Treenet Proceedings of the 4th National Street Tree Symposium: 4th and 5th September 2003
ISBN 0-9775084-3-9

URBAN TREES: A LOCAL GOVERNMENT PERSPECTIVE

Tim Johnson, TREENET Inc.

Local government urban forestry offers unique challenges and opportunities. The role is vital in the development of community and in our progress toward sustainability, though much of society doesn't yet appreciate its value. The range of complex tasks performed by council arborists, the breadth of regulatory constraints under which they work and the limited information available to them make achieving desired outcomes difficult.

Local government is about community. Every task, function, service or governmental role performed by council should be for the good of the community. Urban forests should be established and maintained for the public good.

PUBLIC TREES AND THE TRIPLE BOTTOM LINE

The 1987 World Commission on Environment and Development (the Brundtland Commission) stressed the need for sustainable development. The 1992 United Nations Conference on Environment and Development (the Rio Earth Summit) championed ecologically sustainable development (ESD) based on a considered balance of social, environmental and economic goals.

Our national government, all states and territories and many local government authorities have declared their support for ESD goals. Their balance sheets should therefore use the "triple bottom line." The costs of all goods, services and functions provided or performed by these organisations should be considered against social, environmental and economic outcomes. Thus local government should consider the economic, social and environmental costs and benefits of its arboricultural work. (For more information see http://www.ea.gov.au/industry/finance/publications/indicators/)

THE BENEFITS OF URBAN TREES

Economic Benefits

Reports over the last decade have analysed the values of urban trees, see Hewett, P. (2002); McPherson, E.G. (1996); McPherson *et al* (2000); Moore, G. (2000); Alexander, K. (2003). Researchers have also begun to present the environmental benefits of urban trees in financial terms.

The gross annual benefit of a typical Adelaide street tree has been calculated at $171 (Killicoat, P, *et al* 2002). McPherson (2001) analyses costs and benefits of small, medium and large trees and determines the average annual net benefit over a forty year period as -$2, $33 and $66 respectively (in US$).

Many local business operators consider the financial return derived through increased provision of parking space and "street exposure" to be of more value than amenity and environmental benefits provided by urban trees. A recent study by Wolf, K. (2003) suggests that this view is flawed. Wolf found that many clients were willing to travel further to and pay more for products and services in greener areas. Wolf's findings included that *"an urban forest canopy may enhance revenues for businesses"* and *"the urban forest should be a central element of retail place."*

Environmental Benefits

An environmental concern that is considered in rural areas but not so much in major urban settings is rising saline groundwater. Experience in rural areas indicates that rising groundwater not only has significant impacts on native vegetation and biodiversity conservation but also on roads, buildings, gardens and sports turf (Department of Agriculture, Rural Towns Management Committee 2001). This report also identifies that trees are an effective element of groundwater management systems:

> *"…research indicates that the effect of trees on groundwater tables is very localised – to within 10 to 30m of the edge of the plantings. … The use of trees along road reserves is suggested because road damage represents the single largest cost arising from shallow groundwater. Trees planted near roads can be an effective method of preventing the ground beneath the road pavement from becoming saturated."*

The cost of road reconstruction in Adelaide (a 7m wide asphaltic concrete carriageway with concrete kerbing typical of minor residential streets) is approximately $1,200 per linear metre (Catinari, A., 2003 pers. com.). In groundwater affected areas the useful life expectancy of roads can be reduced to 20 years instead of the more typical 40 years. Groundwater impacts begin when water tables rise to less than six metres deep in reactive clay soils or 1 metre deep in sandy areas. Street trees should be considered essential in many areas on this basis alone.

Street trees can significantly extend the life of bituminous road seals by shading street surfaces. Periods between resealing road surfaces can be extended from approximately once per decade to less than once in every 20 years, with considerable environmental and economic savings resulting (McPherson *et al* 2001). Given the combined benefits from shading and groundwater reduction it is surprising that street tree planting is not more widely viewed as an essential part of road design and maintenance.

Impacts of rising groundwater are not restricted to public infrastructure. Costs to individuals for repairs to brickwork of private homes, drainage to prevent further damage, maintenance of underground services and increases in utilities charges (due to higher maintenance requirements) can be substantial. In areas where saline groundwater has reached road surfaces, vehicles have deteriorated to the point of becoming unroadworthy within a few years (Zidarich, K. 2002, pers. com).

Many of the economic benefits of tree planting are calculated on returns to regional commons such as water catchments, local government areas or even to global commons like the atmosphere. Though rising groundwater is a widespread problem, its potential economic impact on individuals might make it useful for raising the profile of related issues in urban areas and for gaining support for more intensive urban forestry.

Social Benefits

Several recent studies extend previous works relating the human benefits of interaction with nature to societal functioning and the urban forest. Kuo, E. and Sullivan, W. (2001) detail the results of an extensive study of residents of architecturally identical dwellings with varying levels of surrounding vegetation. Kou and Sullivan found that incidences of violence were significantly reduced in both quantity and severity for residents living in better-vegetated areas. Similarly, anti-social behaviours such as littering, graffiti and vