woodland than the NFI and found 9.6% across the city and a roughly 50:50 split between woodland and non-woodland trees.

Distribution of trees in The City of Manchester

3.11 The distribution of trees, and associated health, amenity, environmental and ecological benefits, is highly variable, both between wards, and also land uses. How often a person encounters trees in Manchester depends heavily on where they live, what they do, and how they travel.

Tree canopy cover

3.12 Canopy cover is the measure of how much land, viewed from above, is covered by tree branches, leaves, and twigs. This rate varies significantly across the city. A person standing in Didsbury West is almost six times more likely to be under a tree than a person standing in Deansgate. There is, of course, significant variation in land use across the city and it is not surprising that the city centre wards of Deansgate and Piccadilly have the lowest tree canopy cover, because they are also the most densely built. However, it remains the case that there is a significant disparity between the most and least tree-covered wards. If the two city centre wards are excluded as outliers at the lower end of the scale, the next five wards with the lowest canopy cover all have less than half the canopy cover of each of the top five wards.

Table 8 Relative levels of tree canopy cover in selected wards

Lowest canopy cover[19]	Highest canopy cover
Moss Side (7.4%)	Didsbury East (26.5%)
Cheetham (9.0%)	Whalley Range (27.7%)
Ancoats and Beswick (11.0%)	Higher Blackley (27.9%)
Ardwick (11.2%)	Chorlton (28.7%)
Hulme (12.0%)	Didsbury West (30.3%)

[19] Excluding city centre wards Deansgate (5.1%) and Piccadilly (5.7%)

3.13 It is not reasonable to assume that all wards 'should' have the same level of canopy cover, or to form a strategy on that basis. The amount of available space for tree planting varies across of the city and the level of tree canopy cover that might be regarded as 'full' should be expected to vary from place to place according to a range of factors. Within the city, the data does show varying levels of canopy cover. The headline figures are useful as a starting point, but to understand them we must establish where the variation is due to differences in opportunity and capacity, and where it is due to differences in practice. In other words, where this variation describes places that trees *cannot* be planted, and where it describes places that trees *could* be planted.

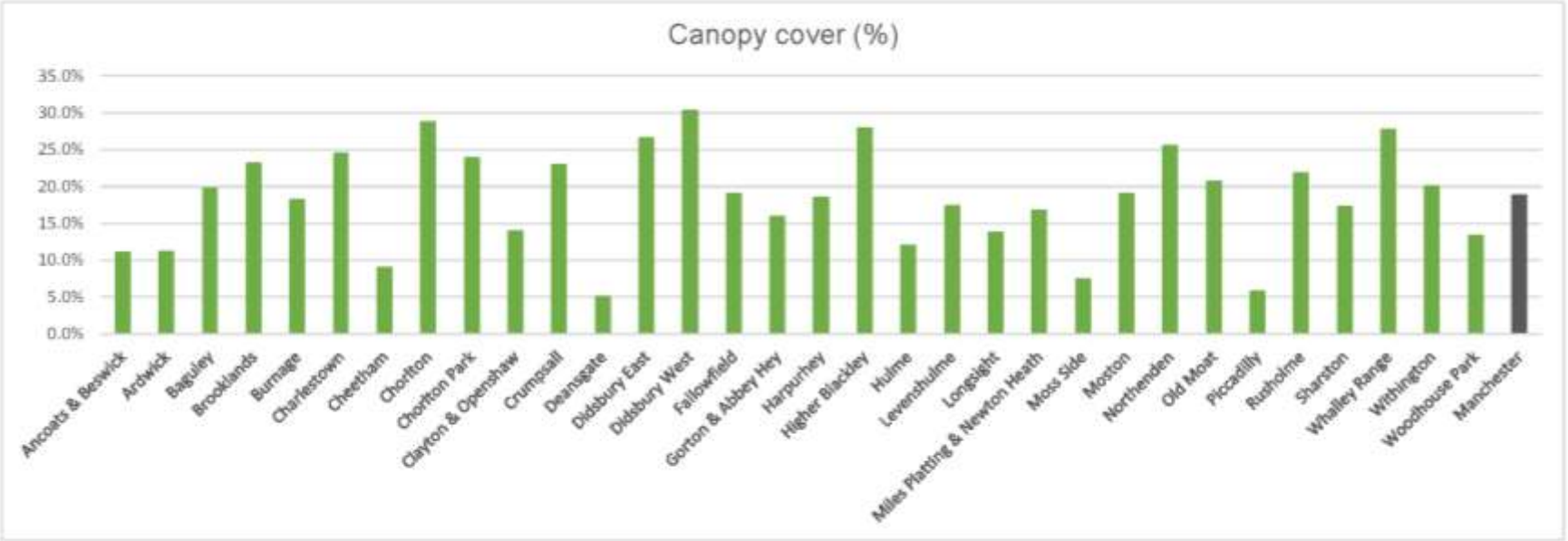

Figure 9 Tree canopy cover by ward

3.14 The treescape makes an important contribution to the quality of the city's offer, its cultural and economic status, and the wellbeing of its people. Given the many benefits that trees provide, their distribution may influence the delivery of those benefits to people. Planting strategy should therefore target specific need and benefits, as well as the quantity of trees. *Where* trees are planted matters because the particular benefits they provide are often closely aligned to their location.

Suitability and Utilisation

3.15 To understand the current distribution of tree canopy, and the extent to which different parts of the city have realised their respective potential, it is helpful to estimate the amount of space that could be planted with trees and compare this to the actual amount of tree cover. Whether land could theoretically support trees is defined in this study as 'Suitability'. Suitable land excludes places where tree planting is not possible, such as the footprint of buildings, roads, railways and water. The total amount of Suitable land is not equivalent to the overall tree canopy capacity, because it would not be appropriate to plant trees in every *possible* space. However, by comparing the space in which a tree could be planted to the actual number of trees, it is possible to compare wards and identify trends.

3.16 The graph below compares the theoretical maximum amount of land that could be planted with trees, ignoring all other priorities and land uses, to the actual amount of current canopy cover. Suitable land significantly exceeds the actual tree canopy. This is expected, because in reality, many places where a tree could theoretically be planted are used for other purposes that preclude tree planting.

3.17 Figure 10 shows that the spread of Suitability between wards is relatively narrow. Most wards have a broadly similar proportion of land that is potentially suitable for growing trees. Of 32 wards, the vast majority (24 wards) are within the range 67% to 78% Suitability. There is one ward that is a slight outlier at the upper end (Higher Blackley has 83% Suitability); four wards with c.57% Suitability; and three wards with lower than 50% Suitability. This indicates that the variability in tree canopy cannot simply be explained by variation in the amount of Suitable land.

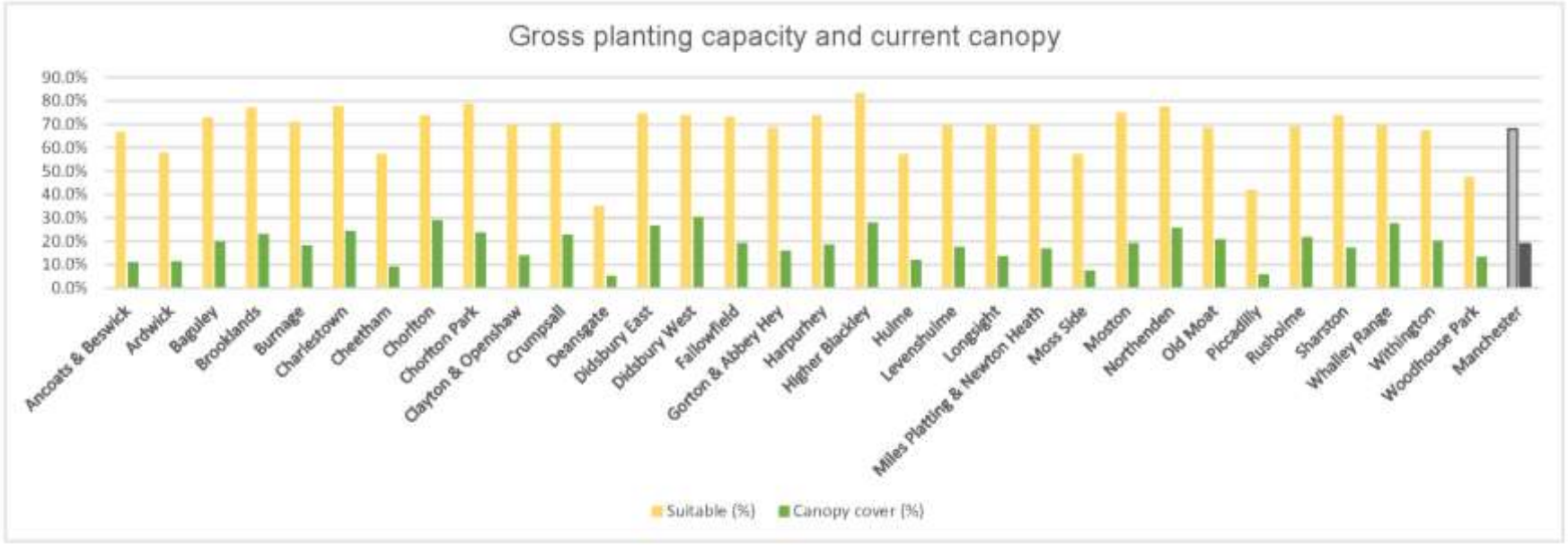

Figure 10 Gross planting capacity and current canopy by ward

3.18 If every ward had a similar land composition and approach to tree planting, it would be expected that tree canopy cover would track Suitability more closely. However, the data shows that this is not the case. Local factors must play a role in determining this difference. To illustrate this variability, Figure 11 shows the utilisation of Suitable tree planting space in each ward. The term 'Utilisation' here refers to the proportion of those suitable locations that have been planted. It is effectively the rate of *conversion* of Suitable land into tree canopy. It is clear from Figure 11 that the Utilisation of potentially suitable land varies between wards.

3.19 The reasons for this variability in Utilisation are complex and beyond the scope of this study, which focusses on characterising the capacity for new planting. However, wards with notably low Utilisation tend to include those with low canopy cover where planting is more technically challenging, for example due to a high proportion of paved rather than green space.

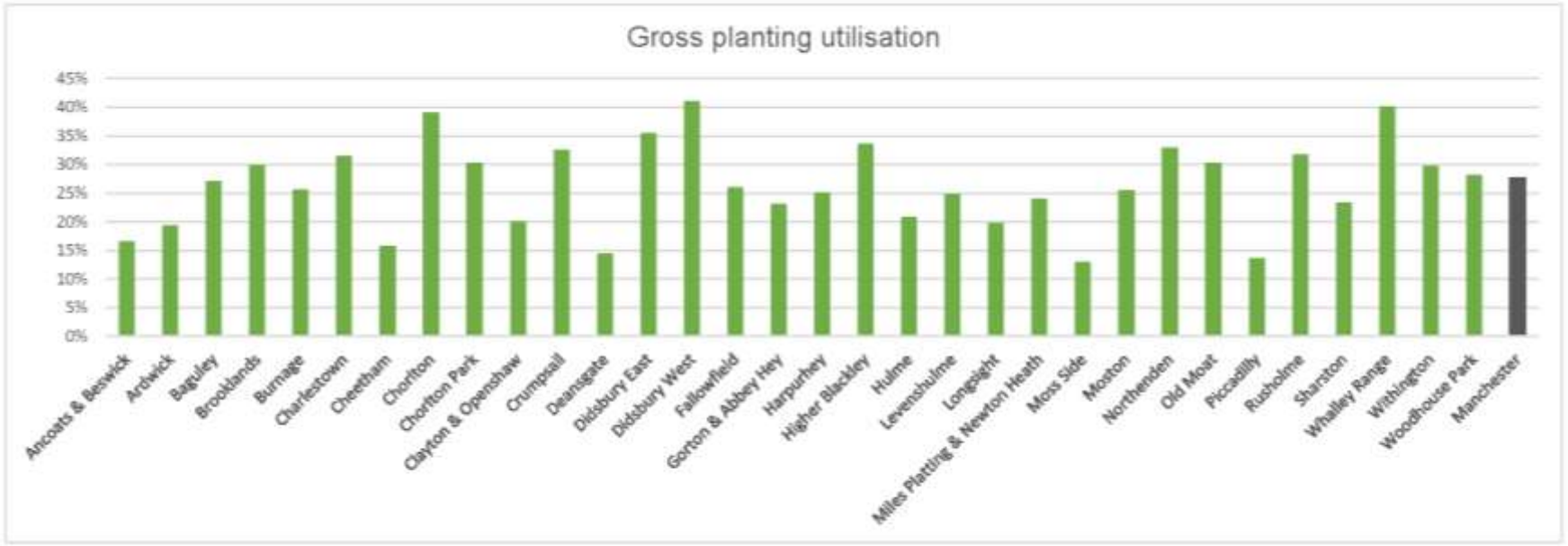

Figure 11 Utilisation of gross suitable land for tree planting by ward

3.20 The above graph is essentially a representation of how likely a possible planting location is to contain a tree, within each ward. The highest Utilisation rate is in Didsbury West. In this ward, 41.1% of all land that could theoretically support trees, does. This is an impressive figure because this is a *gross* assessment; it does not take competing land uses into account or the fact that there are significant areas where tree planting may be possible but not desirable. This point demonstrates a significant factor in why Didsbury West has the highest canopy cover of any ward; it does not simply have more opportunities and capacity for tree planting, it is successful at converting opportunities into actual trees.

3.21 If all wards planted a similar proportion of their available Suitable land, irrespective of ward size, the above graph would be roughly flat. The fact that it contains significant variability demonstrates that the history, culture, land use, ownership and cost of planting within the different wards must significantly influence tree canopy cover.

3.22 It is important that in seeking to increase tree cover in appropriate locations we use the evidence from this study, which shows where there is a gap between suitability and utilisation, together with an understanding of any local issues which may impact the utilisation of suitable tree planting locations.

Figure 12 Sample of planting Suitability and existing tree canopy cover mapping[20]

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National Tree Mapping - © Bluesky International Limited.[21]

[20] See Appendices for full version with Key and equivalent plan for Manchester

[21] Esri, HERE, Garmin, Interpam, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), © OpenStreetMap contributors, and the GIS User Community

Tree ownership

3.23 This study has not modelled tree ownership in detail, but it is a relevant factor in both the distribution of existing trees and also the possible pathways to new tree planting. For example, home ownership may influence attitudes to tree planting because it could influence the liability for management and also permission to plant.

3.24 A high level of public ownership of land within a ward may identify areas in which the council would have greater control over the outcome and/or delivery of planting strategies. However, it would also be associated with a greater cost and responsibility for tree management within those wards.

3.25 The figures in the table below are based on the proportion of land that is owned and controlled by Manchester City Council. This is heavily influenced by a relatively small number of relatively large parks, cemeteries, and green spaces, such as Boggart Hole Clough and Heaton Park. Wards containing such spaces tend to have a relatively large overall proportion of council owned land. It therefore should not be inferred in wards with high council land ownership that the council has a significantly higher level of influence or control over the treescape than in other wards. In particular, the level of council ownership in places where people live, travel, shop and work may be relatively similar between wards, even where the data appears to show significant overall differences due to large sites. However, this analysis does give a rough indication of the overall proportion of land that is under public control and where the council is likely to be a more or less significant actor in the pursuit of tree planting objectives.

3.26 An analysis of MCC land using Bluesky National Tree Map™ data was undertaken to estimate the number of individual trees on council land and corroborate the wider capacity assessment. This found that approximately half of all trees are under council ownership (52.4%[22]). This appears to be inconsistent with the 28.3% council ownership of land, but this difference is likely to be explained by the relatively high levels of tree cover in large parks and green and natural spaces, which tend to be under council ownership.

[22] According to this analysis, there are 114,551 trees on land owned by Manchester City Council

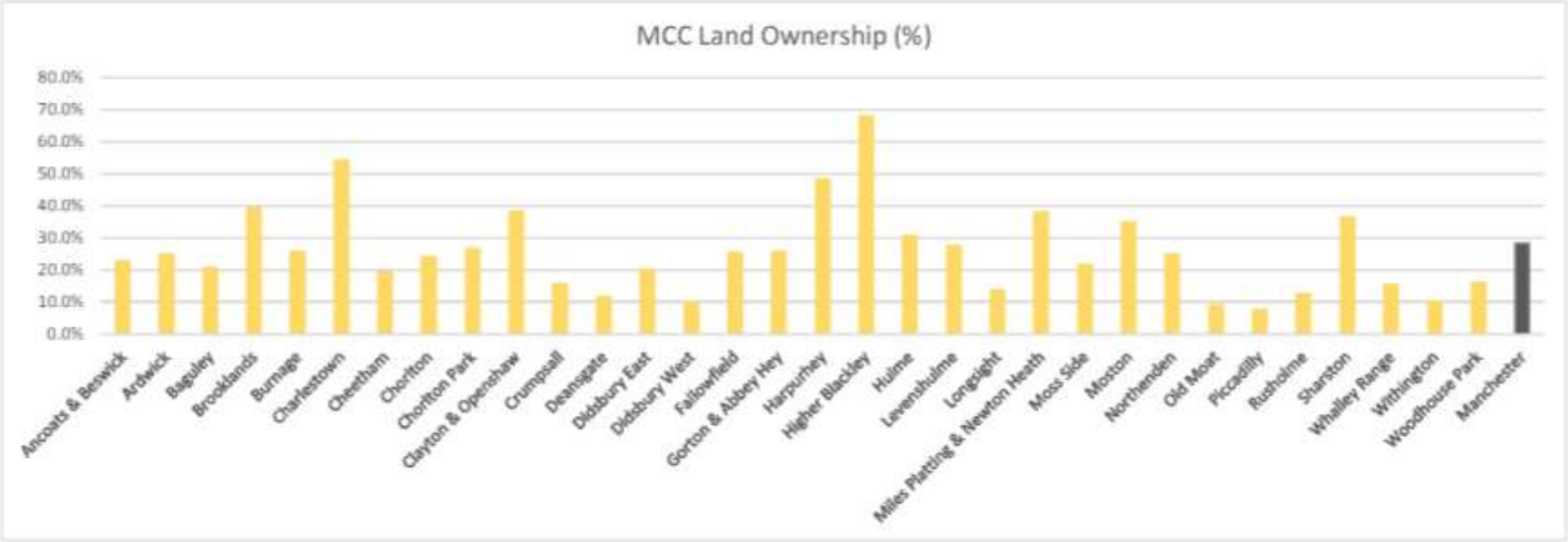

Figure 13 Amount of land owned by Manchester City Council by ward

3.27 There are 9 wards with greater than 30% council ownership (the mean average across the city being 28.3% and all other wards being below this). Of these, 6 (Charlestown, Clayton and Openshawe, Harpurhey, Higher Blackley, Miles Platting and Newton Heath, and Moston) are in the top ten wards with the largest real terms capacity for tree planting. Wards with low council land ownership tend to have lower capacity for tree planting[23]. Whilst this correlation does not take account of where trees are within the ward, it appears to emphasise that the council has a significant role to play, both in the delivery of tree planting on its own land, as well as in a leadership and coordination capacity.

[23] With the notable exception of Woodhouse Park, which has a large real terms capacity mainly because of its large size, but does not have high council land ownership

Woodland and Non-Woodland trees

3.28 The composition of the treescape is variable across the city, particularly in terms of whether most trees are growing as individuals or within woodland. It is not straightforward to measure this definitively but using a replicable methodology, all wards were modelled according to the proportion of these two components in the treescape. Deansgate has the highest proportion of individual trees and Higher Blackley has the highest proportion of woodland.

3.29 These totals do not necessarily translate into number of trees or amounts of woodland, but do give an indication as to the composition of the treescape, and particularly the amount of connected tree canopy and land that is used for tree growing, as opposed to land that happens to be covered by trees. This distinction is partly useful as a means of estimating the possible management approach and costs, but it also speaks to land use. Woodland and larger areas of plantation or tree groups require land to be used primarily for tree growing, albeit that this land may perform a range of other functions such as for recreation, garden, or sports. Individual trees, such as those planted within pavements may cover a large area but tend to occupy a very small amount of space at ground level.

3.30 Within a mature and well-developed city like Manchester, the opportunities for new woodland creation are limited. There is very little greenfield land, and brownfield land is subject to a large number of competing priorities. In the current policy and commercial context, it should not be assumed that changes in land use will deliver any significant increase in woodland within the city.

3.31 There are some opportunities to increase woodland cover, which tend to be by growth, connection, and improvement of *existing* woodland and by increases in linear woodland strips such as along roads, rivers and railways rather than by the creation of large new habitats on currently unwooded land. The canopy cover provided by individual trees represents a much more dynamic and available means of future growth and improvement of the treescape than woodland and future increases in tree canopy should be expected to be weighted towards individual trees and small groups of trees. This component of the treescape is both under-utilised (meaning greater opportunities), and it does not suffer from the same competition for space and land use as urban woodland creation (meaning there is lower friction). Planting individual trees in the right locations should add value, whereas woodland creation, however desirable, carries a land use penalty that makes it less desirable, particularly where land value is high.

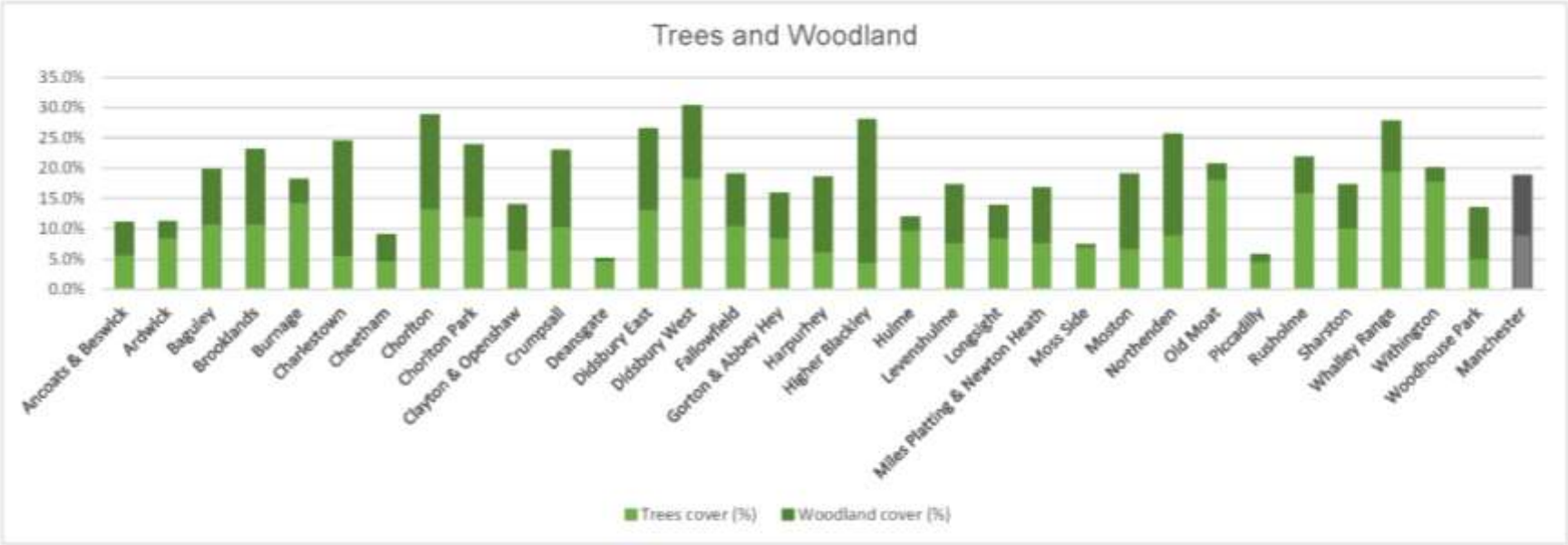

Figure 14 Proportion of woodland and non-woodland trees by ward

3.32 A compelling feature of the above graph, which may not be apparent on the ground, is that it demonstrates the role that individual trees play in the tree population. About half of Manchester's tree canopy area is woodland and therefore half are non-woodland trees. Individual trees represent at least a third of canopy cover in all but two wards and therefore is a very significant component of the treescape almost everywhere in the city. Charlestown and Higher Blackley have a lower proportion of individual trees within the overall canopy, which is partly due to a large amount of woodland, but they do both also have relatively low numbers of individual trees for their size. For example, without its woodland, Higher Blackley would have the lowest tree canopy cover of any ward in the city.

3.33 Notwithstanding the significant variability in the composition of the tree canopy, the aggregation of individual, sometimes small trees across gardens, verges, parks and plazas represents a substantial quantity of tree cover, totalling over 1,000ha across the city. This large figure demonstrates the principle that individual trees can be accommodated in significant numbers within the urban environment, and lays the groundwork for an increase in this component of the treescape in particular.

Woodland ownership

3.34 The significance of the council as a custodian of woodland within the city cannot be overstated. In almost all wards, the council controls the majority of all existing woodland. Other significant owners of woodland include other transport authorities and the overall picture is one in which the public sector has responsibility for the protection and management of most woodland.

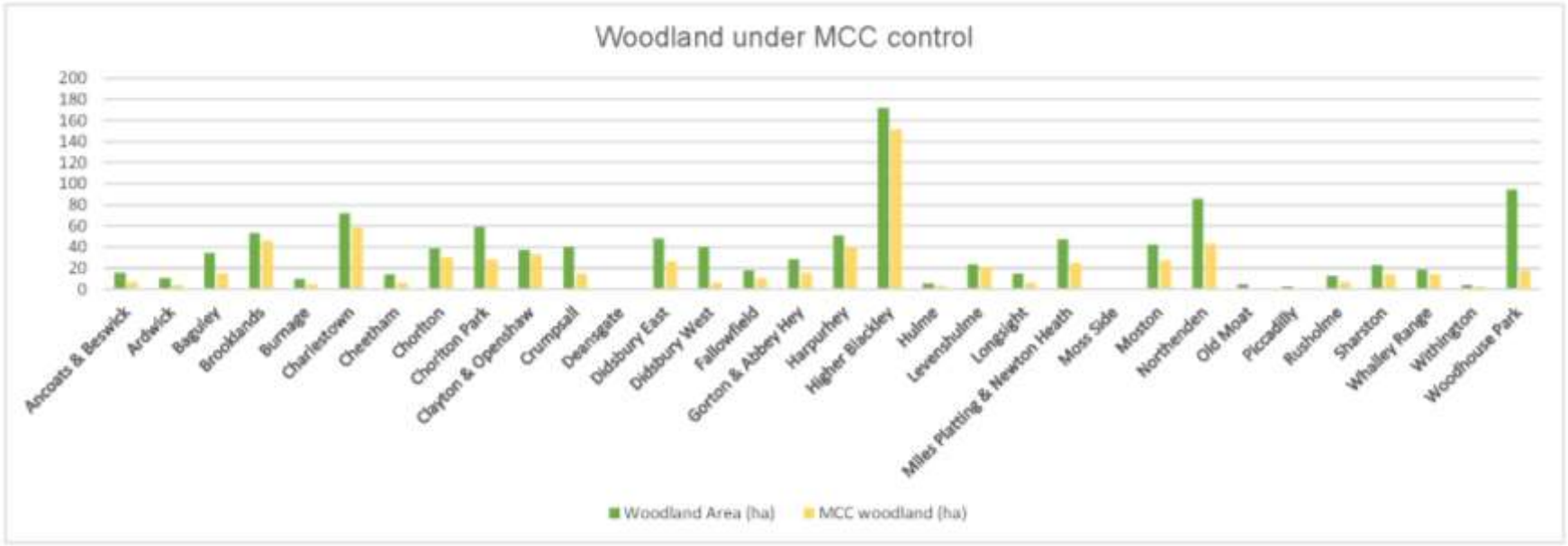

Figure 15 Amount of woodland owned by Manchester City Council by ward

Land Use

3.35 Perhaps unsurprisingly, even the relatively simple analysis of land use in this study highlights the diversity of land use across the city. Eight land use categories were selected to represent the broad patterns of activity in terms of the likely priorities and objectives for use of the space, and as a way of comparing similar land across the study area, especially in terms of what level of tree cover is likely to be achievable. For example, knowing whether an area of grass is a roadside verge, private garden, or a sports pitch tells us something about the likely acceptable level of tree cover. In a similar way, planting trees within a tarmac pavement or a school yard may be technically feasible and highly desirable, whereas planting in tarmac within a service yard, logistics hub or airport may not.

3.36 The graph below presents a summary of the proportions of each land use type across all wards. It also shows clearly where wards have atypical land use composition, which could influence tree cover. For example, the graph illustrates the large amount of residential garden space in Burnage, Withington, and Old Moat; the huge proportion of green space in Higher Blackley, the result of Heaton Park; the significance of Manchester Airport and associated parking to the composition of Woodhouse Park; and the amount of educational land in the composition of Hulme.

3.37 This analysis of land use shows just how much of the land within the city falls under categories that are readily amenable to planting with trees. Parks, green and natural spaces, residential properties (of which gardens are a substantial majority), and agricultural land are obvious examples. However, it is important to note that travel and transport routes include all pavements, highway verges, railway embankments and land around waterways; and that schools, hospitals and other civic and commercial buildings also often have attached fields, gardens or landscaped grounds. There are relatively few examples of land use that are wholly preventative to tree planting, but what constitutes a reasonable and desirable level of tree cover does vary between use cases. The cost and complexity of tree planting, and who might bear it is also strongly influenced by land use and ownership. Tree planting that does not avoid future management problems or local conflicts is unlikely to deliver sustainable benefits.

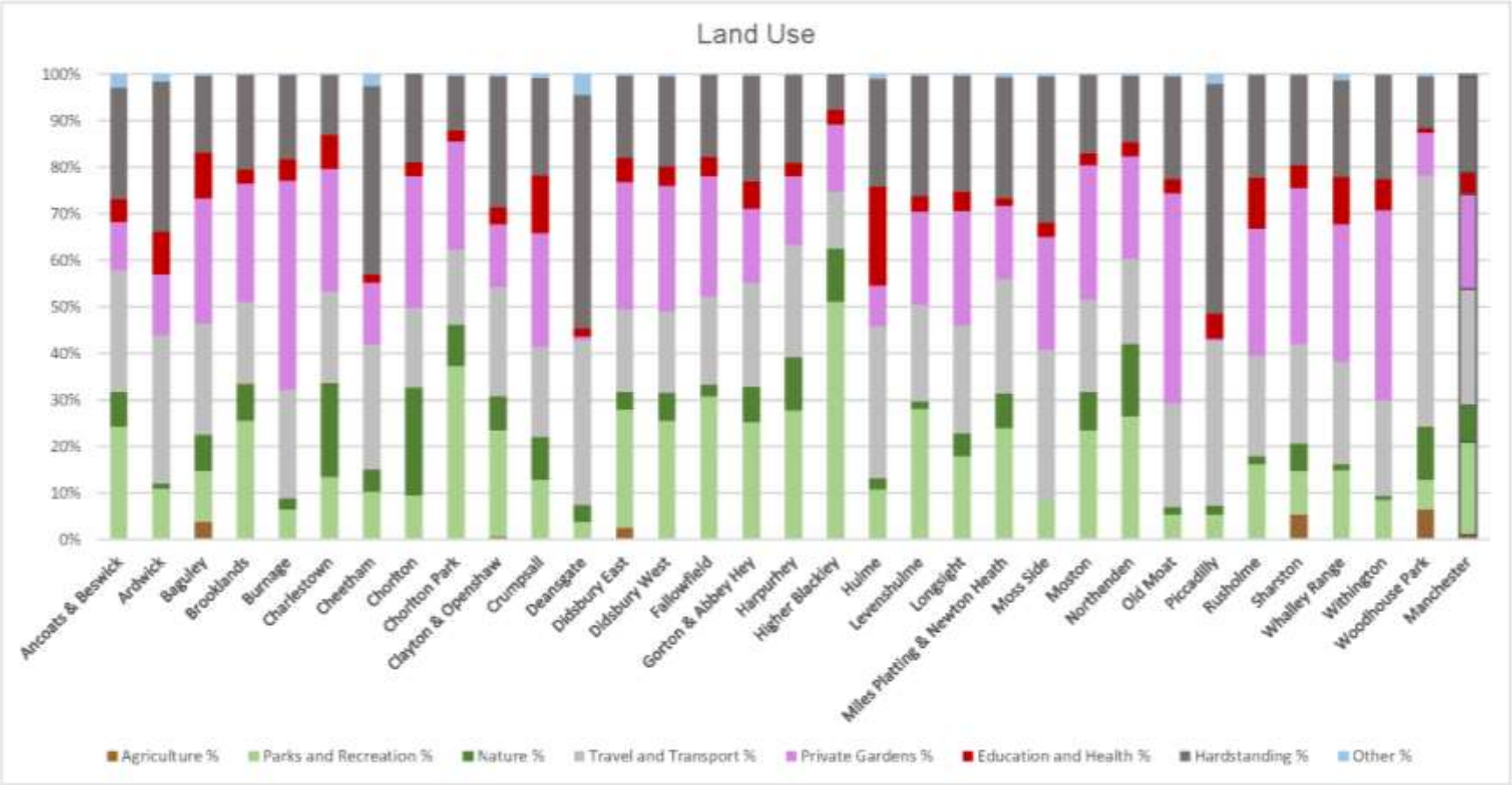

Figure 16 Land Use by ward

Land Cover

3.38 The proportion of land that is covered by water within the city (including rivers, canals, quays, ponds, reservoirs and lakes) is just over 1%. There are only four wards with more than 2% water by area. This element, whilst an important resource and asset, is therefore of limited significance in terms of its influence on tree cover, except perhaps that water tends not to have strict restrictions on the planting of trees on adjacent land, which might overhang it.

3.39 Given the low level of water coverage, the graph below can principally be read as a representation of the split between green and grey land within each ward. In this, there are significant outliers, but the median wards (Crumpsall: 51.6% and Burnage: 58.9%) and the mean average of all wards (52.4%) are closely aligned. Just over half of the land in the city is Green.

3.40 At the ward level, there appears to be some correlation between wards size and the amount of Green land cover, with larger wards tending to have slightly more Green space. This may be partly because large green spaces such as parks and cemeteries tend to be indivisible and fall into one ward; wards that contain them therefore are simply larger than average because they contain a green space. The thirteen largest wards contain all ten of the Greenest wards; and the five smallest wards contain four of the five least Green.

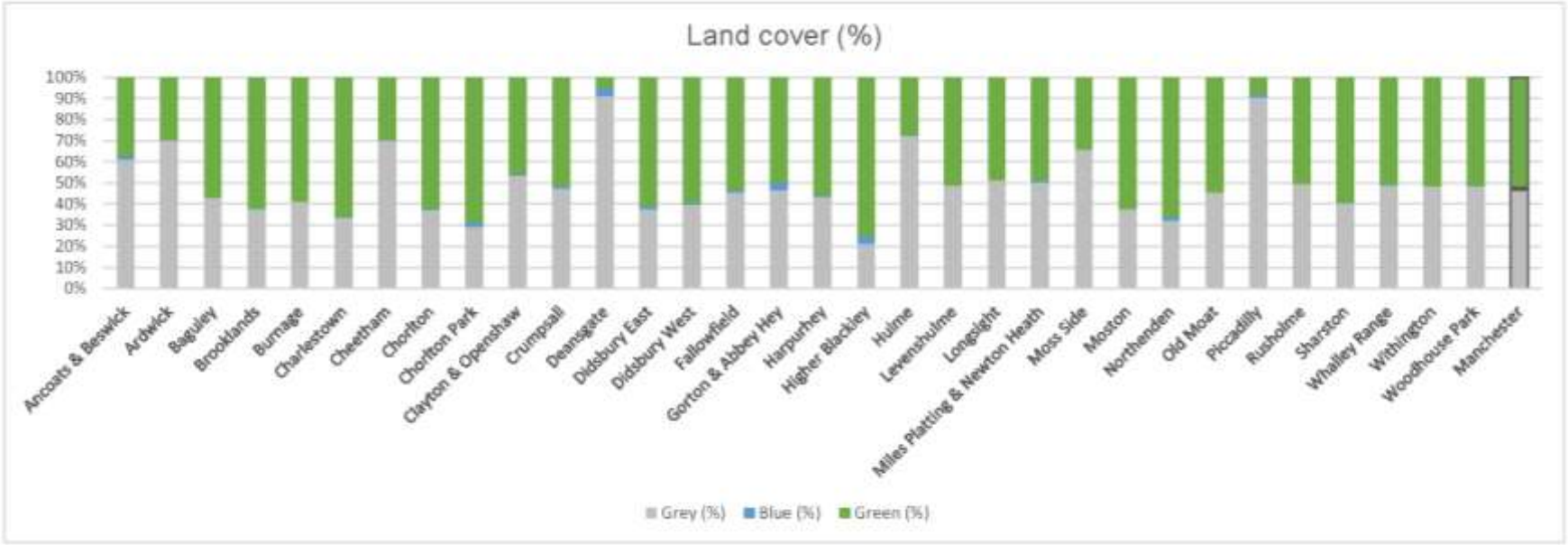

Figure 17 Percentage Land Cover by ward

3.41 The proportion of Green space is a useful indicator of the amount of land on which it may be possible to plant trees without an unusually high cost, or a significant requirement for specialist input. Planting trees in soft landscape requires careful species selection but does not normally require specialist engineering or bespoke planting pit design. However, the cost and complexity of planting should not be equated to either the benefits that it would deliver, or where tree planting should be prioritised. This approach would reinforce existing disparities in the distribution of trees, particularly in terms of the under-provision of trees in harder and Greyer urban environments, where they may deliver the most benefits. A balance must be struck between the need to increase tree cover within finite resources, and the objective that this process should result in a more fair distribution of trees and associated benefits.

3.42 Most wards are within the approximate range of 200 to 600 hectares in size and with the exception of a small number of outliers, the amount of green land within all wards is relatively consistent, within the range 45 to 70%. Only 7 wards have less Green land than this, and these wards tend to be below 400 hectares. This further emphasises that the variability of the size of wards is strongly influenced by the amount of Green land they contain. The graph below is based on the same data as above, but shows the actual amount of Land Cover rather than the proportion. This shows that, with the exception of the unusually large Woodhouse Park, the amount of Grey land within wards only varies by 200 hectares, whereas the amount of Green land varies by over 500 hectares.

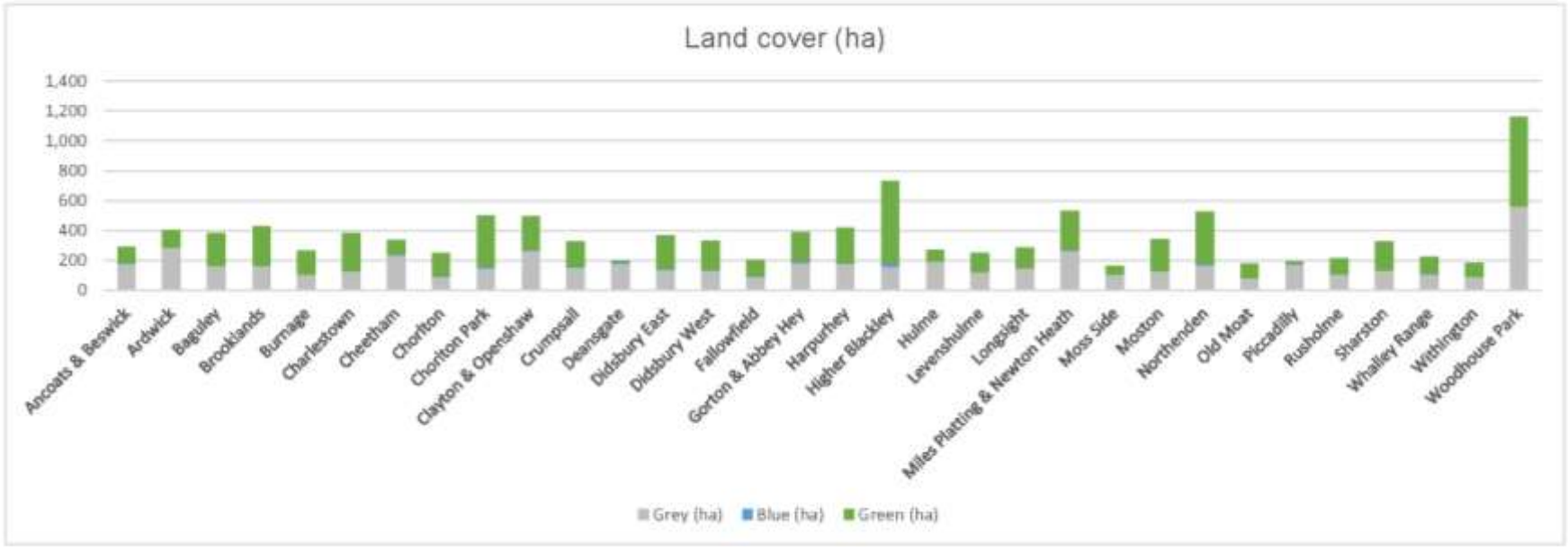

Figure 18 Hectares of Land Cover by ward

3.43 One of the consequences of the variability of Green land between wards is that it influences the relative scale of the challenge associated with any ambition to increase tree cover in that ward. In Cheetham, Moss Side, Piccadilly or Deansgate for example, there is little choice but to deliver a significant proportion of any new tree planting within hard landscape, because the composition of the ward dictates it. On the other hand, Higher Blackley, one of the largest and greenest wards in the city, has relatively poor integration of trees within the lived environment and a substantial part of any new planting effort should therefore be directed to highways, housing and hardstanding, rather than simply achieved by augmenting the already substantial woodland.

Resource requirement

3.44 The cost of planting a tree can vary by orders of magnitude. At the lower end, the cost of supplying, planting and supporting an individual whip within a large afforestation scheme may be a few pounds. At the upper end, designing, supplying and installing a contract grown, semi-mature tree in a complex hard landscape can run to tens of thousands. Resources is not limited to money, and the success of planting schemes may rest equally on good design, monitoring, and local support.

3.45 This study does not estimate the overall cost of delivering the tree planting it describes. The capacity that has been identified and modelled could be fulfilled in a range of ways, which would have different associated costs and liabilities. This capacity will only be realised by the individual actions of a broad group of stakeholders, which will include decisions about the number, type and locations of tree planting. An estimate of cost would therefore give such a wide range that it would be almost meaningless. Furthermore, the cost of supplying, planting and managing trees will be borne across a large range of individuals, organisations and public bodies, sometimes via cooperative partnership approaches, so a single figure would not be particularly useful to any individual actor. However, every individual or organisation that subscribes to the objective of increasing tree cover in the city should use this report to understand what part they should play in the collective effort, and allocate or seek suitable resources to that task.

3.46 The cost of planting trees depends largely on two factors: the size and type of the tree, and the ground into which it is being planted. Of these, the latter is by far the largest contributor. Planting in green sites is relatively simple; tree pits can be prepared, planted, backfilled and watered. Maintenance of trees during the establishment phase is limited to watering and monitoring, or in some cases even less. Planting in hard landscapes involves at least an increased reliance on watering during establishment, and tends to require larger plants and more substantial supports because of the environment the tree will be growing in. It may also require the formation of new planting pits, which adds cost, materials and complexity, particularly where underground services must be incorporated and protected.

3.47 The assessment of land cover is a useful basis for approximation of resource distribution. Green land such as gardens, grass verges and parks may still include services, or demand larger plants in some locations but on average they will be simpler and cheaper to deliver than planting in Grey hard landscapes. Wards in which a larger proportion of the capacity is on Grey land will be more expensive to deliver than those where planting is mostly on Green land.

How has resource requirement been modelled?

3.48 It is assumed that on average, planting one tree in hard landscape requires equivalent resources to planting five trees in soft landscape. For each ward the amount of the identified planting capacity on Green land and the amount on Grey land was calculated, the Grey element was multiplied by 5, and the two elements were recombined to generate an overall weighted figure for the ward. This figure is notionally equivalent to the cost of doing all of the recommended tree planting on Green land, although it should be noted that this is not actually possible.

3.49 The weighted planting totals for each ward are based on both the amount of capacity identified in each ward, as well as the proportion on Grey and Green land. They can therefore be compared to one another to give an indication of what proportion of the overall planting strategy described by this study each ward would deliver, not in terms of the number of trees but in terms of 'effort' or the scale of the task. This should be used to allocate resources, including funding.

3.50 The table below also gives a 'unit cost' which is based on the proportion of the planting in each ward that would be on Grey land. This therefore represents the relative cost of planting a single tree in each ward, on a scale of 1 to 5. A score of 5 would represent a ward in which all of the planting capacity is in hard landscape; a score of 1 would represent a ward in which all planting capacity is in soft landscape.

Table 9 Resource requirement by ward and unit costs

Wards	Proportion of overall resource	Unit cost
Woodhouse Park	9.4%	1.5
Clayton & Openshaw	8.7%	2.9
Harpurhey	6.4%	2.4
Ardwick	6.3%	3.4
Ancoats & Beswick	6.1%	2.7
Miles Platting & Newton Heath	5.7%	2.6

Wards	Proportion of overall resource	Unit cost
Cheetham	4.9%	3.0
Hulme	4.5%	3.3
Charlestown	4.2%	1.9
Piccadilly	3.9%	4.8
Higher Blackley	3.7%	2.0
Gorton & Abbey Hey	3.6%	2.8
Deansgate	3.5%	4.9
Sharston	3.5%	2.2
Moston	3.4%	1.9
Baguley	3.3%	2.0
Longsight	3.1%	2.0
Brooklands	2.2%	2.7
Northenden	2.1%	2.1
Moss Side	2.1%	2.2
Chorlton Park	1.9%	1.5

Wards	Proportion of overall resource	Unit cost
Crumpsall	1.9%	3.8
Levenshulme	1.7%	3.4
Fallowfield	1.1%	3.2
Burnage	0.7%	1.7
Chorlton	0.6%	1.5
Withington	0.5%	4.2
Rusholme	0.5%	4.0
Old Moat	0.4%	3.5
Didsbury East	0.2%	1.0
Didsbury West	0.1%	1.0
Whalley Range	0.1%	2.1

3.51 The table above demonstrates that the technical difficulty and unit cost of planting varies enormously between wards. Deansgate, Piccadilly, Withington and Rusholme all have unit costs of 4 or higher. Chorlton, Woodhouse Park, Chorlton Park, Didsbury East and Didsbury West all have unit costs of 1.5 and below.

3.52 The actual resource requirement in real terms is strongly influenced by the total capacity in each ward. Woodhouse Park for example is one of the cheapest places to plant trees, but it is so large that it would be the largest individual component in any resource allocation. Beyond this unusually large ward, the top ten wards would require 60% of all resource allocation to realise planting capacity across the city. By contrast, the bottom ten wards account for just 6% of resource requirement.

3.53 The cost of delivery may vary depending on how accurate the assumptions about the relative cost of planting in hard surfaces compared to soft ground prove to be. However, a range of scenarios were tested between 1:2 and 1:10 relative planting cost (Green to Grey) and this did not significantly affect the outcome in terms of the order and proportions of priority wards.

3.54 Economical ways of delivering canopy cover should be prioritised wherever trees are planted in order to maximise the amount of tree canopy that can be delivered within finite resources. In wards with a particularly high *unit cost*, the importance of this principle is perhaps increased. In other words, wards with a high unit cost should maximise the value that is delivered by each 'unit' (tree or area of tree canopy). There are a number of ways to do this, but the simplest is to plant species with the largest suitable mature size for the location.

Tree planting capacity

3.55 The current distribution of tree canopy cover, the types of land that trees are growing on, and how much of each type of land there is within each ward all inform the estimation of the number of additional trees that could be planted within the city without changing land use, or overcrowding any particular type of land with trees in inappropriate locations. The process of modelling capacity has two stages:

(i) Using the existing distribution of trees to understand what is possible and what is reasonable in terms of canopy cover on any given type of land. This analysis produces a theoretical 'target' for tree cover on each type of land.

(ii) Testing those targets in each ward and making modifications to them to accommodate local factors such as large individual sites, or trends in the built infrastructure of the ward that present particular constraints or opportunities.

3.56 The result of this process is an assessment of Capacity, which is the measure of how much additional tree planting could be done on a particular type of land, within a particular ward.

3.57 These figures can be interpreted locally because they offer a granular assessment of the capacity, as well as aggregated to give a highly reliable assessment of capacity across the city. For example, the capacity figures can be used to understand, how much tree planting could be done in Parks in Brooklands (313 trees); in Private Gardens in Hulme (419 trees); or in Schools and Hospitals in Rusholme (67 trees). Modelling delivery at this resolution is intended to allow a range of council and other actors to plan delivery mechanisms, mobilise resources and collaborate in a targeted way with both a shared ambition and confidence of deliverability and fairness.

Averages and targets

3.58 The tables below summarise the Targets that were used as the starting point for the assessment of Capacity. 10 Targets were developed, representing tree planting on Grey and Green land across 7 Land Use categories. Some combinations do not occur, such as Green Hardstanding Areas, therefore four possible combinations are not modelled. These are included for context in the tables below and marked 'n/a'.

3.59 Targets were developed on the basis of: the mean average tree cover in the city for that type of land (and the distribution of scores contributing to that average); the 'best in class' ward figure; and reference to external research, publications and professional judgement. In order to ensure an overall increase in tree cover, all Targets are above the city average. In order to ensure realistic recommendations, all Targets are below the 'best in class' figure. Where the variation in canopy cover between wards is very large, sometimes the Targets are significantly lower than some wards already achieve.

Table 10 Current levels and targets for canopy cover on Grey land

Land Use	Highest canopy cover	Highest canopy cover	Average canopy cover	Target canopy cover
Agriculture	*n/a*	*n/a*	*n/a*	*n/a*
Parks and Recreation	Deansgate	45%	7%	10%
Travel and Transport Routes	Whalley Range	36%	16%	25%
Education and Healthcare Facilities	Withington	17%	9%	12%
Natural Environment	*n/a*	*n/a*	*n/a*	*n/a*
Private Gardens	*n/a*	*n/a*	*n/a*	*n/a*
Hardstanding Areas	Old Moat	24%	8%	12%

3.60 The table above presents Targets for Grey land within each Land Use type. This includes places such as courtyards, car parks, paved areas in hospitals and universities, school yards, pavements, pedestrianised areas, playgrounds and logistics and storage yards.

3.61 The table below presents Targets for Green land within each Land Use type. This includes places such as domestic gardens, woodland, playing fields, grass verges, railway embankments, public parks, farmed fields and hedgerows.

Table 11 Current levels and targets for canopy cover on Green land

Land Use	Highest canopy cover	Highest canopy cover	Average canopy cover	Target canopy cover
Agriculture	Miles Platting & Newton Heath	12%	7%	12%
Parks and Recreation	Whalley Range	52%	29%	30%
Travel and Transport Routes	Didsbury West	55%	30%	40%
Education and Healthcare Facilities	Chorlton	61%	27%	30%
Natural Environment	Brooklands	90%	68%	70%
Private Gardens	Didsbury West	38%	19%	20%
Hardstanding Areas	*n/a*	*n/a*	*n/a*	*n/a*

Capacity

3.62 Each Target was manually reviewed for every ward using aerial photography, mapping and local knowledge. The resultant modified figures are what this study refers to as Capacity: the amount of tree cover in each area that could and should be achieved to ensure a reasonable distribution of both benefits, and effort across the city.

3.63 Local factors mean that some Targets cannot be achieved within some wards and these Capacity figures are therefore lower. In some wards, certain Targets are already comfortably exceeded and there is therefore no need for further planting in those areas to deliver the objectives of this study, although that does not mean that planting should be prevented or avoided. For these reasons, the Target figures above should not be applied locally or interpreted as a goal in any context. They are a methodological stepping stone towards a locally calibrated model.

3.64 For a full account of the assessment of Capacity across wards and the reasons for modifications, refer to the Ward Summary Charts at Appendix A.

3.65 The Capacity for tree planting on each type of land within each ward was multiplied by the amount of that land type to generate totals, which were aggregated. These represent the amount of canopy increase that could be delivered within each type of land in the city that was assessed by this study. This analysis is useful to begin to understand where at the city level the areas of greatest focus and gain may be, and what delivery strategies are likely to bear the most fruit.

Table 12 What size and where is the capacity for tree planting in Manchester?

Land Use	Existing canopy (ha)	Planting capacity (ha)	Total capacity (ha)
Agriculture	8.6	6.6	15.2
Parks and Recreation	616.9	53.3	670.2
Travel and Transport Routes	216.6	95.1	311.7
Education and Healthcare Facilities	79.7	19.8	99.4
Natural Environment	558.7	36.3	595.0
Private Gardens	450.4	73.6	523.9
Hardstanding Areas	61.8	35.3	97.1

[Unsuitable][24]	*[177.9]*	*[n/a]*	*[177.9]*

3.66 At the level of the tree population of the whole city, the above table clearly demonstrates that by far the largest capacity for planting is on Travel and Transport Routes and in Private Gardens. These two account for more than half of all the planting capacity. This is partly a function of the significant amount of land that these two Land Uses account for. However, it illustrates a useful point that may be counter-intuitive, particularly to the general public. The Land Use making the largest contribution to tree canopy cover in the city is Parks and Recreation land. This leads to the anecdotally common position that tree planting is desirable, and it should be done in Parks: *that is where trees live*. However, the data show that whilst Parks do have an important contribution to make, they are (at least on average) already relatively 'full' of trees. In other words, Parks tend to be closer to their Capacity for tree canopy cover than some other land types. Even if Parks and Recreation and Natural Environment land are combined, which they might reasonably be in the public perception, their capacity for planting is still less than exists on Travel and Transport Routes land.

3.67 The table above also begins to set the priorities at the city level for tree planting: the first priority for canopy cover increase in the city is a substantial programme of street tree planting in verges and pavements and increased greening of rail, tram, motorway, and waterway corridors. The second priority, is engagement of the public to increase planting in domestic gardens. These will clearly require entirely different resources and delivery models.

How is planting capacity distributed between Green and Grey land

3.68 The following tables show the composition of each of the above aggregated Capacity figures in terms of Grey and Green land within them. They therefore give an indication as to the types of planting design, strategy, cost and maintenance that may be required to realise capacity.

Table 13 Trees and planting capacity on Agriculture land

[24] Unsuitable land was not assessed in detail in this study because it is assumed that trees cannot be planted or allowed to grow on it. However, it does contain tree canopy so it is important to count it within the overall total. This canopy comprises branches that overhang places in which trees could not be planted, such as rooftops and highways.

Agriculture Land Cover	Existing canopy (ha)	Planting capacity (ha)	Total capacity (ha)
Grey	0.0	0.0	0.0
Green	8.6	6.6	15.2

3.69 Only Green agricultural land was included in this study. There may be limited capacity for planting in farm yards but this is both a very small amount of land, and it is likely that any such yards and paved areas are strongly utilitarian in nature and not readily amenable to planting.

Table 14 Trees and planting capacity on Parks and Recreation land

Parks and Recreation Land Cover	Existing canopy (ha)	Planting capacity (ha)	Total capacity (ha)
Grey	7.1	3.7	10.7
Green	609.8	49.6	659.4

3.70 Parks and Recreation land has significant capacity, which might be delivered by a combination of changes to management practices and also new planting. The relatively small proportion of the overall capacity that is on Grey land includes trees that overhang paved infrastructure, such as footpaths within parks. This is therefore an example that makes the broader point that increases in tree canopy cover can also be achieved by planting on adjacent land, especially where this is cheaper to deliver. Planting trees along a footpath or next to a playground within a park would contribute to the canopy coverage on Green and Grey land and would normally be easier to deliver than planting within those paved or surfaced areas.

Table 15 Trees and planting capacity on Travel and Transport Routes land

Travel and Transport Routes **Land Cover**	**Existing canopy (ha)**	**Planting capacity (ha)**	**Total capacity (ha)**
Grey	147.0	68.7	215.7
Green	69.6	26.4	96.0

3.71 Travel and Transport Routes land represents the largest area of capacity in the city. Within this, it is notable that whilst the weighting is strongly towards Grey land (which is the larger component), the ratio of Grey to Green in the planting capacity is lower than for any other land use. This demonstrates that there is a very substantial amount of Green land within transport corridors as well as the more obvious Grey paved and tarmac areas. These may typically be linear and narrow, or small and atomised, but on aggregate they are a significant resource. The existing management of these areas has substantial cost implications for landowners, particularly the council, and a transition of some areas to tree cover may actually reduce management costs in the long term.

Table 16 Trees and planting capacity on Education and Healthcare Facilities land

Education and Healthcare Facilities Land Cover	**Existing canopy (ha)**	**Planting capacity (ha)**	**Total capacity (ha)**
Grey	14.9	5.4	20.4
Green	64.8	14.3	79.1

3.72 The number and size of schools and healthcare facilities is particularly diverse across the City and the capacity figures comprise an amalgamation of some wards with very little capacity indeed and others with significantly more. In real terms, the quantities of tree planting that could be achieved are heavily dependent on the amount of outdoor space, particularly school fields and grounds. However, in terms of the provision of benefits and place-making, planting small numbers of trees in constrained or heavily paved sites may be as effective.

Table 17 Trees and planting capacity on Nature land

Natural Environment Land Cover	Existing canopy (ha)	Planting capacity (ha)	Total capacity (ha)
Grey	0.0	0.0	0.0
Green	558.7	36.3	595.0

3.73 By definition, Natural Environment land does not include Grey land cover. A significant part of this land is already woodland and therefore it has the highest tree canopy cover of any studied Land Use. For this reason, the capacity is proportionally small, although it is also a substantial amount in real terms and one that might be largely delivered by natural regeneration and changes in management practices that may be cost neutral or better.

Table 18 Trees and planting capacity on Private Gardens land

Private Gardens Land Cover	Existing canopy (ha)	Planting capacity (ha)	Total capacity (ha)
Grey	0.0	0.0	0.0
Green	450.4	73.6	523.9

3.74 Private Gardens were assumed to be Green and therefore the above table does not include a figure for Grey area. The reason for this is that reliable mapping of paved areas at this scale is not widely available. The justification for this approach is that whilst patios and other paved areas are widespread, they are not commonly of a size or construction that would prevent the establishment of trees and a connected tree canopy. Unlike more heavily engineered structures, most domestic garden structures do not prevent tree root growth or adjacent tree planting. It is therefore reasonable and simpler to model canopy cover in gardens on the basis that the primary constraint to canopy cover is not practical feasibility, but the preferences of the occupiers and their neighbours.

3.75 The existing canopy cover in gardens in some wards is significantly higher than the theorised capacity used in this study, which is set rather lower, partly in order that wards with a larger challenge have a more realistic prospect of success. If all gardens in all wards matched the canopy cover of those towards the upper end of the scale, this would deliver an additional 300ha of tree cover across the city, equivalent to about half of all the trees in Parks and Recreation land.

Table 19 Trees and planting capacity on Hardstanding land

Hardstanding Areas Land Cover	Existing canopy (ha)	Planting capacity (ha)	Total capacity (ha)
Grey	61.8	35.3	97.1
Green	0.0	0.0	0.0

3.76 Hardstanding Areas is, by definition, all Grey land. It is a diverse mix of private and some public space but excludes highways and transport corridors. Tree cover is relatively low but still significant, especially in more central and commercial wards. The capacity for planting is, as with other Land Uses, based on what already happens in some parts of the city and represents an increase of more than 50%. Much of this activity will fall to the private sector and businesses to deliver, such as landlords of commercial premises, supermarkets, and car park operators.

Towards a tree canopy target for the city

3.77 The current tree canopy cover across The City of Manchester is 18.8%. In some areas, it is much higher and in others, much lower. This could be increased to 21.5% without any change in land use, by better utilisation of available planting spaces, and by bringing all similar land up to comparable levels of tree cover.

3.78 This analysis reflects what remains to be done in order to complete the treescape that has already been established in The City of Manchester. It does not seek to establish the maximum tree cover that the city could possibly accommodate, but to identify where the priorities should be to correct existing disparities and to focus effort in areas of greatest potential gain and benefit. Delivering the recommendations of this report will require a substantial effort, and will deliver significant benefits, but should be regarded as the completion of work already underway, rather than final or conclusive.

3.79 The results of this study reflect what could be expected of each ward and each broad stakeholder group in terms of the respective contribution to increasing tree cover that each should make. It is possible that some will far exceed the capacity that has been identified by this study; this should be encouraged and celebrated but should not offset the responsibility of others to play their part.

3.80 The figure of 21.5% is realistic and comprises a mosaic of canopy cover across the city, according to local capacity. If this figure is realised in the way that this study describes it, the resultant distribution of tree cover across wards would be as shown in the table below.

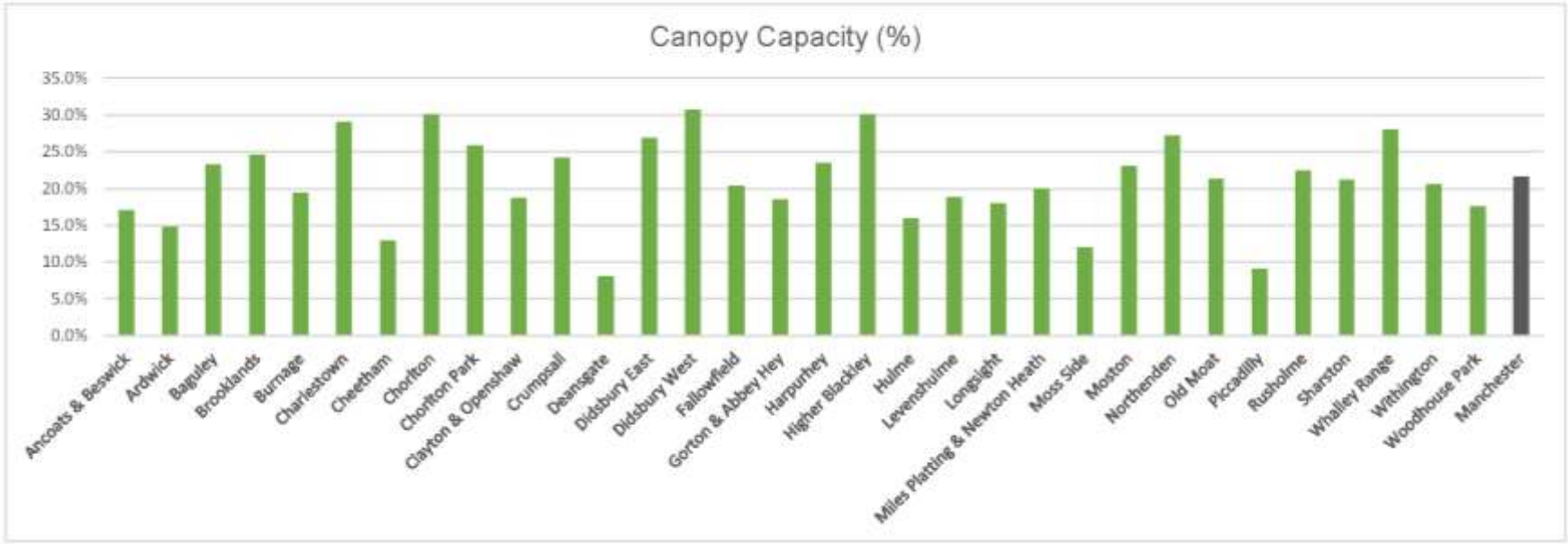

Figure 19 Canopy cover capacity by ward

3.81 The above table represents the capacity of each ward as modelled by this study, which together would bring the total canopy cover of The City of Manchester to 21.5%. This would deliver significant benefits to the people, nature and the environment, and would also make the distribution of those benefits fairer.

3.82 Across all Unsuitable land, there is an average rate of 1.5% tree canopy cover. This comprises trees that are overhanging from adjacent Suitable land and possibly some trees growing in 'Unsuitable' locations. This low rate gives confidence that this component of the treescape is not large enough to significantly affect the results of recommendations of this study. However, in real terms this does represent a meaningful volume of tree canopy (c.178ha) which benefits the city's buildings, transport links and waterways. It is reasonable to assume that this area would increase in proportion to any general increase. More planting of street trees for example, would increase the area of canopy above roads. This effect was excluded from the capacity modelling but it would add 0.3% to the overall canopy cover in the city. The city might reasonably claim therefore to have fulfilled the tree planting described by this study when the overall canopy cover reaches 21.8%.

3.83 The capacity identified by this study equates to an additional 320ha of tree canopy in the city. It is difficult to visualise such a large amount, and there are clearly no individual sites at this scale anywhere in the city. This capacity is spread out and highly diffuse so converting the area to individual trees is helpful for to describe the task. It takes about 200 medium sized trees (with a branch radius of 4m) to make one hectare. On this basis, the result of this study is that there is space in the city for an extra 64,000 trees.

3.84 In woodland, trees may be more numerous within each hectare and also cheaper to plant and grow (even regenerating naturally), whereas large species may cover a significantly greater area per tree, but take longer to develop. A hectare may sound like a lot but could comprise as few as 80 mature street trees. An avenue of such trees might eventually add up to a hectare of canopy cover along as little as 600m of road.[25] 64,000 tree is therefore a useful tool for visualisation and to make the task relatable but should not be regarded as prescriptive.

3.85 It is assumed that all existing tree cover will be maintained. Maintaining urban tree cover requires planting because many, if not most, urban trees cannot be allowed to die, fail and regenerate naturally. Maintaining a stand-still position therefore requires planting, although the long term trend of canopy cover increase suggests that this is already happening.

3.86 There are a significant number of places in the city where the existing tree canopy cover is at or above what is regarded as 'at capacity' by this study. Parks in Ardwick, Private Gardens in Burnage, Hardstanding Areas in Fallowfield, and Travel and Transport Routes in Whalley Range are all already at or above what should be regarded as a reasonable minimum tree canopy cover and no new increases in those, and other similar, areas is assumed by this study. This demonstrates that in fact, a higher tree canopy target for the city may well be achievable in the future. If an ambition to increase tree canopy cover everywhere was adopted, even by a small amount, this would increase the overall canopy cover in the city by a meaningful amount, but it might not be justifiable in terms of the prioritisation of resources.

3.87 Within the overall figures, this study has found widely varying trends, particularly in terms of the amount of land that is Suitable for planting and the Utilisation of that land. This suggests that people that live with trees are simply more 'used' to them, and possibly have a different understanding or appreciation of the balance of benefits, risks or costs associated with them. It is not the case that some parts of the city have lots of trees simply because there are more places to plant them and it is easier, there are real differences across the city in whether trees are actually grown on otherwise similar land. It is to be hoped that normalising tree canopy cover between wards will not only deliver a transformation in the quality of places but also in the culture and expectation of people. The latter may prove critical to sustaining long term change.

[25] 6.5m branch radius and 15m tree spacing

4.0 Wards

4.1 The following section gives a summary of the key figures for each ward in the city, along with a brief narrative describing the existing resource, significant sites, constraints and opportunities, and the nature of the recommended capacity for increases in tree cover.

4.2 In the tables below, the placement or rank of each ward is given as well as the measurement. This should not be interpreted as 'success' or 'failure' of wards against any particular metric. Wards are diverse and have wide ranging capacity for tree cover, depending on their characteristics. Any two wards may be 'full' of trees at quite different levels. The ward placement is presented to make what would otherwise be somewhat inaccessible figures more relatable and to help the reader to understand how any given ward fits into the broader picture.

4.3 Measurements and calculations have been made in real terms (hectares) and this is presented in the tables. In the text narrative approximations of the equivalent number of individual specimen trees are given (in brackets). Again, this is to make the figures more accessible and easier to visualise, although it should be noted that there are a range of ways to deliver increases in tree canopy, of which planting individual specimen trees is only one.

4.4 For each ward, the largest three areas of capacity for increases in tree cover are normally listed. These are not exhaustive, but give an indication of the most significant under-planted land within each ward.

4.5 For a more detailed explanation of the methodology supporting the data and conclusions in this section, refer to Chapter 2. A graphical presentation of some of the data in this section is Appended as Drawings at the end of this document.

Ancoats and Beswick

4.6 Ancoats and Beswick is mid-sized ward with a composition quite close to the city average in terms of land use. However, it has amongst the lowest tree cover of any ward. Tree cover is focussed along the River Medlock but there is low utilisation of suitable planting locations elsewhere.

4.7 The Etihad Campus and the narrow streets in Ancoats limit opportunities for tree cover or species size in some locations, but the capacity for additional tree cover overall is the highest of any ward, relative to the current level, and the fourth largest of any ward in real terms.

4.8 The largest capacity for additional tree cover is on Parks and Recreation land (1060). Travel and Transport Routes land also has substantial capacity (876) including rail and water corridors, as well as street trees. Private Gardens represent the third largest unused capacity for trees (694); a proportion of this is in newer developments which do contain young trees that will increase in size without intervention and deliver some increases.

Table 20 Key figures for Ancoats and Beswick

Ward attributes	Total	Placement (of 32)
Ward size	293.9ha	#19
Tree canopy cover	11.0%	#28
Recommended capacity for change	+5.9 points (16.9%)	#1
Size of tree canopy increase	17.5ha	#4
Relative cost of planting (1 to 5)	2.7	#15
Proportion of total resource	6.1%	#5

Ardwick

4.9 Ardwick is an urban ward with a large proportion of Hardstanding Areas. It contains Manchester Royal Infirmary and Children's Hospital, major rail infrastructure, and industrial estates. Tree cover is well below average with localised exceptions along the southern edge of the ward and around Whitworth Park.

4.10 The capacity for tree planting is limited in some areas by small garden sizes, although newer housing in West Gorton has larger gardens that tend not to contain significant trees due to immaturity of the landscape. Parks and Recreation spaces are an essential link to the treescape and nature across the ward; these tend to already have a good level of tree cover and do not represent significant additional capacity.

4.11 By far the largest planting opportunity is on Travel and Transport Routes land (1255) followed by Hardstanding Areas (785), then Private Gardens (543). A substantial programme of planting street trees along rail networks, wide green verges such as at New Bank Street, narrow verges such as at Devonshire Street South, and in pavements could be accommodated and would bring significant benefits. Increasing tree cover on Hardstanding Areas would require the cooperation of the private sector, particularly around industrial and commercial land and large car parks.

Table 21 Key figures for Ardwick

Ward attributes	Total	Placement (of 32)
Ward size	404.6ha	#9
Tree canopy cover	11.2%	#27
Recommended capacity for change	+3.5 points (14.7%)	#12
Size of tree canopy increase	14.3ha	#8

Ward attributes	Total	Placement (of 32)
Relative cost of planting (1 to 5)	3.4	#7
Proportion of total resource	6.3%	#4

Baguley

4.12 Baguley is a largely residential ward on the edge of the city with a slightly higher tree canopy cover than average. The west of the ward is dominated by Wythenshawe Hospital and industrial and business parks. It has larger woodland blocks along the M56 on its eastern boundary and along Mill Brook. Private Gardens are by far the largest land use, more than double the amount of Parks and Recreation space.

4.13 There is a consistent pattern of capacity for small percentage increases in tree cover across most land use types, representing a healthy mixed opportunity for progress on multiple fronts. The ward also has a relatively low planting cost, partly because of the amount of garden space as well as some agricultural land, parks and incidental green space.

4.14 Private Gardens have the largest capacity for increased canopy cover (985), followed by Travel and Transport Routes (576). There are significant amounts of mown verge space available for planting across the ward. A strategy of planting trees in residential front gardens would also be beneficial to both private and public spaces and may be more cost effective than planting in adjacent pavements in some locations. Parks and Recreation land has capacity for additional planting, particularly by avenues of larger species along internal paths and boundaries (437).

Table 22 Key figures for Baguley

Ward attributes	Total	Placement (of 32)
Ward size	383.2ha	#12
Tree canopy cover	19.7%	#14
Recommended capacity for change	+3.4 points (23.1%)	#13
Size of tree canopy increase	12.8ha	#11
Relative cost of planting (1 to 5)	2.0	#23
Proportion of total resource	3.3%	#16

Brooklands

4.15 Brooklands is a large irregular-shaped ward in the west of the city with significant parts in the east and south given to Wythenshawe Park and Gardens and Roundthorn Business Park respectively. It has relatively high canopy cover, particularly on Natural Environment land which is the most wooded of any ward. Despite the obvious large size of parks in the ward, the total amount is equal to Private Gardens.

4.16 In terms of land cover, Brooklands is the fifth most Green ward in the city, but only the ninth in terms of tree cover. This reflects substantial areas of open grass and somewhat lower utilisation of green space for planting trees. The ward therefore has amongst the top five largest proportions of land that is Suitable for tree planting.

4.17 The capacity of open spaces such as parks and school fields to accommodate trees is slightly constrained because most are small to mid-sized, and many include sports pitches. However, there is a spread of modest capacity for tree planting including, unusually, a primary focus on Hardstanding Areas (380) such as large retail carparks and the business park, with similar capacity in Parks and Recreation (313) and Private Gardens (248).

Table 23 Key figures for Brooklands

Ward attributes	Total	Placement (of 32)
Ward size	430.9ha	#7
Tree canopy cover	23.1%	#9
Recommended capacity for change	+1.4 points (24.5%)	#21
Size of tree canopy increase	6.3ha	#20
Relative cost of planting (1 to 5)	2.7	#14
Proportion of total resource	2.2%	#18

Burnage

4.18 Burnage is a small ward, dominated by residential housing. It has a diverse and relatively evenly distributed tree cover, above the city average. Private Gardens dwarf any other land use and the ward has relatively low provision of Natural Environment, Parks and Recreation land (<10%). There are significant tree populations along the Fallowfield Loop, the railway corridor to the west, and along Errwood Road to the east.

4.19 There is limited capacity for additional tree cover within Private Gardens, Natural Environment and Hardstanding Areas land, all of which already have good coverage. The overall capacity for change in the ward is therefore relatively low, although there are opportunities for the ward to accommodate meaningful contributions towards increases in trees in other areas.

4.20 The main opportunity for increases in tree canopy is on Parks and Recreation land (392), which is a relatively small area but is also significantly under-utilised. These tend to include open spaces with opportunities to plant-up perimeter belts or avenues, as well as smaller pocket parks and amenity grass in residential areas. Education and Healthcare Facilities land includes a number of schools with relatively generous outdoor space that could accommodate a modest increase in tree cover (170), of which a proportion may 'self-deliver' by the growth of more recent planting on newer sites. Travel and Transport Routes land also has opportunities for planting to infill gaps in verges and central reservations, such as along Kingsway (81).

Table 24 Key figures for Burnage

Ward attributes	Total	Placement (of 32)
Ward size	263.5ha	#22
Tree canopy cover	18.2%	#18
Recommended capacity for change	+1.1 points (19.3%)	#26
Size of tree canopy increase	3.2ha	#24
Relative cost of planting (1 to 5)	1.7	#27
Proportion of total resource	0.7%	#25

Charlestown

4.21 Charlestown is at the northern edge of The City of Manchester. It contains significant areas of woodland, including ancient woodland Boggart Hole Clough as well as plantation along the M60 ring road and Victoria Avenue East in the north of the ward. Private Gardens are the single largest land use, although Parks, Recreation and Natural Environment land are larger in combination.

4.22 Tree canopy is about average for the city, which is significantly influenced by Boggart Hole Clough. Tree cover in Private Gardens and on Transport Corridors are well below average. The dominance of Boggart Hole Clough in the treescape also means that the capacity for increases in tree numbers on public green spaces is reduced, both because there are large areas that are already wooded, and the remaining Parks and Recreation land contains a high proportion of sports pitches.

4.23 The proportion of land that is Suitable for trees; the potential contribution to tree canopy increases across the city; and the scale of transformation in the treescape within the ward are all within the top five across in the city. Within this, the largest capacity is in Private Gardens, which are well below average (1290). Travel and Transport Routes land is also well below average and has the second largest capacity (906). Education and Healthcare Facilities land is third (651), which includes large sites like the Co-Op Academy, and other smaller sites, which tend to have few trees.

Table 25 Key figures for Charlestown

Ward attributes	Total	Placement (of 32)
Ward size	383.3ha	#11
Tree canopy cover	24.5%	#7
Recommended capacity for change	+4.5 points (28.9%)	#4
Size of tree canopy increase	17.1ha	#5
Relative cost of planting (1 to 5)	1.9	#26
Proportion of total resource	4.2%	#9

Cheetham

4.24 Cheetham is a mid-sized ward with very low tree canopy cover. A high proportion of the ward is Hardstanding Areas (25% more than all Private Gardens for example) with makes it the fifth most Grey ward by land cover. This trend is largely driven by the southern half of the ward, which includes Strangeways HMP, Manchester Fort and industrial areas. There are significant areas of tree cover in the east along Metrolink land and adjacent to the River Irk, as well as more diffuse planting in parks and gardens.

4.25 In general, there is low utilisation of the available space for tree planting. In part, this may be due to the difficulty of planting in the mostly small-sized parks; the large area of commercial and industrial land in the south of the ward; and the high proportion of logistics and storage in Hardstanding Areas. All of these factors do reduce capacity somewhat but they also increase the average cost of planting, which is higher than in most wards.

4.26 The largest opportunity for increased tree cover is in Private Gardens (949), which contain about half as many trees as the average across the city. Travel and Transport Routes (695) and Hardstanding Areas (663), despite reductions in their capacity, still represent the next largest opportunities. These would principally comprise planting in retail car parks, planting around the perimeter of yards, street trees in engineered planting pits, and also planting in small verges within industrial areas. Delivering new planting in the more heavily paved south of the ward and in denser residential areas is likely to be relatively expensive compared to the greener residential north and west.

Table 26 Key figures for Cheetham

Ward attributes	Total	Placement (of 32)
Ward size	336.9ha	#15
Tree canopy cover	9.0%	#29
Recommended capacity for change	+3.8 points (12.8%)	#11
Size of tree canopy increase	12.8ha	#10
Relative cost of planting (1 to 5)	3.0	#11
Proportion of total resource	4.9%	#7

Chorlton

4.27 Chorlton is a fairly small ward on the west of the city which has the second highest tree cover of any ward. It includes substantial areas of woodland around Chorlton Brook and at Chorlton Ees Nature Reserve in the south-west. However, it also has very high utilisation: most of the places that could be planted with trees, have been.

4.28 Private Gardens, as well as community spaces commonly contain mature trees which are a significant part of the character of the ward. Education and Healthcare Facilities land in the ward has the highest tree canopy cover in the city, and of the nine land classes studied, five were found to already be at capacity. In part, this trend reflects the maturity of the treescape and the number of larger trees that are present that overhang adjacent land types but it must also be indicative of a culture and expectation of tree canopy cover as part of the built environment.

4.29 Chorlton has limited capacity to increase tree canopy cover and the available capacity tends to be in green spaces. This makes is the fifth least expensive place to plant trees on average. Parks and Recreation land has opportunities to improve tree cover (340) including along River Mersey corridor, such as with willow and poplar. The capacity of Natural Environment land is constrained by overriding ecological objectives such as meadow habitats but still has capacity for modest increases (183).

4.30 Travel and Transport Routes (72) and Education and Healthcare Facilities (9) represent smaller but useful opportunities for targeted local improvements, particularly via street trees outside local retail centres, infilling gaps in verge planting, and trees in planters or engineered planting pits at school yards, such as Oswald Road Primary School.

Table 27 Key figures for Chorlton

Ward attributes	Total	Placement (of 32)
Ward size	249.6ha	#24
Tree canopy cover	28.7%	#2
Recommended capacity for change	+1.3 points (30.0%)	#23
Size of tree canopy increase	3.0ha	#25
Relative cost of planting (1 to 5)	1.5	#28
Proportion of total resource	0.6%	#26

Chorlton Park

4.31 Chorlton Park is the fifth largest ward in the city. It contains a significant amount of green space, including large sites such as sports fields in the north-east; Chorlton Park, Southern Cemetery and allotments in the centre; and Hardy Farm, Barlow Tip, Chorlton Water Park, and Chorton-cum-Hardy Golf Course in the south-west. The large amount of green space gives Chorlton Park amongst the highest proportions of land that is Suitable for trees; it also has the second lowest proportion of Grey land.

4.32 There is also a large amount of Private Garden, with a tree canopy cover that is comfortably above average and therefore limited capacity for increase. A substantial part of the green space in the ward does comprise sports pitches and golf, as well as the cemetery, which all reduce the capacity for tree cover at these locations compared to similar sites with less defined or formalised uses. The dominance of green space in the currently unplanted but Suitable land means that Chorlton Park is amongst the least expensive places in the city to plant trees.

4.33 Half of all capacity is in Natural Environment land (1050), of which a proportion may be delivered by natural regeneration such as at Barlow Tip, Hardy Farm and along the River Mersey. Notwithstanding the reduced capacity, Parks and Recreation land is so extensive that opportunities for planting avenues around blocks in the cemetery, between holes on the golf course, as well as on other smaller parks and sports fields still represent the second largest capacity (564). Travel and Transport Routes are the third largest capacity (275), of which some comprises undersized tree species in locations that could accommodate larger trees.

Table 28 Key figures for Chorlton Park

Ward attributes	Total	Placement (of 32)
Ward size	501.8ha	#5
Tree canopy cover	23.8%	#8
Recommended capacity for change	+1.9 points (25.8%)	#19
Size of tree canopy increase	9.8ha	#16
Relative cost of planting (1 to 5)	1.5	#30
Proportion of total resource	1.9%	#21

Clayton and Openshaw

4.34 Clayton and Openshaw is a large and diverse ward in the east of the city. It has a relatively low tree canopy cover but a large amount of Parks and Recreation land, which is concentrated in the north along the River Medlock, and at Sport City. It also includes significant industrial and commercial areas as well as residential land in Clayton in the north and Openshaw in the south. Trees are distributed throughout residential area, along the Ashton Canal, and in small recreation and community spaces such as churchyards and parks.

4.35 Despite the very large proportion of Parks and Recreation land, a substantial part of this is for organised sports and does not have capacity for tree planting. However, a general increase in tree cover would be desirable across smaller parks as well as via more significant capacity at Clayton Vale and Phillips Park. Large amounts of Hardstanding Areas that were designed without trees could be retrofitted with planting pits without significantly affecting functionality.

4.36 If the capacity to increase tree canopy cover in the ward was fully realised, this would give rise to the third largest transformation of the treescape in any ward and the second largest real terms increase in tree numbers. This programme of treescape regeneration would be amongst the most notable in the city and require a significant coordinated effort comprising some 9% of the total recommended investment across the city.

4.37 Travel and Transport Routes land (1566) comprises a mix of Green and Grey land cover. Both are well short of their respective capacity but green verges should be planted fully first before reappraising capacity, because this will deliver benefits more economically, including by overhanging pavements. Tree cover in Private Gardens could be roughly doubled (1380) to bring it in line with comparable areas in other wards, and significant amounts of Hardstanding Areas also represent an opportunity for planting (830) including in larger car parking areas.

Table 29 Key figures for Clayton and Openshaw

Ward attributes	Total	Placement (of 32)
Ward size	495.1ha	#6
Tree canopy cover	13.9%	#23
Recommended capacity for change	+4.6 points (18.6%)	#3
Size of tree canopy increase	22.9ha	#2
Relative cost of planting (1 to 5)	2.9	#12
Proportion of total resource	8.7%	#2

Crumpsall

4.38 Crumpsall is a mid-sized ward in the north of the city with residential areas to the west and a more mixed usage to the east, including North Manchester General Hospital, Abraham Moss School, industrial parks and green space along the River Irk. It has an above average tree canopy cover, helped in part by a notably high level of tree cover in Private Gardens, which are by far the largest land use.

4.39 Education and Healthcare Facilities is a significant Land Use in the ward, but does not represent a particularly large opportunity for tree planting because much of this land which could be is already tree-covered. There is therefore relatively low capacity to increase tree cover across the ward and most areas of opportunity are on Grey rather than Green land, making it a relatively expensive place to plant trees.

4.40 Travel and Transport Routes represents the largest opportunity to increase tree cover (255); railway embankments are already heavily tree-lined but an increase in street tree provision of about a fifth could be accommodated. Tree cover on Parks and Recreation land could be similarly increased (222), by increasing planting along the River Irk, at Abraham Moss and a few smaller green spaces. Hardstanding Areas represents the third largest capacity (172), particularly, Hendham Vale Industrial Estate, supermarket car parks, and Hexagon Tower all of which could accommodate modest well-designed increases in tree cover.

Table 30 Key figures for Crumpsall

Ward attributes	Total	Placement (of 32)
Ward size	324.3ha	#18
Tree canopy cover	22.9%	#10
Recommended capacity for change	+1.1 points (24.0%)	#25

Ward attributes	Total	Placement (of 32)
Size of tree canopy increase	3.8ha	#23
Relative cost of planting (1 to 5)	3.8	#5
Proportion of total resource	1.9%	#22

Deansgate

4.41 Deansgate is the fifth smallest ward in the city and has the lowest tree cover. It has the lowest proportion of Green space of any ward, including very small amounts of Private Garden, Natural Environment, Parks and Recreation land. A relatively large proportion of the ward would be Unsuitable for trees because it is buildings or roads but pockets of tree cover are found at the Cathedral, St John's Garden, along the River Irwell, Castlefield Basin, and around the Town Hall.

4.42 Of the land that could theoretically support trees, about half is Hardstanding Areas such as courtyards, parking and pedestrianised squares. By including pavements, towpaths and other transport land this figure rises to 90% in paved or otherwise hard surfaced areas. This makes it the most expensive place in the city to plant trees. It is understandable that utilisation of the available space for tree planting is very low. However, the capacity to plant trees does exist.

4.43 By far the largest capacity is on Travel and Transport Routes land (745) via street tree planting. A lower canopy cover should be expected than in most wards due to the density of the above and underground built environment and narrow canyon width between buildings. However the very low baseline of 7% leaves room for significant increases, even where large spreading species cannot be used. Public pedestrianisation projects and traffic calming or highway reordering may present opportunities in the future when they arise, in addition to existing Hardstanding Areas land (320) which is mostly in private ownership. Very few trees could be accommodated elsewhere including Private Gardens (30) and Education and Healthcare Facilities (20). Careful design will be critical in all cases.

Table 31 Key figures for Deansgate

Ward attributes	Total	Placement (of 32)
Ward size	198.2ha	#28
Tree canopy cover	5.1%	#32
Recommended capacity for change	+2.8 points (7.9%)	#16
Size of tree canopy increase	5.6ha	#21
Relative cost of planting (1 to 5)	4.9	#1

Ward attributes	Total	Placement (of 32)
Proportion of total resource	3.5%	#13

Didsbury East

4.44 Didsbury East is a mid-sized ward in the south-east of the city with a relatively high tree canopy cover. It includes significant tree populations around the edges of the ward at Fog Lane Park, Fletcher Moss Park, Millgate Fields, Old Bedians, Parrs Wood High School and along the River Mersey. It also has strong linear belts of trees along railway and road links within the interior of the ward as well as at Towers Business Park and on residential roads and gardens.

4.45 Of the ten land classes studied, seven are already at capacity; demonstrating the high utilisation rate across many types of land. Examples of this include street trees around Clothorn Road, the Tesco Superstore car park at Parrs Wood Lane and mature garden trees in the area around Catterick Road. Private Gardens, on average, comfortably exceed what would be regarded as capacity for trees in most wards. However, there is some variation even with the ward and if housing in the south and east matched the areas of highest canopy cover, further increases would be achieved.

4.46 The capacity for additional tree cover is limited, with former Agricultural green spaces in the south west representing the largest opportunity within field margins and hedgerow as well as via natural regeneration in selected locations (123). Education and Healthcare Facilities land (117) such as schools and hospices, and Natural Environment land (21) represent smaller planting capacity. Land uses that already have a relatively high tree canopy cover such as highway verges should not be ruled out for planting; good opportunities, whilst not significant in the data, do exist and may be cost effective to deliver, such as in central verges along Old Broadway and parts of Kingsway.

Table 32 Key figures for Didsbury East

Ward attributes	Total	Placement (of 32)
Ward size	365.3ha	#13
Tree canopy cover	26.5%	#5
Recommended capacity for change	+0.3 points (26.8%)	#31
Size of tree canopy increase	1.3ha	#27
Relative cost of planting (1 to 5)	1.0	#31
Proportion of total resource	0.2%	#30

Didsbury West

4.47 Didsbury West has the highest tree canopy cover of any ward in the city. It also has a very high utilisation rate; there are relatively few places that trees could be planted where this has not already happened. Tree cover in residential areas is very high, with Private Gardens having the highest proportion of canopy cover anywhere in the city. There are also significant tree populations around sports grounds, allotments, the River Mersey (including on brownfield land) and at Withington Golf Club.

4.48 Of nine land classes studied, eight are already at capacity, with some significantly exceeding this target, including 88% tree cover on Natural Environment land, 38% in Private Gardens, and a combined figure of 37% for Travel and Transport Routes land. Similar to Chorlton, this may be indicative of a 'normalised' relationship with trees, especially mature trees, which make a particular contribution to the size and benefits provided by the treescape.

4.49 The only capacity that was modelled by this study is on Parks and Recreation land (206) making Didsbury West also a contender for the most inexpensive place to plant trees to meet this capacity. Opportunities exist along the River Mersey such as at Merseybank Playing Fields and in the golf course, as well as in non-public green spaces such as amenity grass around the Siemens medical complex.

Table 33 Key figures for Didsbury West

Ward attributes	Total	Placement (of 32)
Ward size	334.9ha	#16
Tree canopy cover	30.3%	#1
Recommended capacity for change	+0.3 points (30.6%)	#30
Size of tree canopy increase	1.0ha	#28
Relative cost of planting (1 to 5)	1.0	#32
Proportion of total resource	0.1%	#31

Fallowfield

4.50 Fallowfield is a small ward with tree canopy cover close to the Manchester average. It has a large amount of Parks and Recreation space, mostly comprising Platt Fields Park. Ashburne Hall, Wooton Hall and the Fallowfield Campus have significant populations of mature trees, as does the Fallowfield Loop along the southern boundary.

4.51 The opportunities for tree planting within the ward are relatively modest. There is significant diversity of tree canopy cover within residential areas, which include dense terraced housing with fewer trees as well as areas with larger gardens to the west. Wilbraham Road, the main arterial route from west to east, was not designed to accommodate tree planting and is a relatively wide highway corridor but with very limited tree cover and a narrow central grass verge. Education and Healthcare Facilities, Hardstanding Areas, and Natural Environment land all have very limited capacity for planting.

4.52 Private Gardens represent the most significant capacity (223), although this is not evenly distributed. In denser housing areas to the east, planting of small trees in pavements would be a better way to increase canopy cover. This would contribute towards the realisation of capacity on Travel and Transport Routes land (190) which also includes some wide pavements, such as on Whitmore Road. More ambitious schemes such redesigning the western part of Wilbraham Road could substantially increase tree cover and transform key grey infrastructure into more attractive and multifunctional spaces. There is also limited capacity for planting in Parks and Recreation land (63), such as along paths and tracks in the northern part of Platt Fields.

Table 34 Key figures for Fallowfield

Ward attributes	Total	Placement (of 32)
Ward size	204.7ha	#27
Tree canopy cover	19.0%	#15
Recommended capacity for change	+1.3 points (20.3%)	#24
Size of tree canopy increase	2.5ha	#26
Relative cost of planting (1 to 5)	3.2	#10
Proportion of total resource	1.1%	#24

Gorton and Abbey Hey

4.53 Gorton and Abbey Hey is a fairly large ward with a fairly low average tree canopy cover, which is heavily focussed within green spaces. Built up areas of the ward tend to have more limited green space or trees within them, particularly areas of more dense terraced housing without gardens and industrial areas to the north-west. The east of the ward follows Gorton Upper Reservoir and is very green. There are significant populations of trees within a broad ribbon of greenspace comprising the reservoirs, Fallowfield Loop, Ackroyd Avenue and Gorton Reservoir Allotments, Manchester Donkey Sanctuary, Debdale Park, Gore Brook Valley and Sunny Brow Park. Green spaces in parks, wide verges, schools and churches within the centre and west of the ward provide the closest and most accessible trees in most places.

4.54 The density and layout of terraced housing areas in Abbey Hey and Debdale restricts the capacity for planting in Private Gardens and on Travel and Transport Routes land to the use of smaller species. There is some capacity, but where yard and garden spaces in residential areas are limited planting should be community led to ensure good outcomes. Newer estates in the west tend to have gardens and therefore greater capacity. Overall, the opportunities for increases in tree cover are evenly distributed across land uses with no one outstanding area of focus.

4.55 Travel and Transport Routes land could accommodate trees within planting pits as well as on unplanted verges and green space (463). Parks and Recreation contain some recent planting (e.g. Heroes Wood and at Gorton Park) that will increase in size and self-deliver a proportion of the remaining capacity (422) although opportunities remain in most parks as well as Gorton Cemetery. Gorton Market and manufacturing areas to the north west of the ward could accommodate a large proportion of new trees within Hardstanding Areas (390) and a similar capacity exists across Education and Healthcare Facilities (346). Of this, Wright Robinson College is the largest by far and has some significant Hardstanding Areas and amenity grass that contain very few trees.

Table 35 Key figures for Gorton and Abbey Hey

Ward attributes	Total	Placement (of 32)
Ward size	389.0ha	#10
Tree canopy cover	15.9%	#22
Recommended capacity for change	+2.5 points (18.4%)	#17
Size of tree canopy increase	9.8ha	#15
Relative cost of planting (1 to 5)	2.8	#13
Proportion of total resource	3.6%	#12

Harpurhey

4.56 Harpurhey lies within the centre north of The City of Manchester. It is a large ward with substantial well-connected green infrastructure along Boggart Hole Brook in the north; and Moston Vale, tram and rail links, and Village Park in the south. Up the western boundary there is a corridor of green and semi-natural spaces along the River Irk including Sand Hills, Queens Park, The General Cemetery, Harpurhey Reservoir and Ponds, and woodland between Factory Lane and Andrew Road. The ward also contains a very large amount of grey transport land, mostly pavements, which is significantly underutilised for tree planting.

4.57 A proportion of housing is terraced with yards, which cannot support significant levels of tree cover. However, most properties have small gardens as well as some in the form of communal greenspace, particularly in central Harpurhey. Tree cover in gardens is low and there is significant capacity for increases. The most notable examples are more recent developments which have almost no street or garden trees, partly due to immaturity of the landscape, but which could readily accommodate both. Waverley Road, Larchwood Avenue, Nigel Road and Elmwood Grove are an example of newer developments with significant room for growth.

4.58 Overall, Harpurhey has substantial capacity for increased tree canopy cover, which would be the third largest increase in The City of Manchester in real terms and the second most notable transformation of tree canopy in any ward. The largest part of this (1722) is on Parks and Parks and Recreation land where a large programme of planting could be accommodated across almost all sites, including at David Lewis Recreation Ground, Collyhurst Park, Village Park, Sand Hills, Moston Vale and at Upper Monsall Street.

4.59 Travel and Transport Routes land also has a large capacity for additional planting (1279). Verges should be maximised first and are very readily available, including planting of larger amenity grass spaces such as at Jonas Street, Radford Drive, Dalbeattie Street, Clayhill Walk and around Thornton Street North. The residential layout in many areas lends itself to tree planting and a major planting programme in verge spaces represents a genuine and significant opportunity to green the streetscape. Private Gardens still represent the third largest opportunity for increased canopy cover (634) despite the reduced capacity in some housing types. A proportion of this may be delivered by tree growth on newer sites but there is significant potential for planting in both communal and separate gardens.

4.60 Whilst not significant in the data, there are notable planting opportunities within large car parks at Harpurhey Shopping Centre and in the business park around the Greater Manchester Police Headquarters. The formal planting arrangement including pleaching at the latter is very attractive but it limits tree canopy cover and some associated environmental benefits, it is also expensive to maintain and a change in management practices could reduce costs as well as increasing habitats and air quality.

Table 36 Key figures for Harpurhey

Ward attributes	Total	Placement (of 32)
Ward size	417.1ha	#8
Tree canopy cover	18.5%	#17
Recommended capacity for change	+4.9 points (23.4%)	#2
Size of tree canopy increase	20.5ha	#3
Relative cost of planting (1 to 5)	2.4	#17

Ward attributes	Total	Placement (of 32)
Proportion of total resource	6.4%	#3

Higher Blackley

4.61 Higher Blackley is a very large ward in the north-west with the third highest level of tree cover and the most woodland in any ward. This is distributed, sometimes in fairly large swathes, between residential areas; along the River Irk; at Blackley Forest, French Barn Lane, and Alconbury Walk; and along motorway embankments. The western part of the ward is Heaton Park, by far the largest park in the city. This contains further woodland and scrub, as well as formal and ornamental planting and trees around golf facilities.

4.62 Despite the already high level of canopy cover, the fact that so much of the ward is Suitable for tree planting (within the top five wards) means that there is still significant capacity. This is partly because of size but also because Higher Blackley has the lowest level of individual tree cover of any ward in the city. The high canopy cover in the ward (27.9%) is almost entirely driven by the amount of woodland and individual non-woodland trees contribute only 4.5% towards the total.

4.63 Private Gardens are the only land class that should be expected to accommodate a lower than average tree cover because most houses have gardens but many are small. Planting in communal gardens and wide shared verges presents a better opportunity to increase tree cover within residential areas and improve the integration of trees and lived environment in what is currently a notably 'segregated' treescape.

4.64 Perhaps unavoidably, the largest capacity in the ward is on Natural Environment land (1264), of which a proportion is within Heaton Park. This capacity also includes an increase in canopy density on some scrubby land and rougher ground such as the east of Plant Hill Park, land along Alconbury Walk, and on substantial areas of land on both sides of the M60 in the north-east of the ward adjacent to the River Irk, Boardman Brook and Northridge Road.

4.65 Travel and Transport Routes land could accommodate planting (807) on the large number of soft roadside verges across the ward that do not contain trees. These include a number of large grass areas such as at Chain Road, Cobble Bank, Sandyhill Road and Tweedle Hill Road. Private Gardens (646) have variable capacity but with good species selection could accommodate a widespread modest increase in canopy cover. Smaller opportunities also exist in large retail car parks such as Sainsbury's and Home Bargains, which contains small trees, as well as on large school sites such as the Co-op Academy. Blackley Cemetery also has significant potential to increase canopy cover without compromising the quality or use of the site.

Table 37 Key figures for Higher Blackley

Ward attributes	Total	Placement (of 32)
Ward size	733.3ha	#2

Ward attributes	Total	Placement (of 32)
Tree canopy cover	27.9%	#3
Recommended capacity for change	+2.0 points (29.9%)	#18
Size of tree canopy increase	14.8ha	#7
Relative cost of planting (1 to 5)	2.0	#24
Proportion of total resource	3.7%	#11

Hulme

4.66 Hulme is an inner city ward to the south of the city centre. It includes significant transport corridors and employment areas, as well as retail and residential. The eastern part of the ward is dominated by the University of Manchester and Manchester Metropolitan University, giving Hulme the largest proportion of Education and Healthcare Facilities land use of any ward by a considerable margin. The largest area of tree canopy is adjacent to Moss Side Health Centre, although there are also clusters or linear planting of trees, particularly along Princess Road; at a number of schools; at Hulme, All Saints, and St George's Parks; on the Castlefield Campus; and in the pedestrianised Leaf Street and Letsby Avenue pocket parks.

4.67 The land cover is heavily Grey, with similar amounts of Hardstanding Areas and Parks and Recreation land. This makes Hulme a relatively expensive place to plant trees. Opportunities to increase tree cover in existing green spaces such as verges, parks and gardens, the Deansgate Interchange should be maximised, but planting in hard surfaces would be an unavoidable part of greening Hulme. Utilising larger tree species is also particularly important where planting locations are fewer in number in order to deliver maximum canopy cover and associated benefits from the fewest individual trees.

4.68 Travel and Transport Routes is the largest land use and so produces the largest capacity for planting, even with Unsuitable land excluded (964). Private Gardens in the ward have relatively low tree cover (11%) and this could be increased (419). Some capacity in residential areas is in communal green and parking spaces and residential verge spaces that may be in shared or managed ownership. Parks and Recreation (276) and Hardstanding Areas (274) have similar capacity overall. Planting along paths in parks and around margins such as at Bold Street Sports Ground would not significant affect park use internally. At Old Birley Street Open Field, planting to improve screening around the petrol station and avenue planting along road would be desirable. Asda Hulme, Hulme High Street Retail Park, and university land represent the main opportunities on Hardstanding Areas, although there are many smaller courtyards and car parks throughout the ward that could benefit.

Table 38 Key figures for Hulme

Ward attributes	Total	Placement (of 32)
Ward size	267.9ha	#21
Tree canopy cover	12.0%	#26
Recommended capacity for change	+3.9 points (15.8%)	#10
Size of tree canopy increase	10.4ha	#14
Relative cost of planting (1 to 5)	3.3	#9
Proportion of total resource	4.5%	#8

Levenshulme

4.69 Levenshulme is an unusual ward in terms of tree cover, which is slightly below average but is very unevenly distributed. The ward has a large amount of Parks and Recreation and Natural Environment land, which is concentrated in a small number of large sites at Greenbank Park, Playing Fields and Chapel Park; Cringle Park; and Highfield Country Park, Levenshulme Allotments and the Fallowfield Loop. These sites, particularly Highfield Country Park, contain a huge proportion of the ward's trees, whereas the residential and industrial areas that make up most of the rest of the ward have very low levels of tree cover. This is partly a function of the majority of terraced housing with small or no gardens. There is less Private Garden space in Levenshulme than land used for either Travel and Transport Routes, Parks and Recreation, or Hardstanding Areas.

4.70 The capacity for increases in tree canopy cover in Levenshulme is relatively low. Parks and Recreation, and Education and Healthcare Facilities land are both close to capacity with only local and small-scale opportunities, such as along paths in Cringle Park. Travel and Transport Routes and Private Garden capacity are both heavily constrained by the density of housing and narrow pavement space. Hardstanding Areas in the ward are dominated by scrapyards and haulage in the north-east, which are inherently unsuited to planting and therefore have lower capacity than other types of Hardstanding Areas such as retail, which are more common in other wards.

4.71 The combined effect of the high level of existing canopy cover in green spaces; the very low numbers of trees in residential areas; and the small amount of garden space mean that main opportunity in the ward to plant trees is within Travel and Transport Routes (334). For the most part, this means street trees in pavements. There are some good examples of what can be achieved within the ward within relatively dense terraced housing, which could be extended elsewhere. Small species planting at Longden Road and larger mature trees at Poplar Road give good short and longer term examples.

4.72 Natural Environment land has some capacity (229) of which, a proportion might be delivered on Greenbank Playing Fields as well as rough land at Nelstrop Road North and Elsa Road, which might be suited to grant funded habitat creation and tree planting. Management. Highfield Country Park has high canopy cover but a small proportion of the existing scrub could be allowed to follow natural succession to increase the number of large canopy species trees, including around equine land at the southern tip. Hardstanding Areas (103) and Private Gardens (86) have modest capacity, which is focussed on small car parks for retail and religious buildings, and at newer residential developments such as around Red Rose Crescent, Bratton Drive, Greystoke Avenue and Peter Moss Way.

Table 39 Key figures for Levenshulme

Ward attributes	Total	Placement (of 32)
Ward size	252.2ha	#23
Tree canopy cover	17.4%	#19
Recommended capacity for change	+1.4 points (18.7%)	#22
Size of tree canopy increase	3.8ha	#22
Relative cost of planting (1 to 5)	3.4	#8
Proportion of total resource	1.7%	#23

Longsight

4.73 Longsight has low tree canopy cover and is consistently below capacity across all land classes. The largest land use is Private Gardens, which are present across the northern and eastern parts of the ward with low levels of tree cover. Terraced housing in the west of the ward tends to have smaller yards. There are locally significant areas of tree planting along the railway line, at Pottery Lane, Crowcroft Park, Annie Lees Park, and in Nutsford Vale Park, which is by far the largest green space in the ward.

4.74 There are significant constraints to increases in tree cover within the ward in the form of land uses that exclude trees. These include motorcycle tracks and sports pitches, and the very large British Car Auctions site. Areas of back to back terraced housing with narrow pavements also put downward pressure on capacity for tree cover. However, allowing some natural regeneration in Nutsford Vale Park would deliver modest increases without planting, and large car parks in the north of the ward serving Asda, Gala Bingo and the motorcycle facilities could be improved by internal tree planting.

4.75 Parks and Recreation (652) and Private Gardens (696) have the largest capacity for increases in canopy cover. In particular Melland Fields, Annie Lees Park and incidental informal spaces such as at Pennington Street, as well as housing estates in the north and east of Longsight, which tend to have more generous gardens but few trees. Travel and Transport Routes land includes planting opportunities (451) along railway land such as at Glencastle Road. Planting of smaller tree species should be preferred in denser residential areas to prevent future conflicts, whereas the capacity to increase tree numbers in green verges does exist in some areas, such as along the western part of Kirkmanshulme Lane. Education and Healthcare Facilities represents the third largest combined capacity (265) mostly at school sites such as Rushbrook Primary Academy School, as well as smaller sites such as Longsight Community Primary School and Crowford Park Primary School.

Table 40 Key figures for Longsight

Ward attributes	Total	Placement (of 32)
Ward size	287.1ha	#20
Tree canopy cover	13.7%	#24
Recommended capacity for change	+4.1 points (17.8%)	#7
Size of tree canopy increase	11.7ha	#13
Relative cost of planting (1 to 5)	2.0	#22
Proportion of total resource	3.1%	#17

Miles Platting and Newton Heath

4.76 Miles Platting and Newton Heath is the third largest ward. It comprises a mix of industrial and trading estates, housing, large and often linear green spaces, and also contains railway, canal, river and major highway links. There are significant tree populations along railway corridors and land adjacent to the River Medlock, at Brookdale Park, Scotland Hall Road Recreation Ground and Philip's Park Cemetery. Overall, the tree canopy cover is lower than average and there are significant numbers of trees on brownfield land which may represent a further future downward pressure on tree canopy cover such as at Jackson Brickworks.

4.77 There is a very large amount of Parks and Recreation land in the ward but this is already close to capacity in terms of tree cover, whereas the areas of Hardstanding Areas tend to be associated with industrial uses and therefore have both low canopy cover and a reduced capacity for increases. Dense housing in some areas reduces the capacity of Travel and Transport Routes land to accommodate trees and on-pavement parking in some areas would need to be redesigned in order to accommodate planting in protected planting pits. Notwithstanding the technical complexity, there are widespread examples of under-utilised wide pavements and central reservations in the ward. Vacant plots in the west around Whitley Road are likely to provide increases in tree cover as part of any future regeneration, from a very low baseline.

4.78 Travel and Transport Routes (1145) and Private Gardens (1127) represent the major components of the capacity for increases in tree canopy cover. Housing types and layouts are variable across the ward but there the numerous opportunities for planting in gardens, verges and pavements across such a large ward add up to a sizeable contribution to tree numbers in the city. Newer developments, such as in the west, tend to contain few trees and present good opportunities for rapid increases. Hardstanding Areas (399) and Natural Environment (371) land have similar capacity to one another but the approach to delivery and the cost would be very different. The amount of brownfield land and rate of development makes modelling capacity difficult in the ward, and maximising tree cover on mature land uses such as residential areas, streets and parks may deliver more stable gains in tree cover in the medium term.

Table 41 Key figures for Miles Platting and Newton Heath

Ward attributes	Total	Placement (of 32)
Ward size	530.0ha	#3
Tree canopy cover	16.7%	#21
Recommended capacity for change	+3.1 points (19.9%)	#15
Size of tree canopy increase	16.6ha	#6
Relative cost of planting (1 to 5)	2.6	#16
Proportion of total resource	5.7%	#6

Moss Side

4.79 Moss Side is the smallest ward in the city and has a very low level of existing tree canopy cover. It is a difficult place to grow trees because of a high proportion of Hardstanding Areas as well as extensive areas of dense housing with narrow pavements and limited outdoor garden space which cannot accommodate the same level of tree canopy as housing at lower densities. Small pocket parks and other recreation and sports land make up less than ten percent of the ward and tend not to contain significant numbers of mature trees. Moss Side has the third lowest proportion of Green land of any ward.

4.80 Notwithstanding the limited amount of space that is Suitable for tree planting in real terms, there is relatively low utilisation of this space. This means that there is a significant proportion of available planting locations that are unused. A coordinated programme of tree planting across the ward could therefore transform the appearance and treescape of Moss Side in a way that is not possible in most other wards. The recommended capacity for additional tree planting is in the top five of all wards, which would deliver significant local as well as regional benefits.

4.81 Private Gardens are the largest land use by far and a culture shift will be required as well as resources and technical support to increase tree cover from a very low base (8%) towards a realistic capacity of around 15% (975). This will necessarily be weighted towards the west of the ward but limited planting in yards and small gardens elsewhere is possible. Street tree planting on Travel and Transport Routes land (307) must be the second priority, which should include a mix of verges, reservations and planting in pavements. Planting in denser terraced streets is unlikely to be possible without reconfiguration of traffic flow, such as by converting grid pattern housing to one-way systems with improved on street parking and planting within traffic calming islands and new green verges. There are limited opportunities for planting elsewhere across Education and Healthcare Facilities, Parks and Recreation, and on Hardstanding Areas, such as in car parks.

Table 42 Key figures for Moss Side

Ward attributes	Total	Placement (of 32)
Ward size	164.1ha	#32
Tree canopy cover	7.4%	#30
Recommended capacity for change	+4.4 points (11.8%)	#5
Size of tree canopy increase	7.3ha	#18
Relative cost of planting (1 to 5)	2.2	#18
Proportion of total resource	2.1%	#20

Moston

4.82 Moston is a mid-sized ward in the north-east of the city, which has tree canopy cover approximately equal to the city average. However, this average contains a mosaic of areas of terraced housing with narrow streets and few trees, within a matrix of green infrastructure and open spaces along Moston Brook and Boggart Hole Brook, the railway line, at Broadhurst Park, and amenity greenspace around Halliford Road and Waterford Avenue.

4.83 The capacity for tree planting within some residential areas is reduced because of the narrow street width but there are also some large green verges such as on Broadway, which could be planted as well as wider pavements in other residential areas. There is a significant amount of land that may be suited to infill development in the future, particularly in the north-west and south of the ward. Tree planting on what is currently green space could form a temporary land use that is cheaper to maintain than mown grass but it would be preferable to establish a long-term plan for green infrastructure links and tree planting to provide a framework for future development and a maturing landscape that is compatible with a range of future uses.

4.84 Gardens have the most capacity by far (1195), particularly in the central part of the ward, which has mid-sized gardens and a below average tree cover. Gardens are also the largest land use. Travel and Transport Routes land represents the second largest opportunity for increases in tree cover through planting of verges, incidental green space such as Waterman's Close, and in pavements (743) despite the reduced capacity for larger species in denser areas. Parks and Recreation land has widespread capacity for planting (570) including Broadhurst Park; and land at Ebworth Street, and between Rudd Street, Lighbowne Road and Joyce Street. Perhaps the largest single opportunity is St Joseph's Cemetery, of which the southern half is almost entirely without internal trees, in stark contrast to the mature canopy across the northern half.

Table 43 Key figures for Moston

Ward attributes	Total	Placement (of 32)
Ward size	344.6ha	#14
Tree canopy cover	19.0%	#16
Recommended capacity for change	+3.9 points (22.9%)	#8
Size of tree canopy increase	13.4ha	#9
Relative cost of planting (1 to 5)	1.9	#25
Proportion of total resource	3.4%	#15

Northenden

4.85 Northenden is a large and irregularly shaped ward following the south-western bank of the River Mersey as it bisects The City of Manchester. It is highly variable in composition, containing sections of the M56 and M60 motorways and industrial areas, as well as Northernden and Didsbury Golf Clubs, and three distinct residential areas at Benchill, Northenden and northern Moor. It has substantial areas of tree cover at Kenworthy Woods in the north-west, which extend around the motorway junction and in ribbons along transport corridors and around golf facilities. There are also small compartments of woodland within the ward at Elwyn Avenue, Homewood/Greenpark Road, and Shandon Avenue.

4.86 The large amount of green space across the ward means that it has amongst the top five highest proportions of land that is Suitable for growing trees. It is also the third Greenest ward by Land Cover, with Private Gardens, Parks and Recreation, and Natural Environment being the top three Land Uses by far. A significant proportion of the Parks and Recreation land is golf courses, which contain significant areas that could not accommodate tree planting, which does reduce capacity somewhat within current land use patterns. Unusually, the Sharston Industrial Estate does contain small soft verges that could be planted to improve tree canopy around Hardstanding Areas and improve the quality of employment areas.

4.87 Travel and Transport Routes land is the primary opportunity for increased tree canopy cover (585) which comprises capacity for planting along Palatine Road outside shops, and infill planting opportunities in grass verges, which are widely available such as at Mullacre Road, Woodhouse Lane, Alders Road and Royle Green Road. Northern Moor also has some particularly wide mown verges that could make a significant contribution to tree cover locally such as at Lawton Moor Road, Carloon Road and along Sale Road.

4.88 Motorway embankments have some limited opportunities for planting, which could be realised by natural regeneration by adjusting maintenance regimes. This principle could also increase tree cover on Natural Environment land such as at Kenworthy Woods (363) and along the River Mersey. Delivering similar capacity in Parks and Recreation land (375) will require increases in tree cover on golf courses within far roughs, ornamental areas and by augmentation of existing tree belts as well as planting on smaller sites such as open space at Shawcross Lane and Haveley Park. A smaller but useful opportunity also exists on Education and Healthcare Facilities land (156), of which The Manchester College, Manchester Academy, Rack House School and Benchill Primary School and Community Centre are amongst the larger sites.

Table 44 Key figures for Northenden

Ward attributes	Total	Placement (of 32)
Ward size	524.7ha	#4
Tree canopy cover	25.5%	#6

Ward attributes	Total	Placement (of 32)
Recommended capacity for change	+1.6 points (27.0%)	#20
Size of tree canopy increase	8.0ha	#17
Relative cost of planting (1 to 5)	2.1	#21
Proportion of total resource	2.1%	#19

Old Moat

4.89 Old Moat is the second smallest ward and is principally residential in composition. The amount of Parks and Recreation or Natural Environment land in the ward is very low whereas Private Gardens make up almost half of all land. There are significant tree populations along the Fallowfield Loop and the railway corridor, but most trees are in gardens and in formal avenues along residential streets.

4.90 Private Gardens have good tree cover at a level significantly above the city average. Whilst individual opportunities for planting do exist, they are not collectively significant as an opportunity for tree canopy increase. The dominance of residential land uses in the ward means that this fact depresses the overall capacity of the ward for new planting. Planting in front gardens might offer a better route to greening some highway corridors than street tree planting. This has already happened in other places, such as Mauldeth Road West, where all of the mature trees are in front gardens rather than in the highway curtilage. Succession planning will be needed to preserve these collective features in the long term, with gaps already appearing that would benefit from planting-up.

4.91 Travel and Transport Routes land represents the largest capacity for increased tree cover (104). This comprises infill planting in gaps within avenues and some verge space such as along Princess Road, which has a central reservation that could accommodate planting more economically than tree pits in pavements. Planting in pavements could be accommodated in the local centre around Copson Street, which is one of the least green parts of the ward and could be transformed by a relatively limited but well-designed tree planting scheme. Education and Healthcare Facilities sites such as nursing homes, West Didsbury Primary School, Withington Girls' School and Old Moat Primary School (57) and Parks and Recreation land at Old Moat Park (27) have modest capacity for planting, mainly within gaps along boundaries.

Table 45 Key figures for Old Moat

Ward attributes	Total	Placement (of 32)
Ward size	179.6ha	#31
Tree canopy cover	20.7%	#12

Ward attributes	Total	Placement (of 32)
Recommended capacity for change	+0.5 points (21.2%)	#27
Size of tree canopy increase	0.9ha	#30
Relative cost of planting (1 to 5)	3.5	#6
Proportion of total resource	0.4%	#29

Piccadilly

4.92 Piccadilly is a small ward in the centre of Manchester. It has the second lowest tree cover and around half of the ward is Hardstanding Areas. Much of the ward comprises retail and business uses, with Manchester Piccadilly train station, the Arndale Centre and the Royal Mail Manchester sorting office being amongst the largest individual sites. The amount of Green land of any kind is the second lowest of any ward and the amount of Parks and Natural Environment land is relatively low (<10%). Trees tend to be located within pocket parks and small green spaces such as St Michael's Flags and Angel Meadow Park, Piccadilly Gardens, Alan Turing Memorial, Vimto Park, on university land in the south, and around the Store Street aqueduct and Thomas Telford Basin.

4.93 There is low utilisation of locations that could accommodate trees across the ward, which must be a reflection of the complexity and cost of planting in hard urban landscapes. This means that there is significant capacity for planting but it tends not to be in green spaces, making Piccadilly the second most expensive place to plant in the city. Planting capacity is limited in some areas by dense utilities and pavements that are too narrow for planting. Narrower species could be accommodated in some retail and business districts but this will decrease the canopy cover that would be achieved by any given number of trees or spacing. However, with sufficient resources, it would be possible to significantly increase canopy along roads, in courtyards, in pedestrianised areas and paved open spaces and substantially increase the presence and benefits of trees within the inner city.

4.94 Travel and Transport Routes land represents the largest available capacity for tree planting (629), most of which would comprise street trees in engineered pits. Trees could also be accommodated in significant numbers (566) on Hardstanding Areas. This includes courtyards and pedestrianised areas as well as car parks, which are very variable. Manchester Major Street, Bloom Street, and Sackville Street car parks are good examples of how large trees can be accommodated within such sites. Parks and Recreation land is limited but has larger capacity for planting (39) than in other parts of the city because green spaces tend not to have dual functions such as sports pitches. Piccadilly Gardens for example would benefit from increased shading which in hard urban spaces is particularly desirable.

Table 46 Key figures for Piccadilly

Ward attributes	Total	Placement (of 32)
Ward size	193.5ha	#29
Tree canopy cover	5.7%	#31
Recommended capacity for change	+3.3 points (9.0%)	#14
Size of tree canopy increase	6.3ha	#19
Relative cost of planting (1 to 5)	4.8	#2
Proportion of total resource	3.9%	#10

Rusholme

4.95 Rusholme is a fairly small ward, south-east of the city centre. It has a mature tree population, above the average canopy cover across the city. Three large green spaces dominate the centre and south-west of the ward around Manchester Grammar School. These include Birchfields Park, Unsworth Park, and the school playing fields; the adjacent allotments also contain unusually large trees for the land use. However, most of the ward's trees are embedded within streets and residential areas. These are well-established, with a common pattern of mature trees in front gardens rather than street trees defining the character of the treescape in residential areas, especially in the north-west. The notable exception is an area of terraced housing around Scarsdale Road and Bankfield Avenue, which are closer to the roadside and have limited outdoor space; there are fewer trees in these areas.

4.96 The amount of tree canopy cover on Travel and Transport Routes land is skewed by the large number of privately owned trees and mature park avenues overhanging the highway. There is therefore an increased capacity for targeted street tree planting that is not reflected perfectly in the mapping data. This should be focussed on the provision of small trees in areas of terraced housing, and planting in engineered pits along streets in the south of the ward, which could be designed to complement and reinforce off-street parking arrangements along Cranston Road, Brynton Road and Elsden Road.

4.97 The lack of significant green space for planting makes Rusholme the fourth most expensive place to plant in the city, but the actual size of the capacity is relatively low so the overall cost of delivery would be modest. Opportunities on Travel and Transport Routes land (81) are principally on secondary and residential roads. Manchester Grammar School is the largest site in the Education and Healthcare Facilities land class, which has modest capacity for increased tree canopy along with MEA Central (67). The restoration of small pockets of disused or damaged land at Unsworth Park, augmentation of tree belts along the railway corridor, and management of some mature tree populations towards a natural woodland structure, such as along Gore Brook would enhance the habitat functions of trees and deliver small increases on Natural Environment land (47).

Table 47 Key figures for Rusholme

Ward attributes	Total	Placement (of 32)
Ward size	215.1ha	#26
Tree canopy cover	21.8%	#11
Recommended capacity for change	+0.5 points (22.3%)	#29
Size of tree canopy increase	1.0ha	#29
Relative cost of planting (1 to 5)	4.0	#4
Proportion of total resource	0.5%	#28

Sharston

4.98 Sharston is a mid-sized ward with a diverse composition. It is bisected by the M56 in the north at Sharston Industrial Estate and has a large swathe of agricultural and green space down the eastern boundary along Gatley Brook. It also contains a number of sizeable schools and healthcare facilities, and five woodlands at Calderbeck Way, Woodend Road, Longwood Road, Leominster Drive and Haslington Road. Parks such as Hollyhedge and Peel Hall Park are outnumbered four to one by the amount of Private Garden space. There are significant populations of trees in the west between Greenwood Road and the M56, in parks and woodland, and on motorway embankments and junctions.

4.99 Most houses in the ward have gardens but there are significant numbers of gardens without any trees, as well as shared gardens with low levels tree cover such as Ringway Mews care home and Mitchell Gardens. The southern half of Sharston Industrial Estate lies within ward and, unusually for the land use, does contain grass verges that could be planted with trees. There are no local factors that reduce capacity for tree cover except that Natural Environment land principally comprises woodland and therefore already has a very high canopy cover.

4.100 There is a mix of capacity for additional tree cover that is spread across most land classes with Private Gardens representing the largest component (971), mainly because it is such a dominant land use. Travel and Transport Routes land could also accommodate a substantial planting programme (666) on metro link and residential street verges, such as at Newhey Road and Briar Crescent. There is also a widespread pattern of mown grass at highway junctions such as Rotherby and Stancliffe Roads, Norwell and Fenside Roads, Solway and Crossacres Roads, and Mayfair and Croftlands Roads. Many of these contain no trees but there are examples across the ward that could be replicated more widely such as at Dunstall and Fenside Road. This would be a relatively inexpensive and high impact way to increase tree cover and visual amenity.

4.101 Education and Healthcare Facilities (267) and Parks and Recreation (255) have similar capacity for increases in tree cover comprising larger sites such as at Tramore Walk, St Elizabeth Catholic Primary School, Crossacres Primary Academy and Hollyhedge Park. However, there are also a large number of pocket parks and greens within looped residential roads such as Briardene Gardens and Desmond Road, Panfield and Gorsey Road, Mendip Avenue, Crossacres Road, and Pembury Close. Cedars Road is a good example of how a limited number of trees can be accommodated in such places without compromising recreation or amenity uses.

Table 48 Key figures for Sharston

Ward attributes	Total	Placement (of 32)
Ward size	326.9ha	#17
Tree canopy cover	17.2%	#20
Recommended capacity for change	+3.9 points (21.1%)	#9
Size of tree canopy increase	12.6ha	#12
Relative cost of planting (1 to 5)	2.2	#19
Proportion of total resource	3.5%	#14

Whalley Range

4.102 Whalley Range is a small ward in the west of the city with the fourth highest level of canopy cover. Travel and Transport Routes, Hardstanding Areas and Private Gardens are present in roughly equal measure and Parks and Recreation space is relatively limited. Tree cover is relatively diffuse and integrated with other land uses and is not disproportionately biased towards significant tree populations at a small number of sites. The British Muslim Heritage Centre and Alexandra Park are the two largest defined populations of mature trees. However, large mature street trees (and trees in front gardens that function as street trees) are widespread, and reflect an ambition and imagination in planning the treescape that is lacking in many of the later developments. Whalley Range has the highest level of street tree canopy cover in the city and highest proportion of trees in Parks and Recreation land.

4.103 The high utilisation of available land for planting and the fact that many land classes significantly exceed what is regarded as 'capacity' by this study means that few opportunities for new planting have been identified in the ward. This emphatically demonstrates that the level of ambition and identification of planting opportunities within the study are not unattainable or excessive; they can in some areas be comfortably exceeded, given sufficient time and resources. In particular, Whalley Range is a model for how excellent street tree provision (36.9% across all pavements and verges combined) delivers benefits beyond the streetscape and establishes a culture and expectation of tree cover that permeates gardens and businesses.

4.104 Only Education and Healthcare Facilities land was found to have some limited capacity for additional planting (54). These include Whalley Range High School and roadside planting at William Hulme Grammar School. Parkway Business Centre, vacant land between Gowan Road and Withington Road, and the southern corner of Whalley Range Cricket and Tennis club also offer some opportunities for small targeted planting.

Table 49 Key figures for Whalley Range

Ward attributes	Total	Placement (of 32)
Ward size	226.2ha	#25
Tree canopy cover	27.7%	#4
Recommended capacity for change	+0.1 points (27.8%)	#32
Size of tree canopy increase	0.3ha	#32
Relative cost of planting (1 to 5)	2.1	#20
Proportion of total resource	0.1%	#32

Withington

4.105 Withington is the third smallest ward in the city and also the third most expensive place to plant trees. This is largely because it is already a relatively green ward and the limited remaining opportunities for tree planting tend to be in pavements. Private Gardens are overwhelmingly the largest land use and are already above average in terms of tree cover, as is the ward as a whole.

4.106 There are relatively few large parks, open and natural spaces in the ward (<10%), but utilisation of the available spaces for tree planting is good. The density of the Christie Hospital for example makes further planting at that location almost impossible but the limited existing opportunities tend to have been maximised, contributing to one of the highest levels of canopy cover on Education and Healthcare Facilities land anywhere in the city. In total, the capacity for planting within Withington identified by this study is small, both in real terms and as a proportion, but there are variations and local opportunities at schools, pubs and in front gardens do exist.

4.107 The main opportunity for new planting is on Travel and Transport Routes land (151) which comprises green verges and pocket parks such as Horwood Crescent, as well as street tree planting. The repeating pattern of residential streets in much of the ward provides a good opportunity to replicate any successful model for the delivery of street tree planting. Natural Environment land at Ladybank Park, Fallowfield Loop, and rough ground at Heathside Road (19), and Parks and Recreation land (14) including Kingswood Park could also accommodate small amounts of planting.

Table 50 Key figures for Withington

Ward attributes	Total	Placement (of 32)
Ward size	185.5ha	#30
Tree canopy cover	20.0%	#13
Recommended capacity for change	+0.5 points (20.5%)	#28
Size of tree canopy increase	0.9ha	#31
Relative cost of planting (1 to 5)	4.2	#3
Proportion of total resource	0.5%	#27

Woodhouse Park

4.108 Woodhouse Park at the far south of the city is by far the largest ward, being almost equal to the second and third largest wards combined. Consequently, it is an outlier in many measures in real terms. However, it is also dominated by Manchester Airport, which contributes to the 54% of land used for Travel and Transport Routes. It includes agricultural land to the south-west and the second largest amount of woodland after Higher Blackley. Significant tree populations are found at Cotterill Clough Nature Reserve, south-west of the runway around the visitor centre and River Bollin, Concord Business Park, Painswick Park, the railway corridor, and the M56 and A555 highway network within junctions and on embankments. However, Private Gardens, Education and Healthcare Facilities and Parks and Recreation all have below average tree cover.

4.109 Woodhouse Park has the highest proportion of Green land of any ward, although a large amount of this is grass within the airport, which cannot accommodate tree planting and is excluded from this study into planting capacity. Notwithstanding, it is still the fourth most inexpensive place to plant trees because a significant proportion of the existing capacity is in green space and soft landscaping. Very large areas are given to airport parking, which somewhat reduces the capacity of Hardstanding Areas to accommodate increases in tree cover. However, these large grey areas still represent an opportunity for greening and canopy cover could be increased around the perimeter, and with careful design across the interior of parking sites. On agricultural land, hedgerow trees could be planted or allowed to grow more widely but species choice and size might be influenced by proximity to airport in some cases.

4.110 The scale of planting opportunities available across the ward are such that overall, almost a tenth of all resources could reasonably be directed to Woodhouse Park. Because of its unusual size, Woodhouse Park has the largest capacity to accommodate trees in real terms: almost 48 additional hectares of canopy cover without any change in land use. However, it also has a high capacity for change as a proportion of its size and would be the sixth most transformed ward if the additional planting opportunities were realised.

4.111 Natural Environment land (3031) and Travel and Transport Routes (2518) represent the largest opportunities including, land west of the airport, around Enterprise Way and within M56 Junction 5. Mown verges without any trees are ubiquitous across the ward; a very significant programme of tree planting could be readily progressed in multiple locations such as Simonsway, Gladeside Road, Greenwood Road, Robinswood Road, Poundswick Road, Kingsgate Road and the airport relief road embankments. In the north of the ward, adjacent to Drake Avenue and Livingston Avenue a single area of more than 2.5 hectares of mown grass contains 7 mature trees.

4.112 Private Gardens (1201) and Parks and Recreation (1179) have similar capacities for new tree planting. These include a relatively large number of small pocket parks and mown amenity grass in residential areas such as at Bampton Road, Exbourne Road, Hucclecoat Avenue, Twigworth Road and Pitchcombe Road; many of these contain no trees. Domestic gardens; and formal parks such as Kirkup Gardens have better existing tree cover but with widespread capacity for new planting.

Table 51 Key figures for Woodhouse Park

Ward attributes	Total	Placement (of 32)
Ward size	1,158.0ha	#1
Tree canopy cover	13.4%	#25
Recommended capacity for change	+4.1 points (17.5%)	#6
Size of tree canopy increase	47.7ha	#1
Relative cost of planting (1 to 5)	1.5	#29
Proportion of total resource	9.4%	#1

5.0 The Future

5.1 Having gone through a process of exploring whether it is possible to increase tree cover within the city of Manchester, and where this should be; this section explores how this document might help shape Manchester's future treescape. It is hoped that a better understanding of the current tree population will promote a sense of shared ownership and stimulate the collaborative effort needed not just to plant more trees, but to grow an Urban Forest.

> ***Urban Forest*** is the term commonly used to describe all trees, tree groups and woodland within an urban or peri-urban area. It does not imply a change in land use to woodland or forestry, but reflects the *collective* characteristics and functions that trees provide. It also reflects the need to plan and manage the treescape holistically to maximise benefits, such as forming the backbone of the city's green infrastructure, and adaptation of cities to climate change.

Define a vision

5.2 In the first instance, a clear vision for the future of the urban forest should be embedded as widely as possible in policy, strategy, practice and the public consciousness. It is important to note that the council cannot deliver all the recommended improvements in the urban forest alone. A broader, collaborative and less centralised approach is required.

5.3 A set of core principles should be adopted by the council, following consultation and development of them with relevant stakeholders, and communicated to audiences in ways that are appropriate to each.

What should the urban forest be like?

5.4 This study has found that tree canopy cover should be increased from the current level of 18.8% to 21.8%. This can be done without changing land use and whilst improving access to trees for communities that currently receive fewer benefits from them. This target is aligned with emerging comparable targets in published research and should be regarded as a starting point. It is not a cap or a limit, and is certainly not the maximum that could be achieved.

5.5 The increase described by this study should be regarded as a 'sensible completion' of the treescape as it currently exists rather than a significant expansion in new ways. The following principles represent both a description of what this would look like (based on the evidence of where those trees would be) and also statements about what is required for this to be achieved.

Ten guiding principles for the urban forest of Manchester

(i) Tree canopy cover is increasing. Related risks, inconveniences or problems are avoided or well managed and are not increasing.

(ii) Everyone can see a tree. Trees are a defining characteristic of city life. People are proud of Manchester's urban forest and can articulate what it does for them. Trees contribute to the identity of the city and the beauty and quality of places within it.

(iii) Trees grow wherever there is no reason to prevent them, and are planted wherever they would not naturally grow. Woodland is allowed to develop where possible, and individual trees are selected to be as large, long-lived and diverse as possible in each context.

(iv) Tree cover is maximised within gardens, green spaces, parks and open access land, in balance with other important objectives.

(v) Outdoor spaces defined by trees provide multi-layered benefits to people, businesses, wildlife and the environment. These are not limited to parks and green spaces; trees draw out these functions well into the built environment.

(vi) All streets are tree lined. Transport corridors are a connecting web for nature that links and enhances the city's green spaces and brings immediate and accessible benefits to the doorstep.

(vii) Tree replacement is embedded and recognised universally as a principle. Whenever trees are removed, trees are planted.

(viii) Development does no harm to the urban forest. Where trees are removed, this is offset by planting to increase overall canopy cover.

(ix) Woodland area is stable, and woodland is improving in quality and accessibility. Continuous cover and semi-natural woodland composition is a key objective of most management.

(x) Local people, organisations and businesses are empowered and engaged. There are ways for those with differing resources or skills to work together towards a common vision.

How does this study help facilitate change?

5.6 There is a substantial body of evidence that trees provide a dazzling range of benefits to people, the environment and economy. In simple terms, trees are good news for Manchester. We know that these benefits are going to be increasingly important in the context of the climate emergency, but tree planting is not just about mitigating problems; tree planting can make the city more liveable, healthy and prosperous.

(i) *Fairness* – At the moment, the benefits that trees deliver are not shared equally. The places with the most trees, demand the most management resources. This reinforces a cycle and a culture in which an uneven distribution of trees is 'baked in' and tree planting becomes more difficult in the areas that would benefit the most it. This isn't fair. The vision for the urban forest is one in which benefits are shared equally. Understanding where we are now and what must be done is the first step.

(ii) *Evidence* – This report includes data that provides a robust evidence base for communication, decision making, grant funding, policy development, and many more applications! It is hoped that by providing an unambiguous, measured and objective assessment, this study will find broad support. This is not the council's vision, a political objective, or the wish-list of an advocacy or pressure group. It is a factual description of what could be done right now, simply by filling in the gaps.

(iii) *Engagement* – Manchester's trees are under the control of tens, or maybe hundreds of thousands of landowners. The council is a significant player with greater expertise, resources and authority than most, but its reach in this area is still limited. A new approach is needed. This report issues an invitation to schools, hospitals, council departments, homeowners and landlords, businesses and more. This is not compulsory, it is collaborative; it is a rallying point and a call to action.

(iv) Collaboration – For change to be realised, it will be essential for a large number and range of actors to collaborate. This presents a challenge and also an opportunity. Whilst a large and decentralised movement may be harder to start, it is also likely to be more resilient and harder to stop. The council has a key role to play as a convener of this collaboration, especially by providing the infrastructure, skills, knowledge and information to resource and support those making practical decisions and interventions on the ground.

(v) *Resourcing* – How much will this cost? The simple answer is, it depends! It is not possible, or even meaningful, to estimate overall costs because this study describes a future scenario in which tree planting is not delivered centrally by one organisation from a dedicated budget. It does set out a range of funding mechanisms that may be available to different stakeholders. Perhaps more importantly, it also sets out where resources should be focussed to deliver greatest benefits and to meet greatest need. If we replicate the approach to resourcing that has been followed to date, we should expect to maintain what we already have. We need a clear model for the future so that we can work towards delivering it.

What are the key messages?

5.7 This report contains a lot of detail, but it can be condensed into five simple messages.

1. Everyone has a part to play – tree planting is needed in gardens, streets, schools, hospitals, businesses, natural spaces and beyond. This study sets out what each piece of the puzzle actually includes so that anyone can understand what they can do to help.

2. The urban forest is not finished – The area covered by trees could be increased by about 320 hectares (about 450 football pitches). This isn't the maximum number of trees that could be planted; it's just what would be achieved by identifying the places that would normally contain a tree, and making sure that they actually do.

3. Partnership is vital – Realising this vision will only happen if people work together. The council cannot 'deliver' the trees the city needs only on public land; the benefits and collective identify of the urban forest transcends ownership. One way to focus this work would be to establish an Urban Forest Partnership: a group to take ownership of the vision and coordinate resources.

4. Information sharing – Data transparency is a practical expression of collaboration and information about the urban forest should be shared openly. Monitoring progress and publishing results will show which types of land, and even stakeholder groups, are making the most and least progress. Consideration is needed on how this could be achieved.

5.8 ***5. Pathways for delivery*** – Translating a big picture into individual actions can be challenging, particularly for those without relevant experience or knowledge. To successfully act on this study will require the involvement of residents, politicians, workers and many others that may be unfamiliar with the basics of tree planting. Clear 'pathways' would help to bridge these gaps and allow people to move from 'I agree' to 'so what next…'.

Concluding Statement

5.9 The urban forest of Manchester is growing and there are examples of good practice all over the city. Regeneration and new planting in residential and retail areas contains many trees that are not yet mature and will continue to contribute to increases in tree canopy cover for decades to come. However, there is significant unused capacity that will not be planted under a business-as-usual future.

5.10 The change described by this study is based on the composition of Manchester today. It identifies very significant capacity for tree planting without major changes in land use, simply by filling in the 'gaps'. Future changes in land use for reasons other than tree planting are not anticipated by analysis but should be expected in evolving sectors, such as transport, energy and manufacturing. One example of this may be a significant release of land to other uses in Woodhouse Park if autonomous vehicle use reduces the demand for airport parking.

5.11 Every individual or organisation that subscribes to the objective of increasing tree cover in the city should use this report to understand what part they should play in the collective effort, and allocate or seek suitable resources to that task. This study has demonstrated that no single stakeholder, even the council, can make all the difference alone, and it will take a shared effort by individuals, businesses, communities and the council to realise the change that is needed.

5.12 At this scale, increasing the size of the tree canopy by even three percentage points is an enormous task, but it is achievable. More than this, it is essential. The reality of climate change for both the tree population and the quality of city life makes tree planting an urgent priority. We need to replace trees that we know will fail due to changes in growing conditions and diseases, such as Chalara ash dieback; we need to accelerate the work of diversifying the urban forest to make it more resilient to the future climate; and we need to increase canopy cover in the areas that will suffer the most without it. If this is not done, the cost to the people of Manchester will be a lived environment that is less beautiful, less healthy, more flooded, hotter, dirtier, less efficient, less prosperous, less natural, and with fewer green jobs. Tree planting is a cost-effective way to deliver real benefits to people, nature and the economy.

APPENDIX A: Ward Summary Charts

APPENDIX B: Glossary

Agriculture: A Land Use comprising farming of crops or grazing animals

Blue (Land Cover)**:** Water on any land, irrespective of use, such as ponds and reservoirs

Canopy Cover: The area covered by leaves and branches when viewed from above

Capacity: The increase on Suitable land needed to reach a given Canopy Cover

Community: Shorthand term used on some graphics meaning Education and Healthcare Facilities

Education and Healthcare Facilities: A Land Use including schools, hospitals and similar facilities

Green (Land Cover)**:** Land that is not covered by hard surfaces, buildings or water

Grey (Land Cover)**:** Land that is paved, built up or otherwise sealed

Hardstanding Areas: A Grey Land Use in private ownership, such as yards and car parks

Land Class: One of ten unique combinations of Land Use and Land Cover types

Land Cover: What is on the ground, irrespective of Land Use (Green, Blue or Grey)

Land Use: What land is used for (in seven categories), irrespective of Land Cover

Natural Environment: A Land Use comprising woodland, and informal or natural open spaces

Other: Land for which a Lane Use could not be defined, assumed Unsuitable

Parks and Recreation: A Land Use comprising sports, formal or amenity green spaces

Private Gardens: A Land Use comprising all land around residential buildings

Suitable: A gross measure of all land that could theoretically support trees

Target Modifier: An adjustment to the Capacity of a Land Class to reflect local factors

Travel and Transport Routes: A Land Use comprising the curtilage of road, rail and air infrastructure

Tree Canopy: The area covered by the branches and leaves of one or more trees

Unsuitable: Land that could not be planted, such as buildings, roads, and airports

Urban Forest: All trees, collectively, that are growing within a defined urban area

DRAWINGS

G8386.001 Land Ownership - Manchester
G8386.002 Land Ownership - Ardwick
G8386.003 Tree Canopy Cover - Manchester
G8386.004 Tree Canopy Cover - Ardwick
G8386.005 Land Cover - Manchester
G8386.006 Land Cover - Ardwick
G8386.007 Suitable Land for Tree Planting - Manchester
G8386.008 Suitable Land for Tree Planting - Ardwick
G8386.009 Land Use - Manchester
G8386.010 Land Use - Ardwick
G8386.011 Suitable Land for Tree Planting and Existing Coverage - Manchester
G8386.012 Suitable Land for Tree Planting and Existing Coverage - Ardwick

[NB. Ardwick is included to show mapping at a different scale]

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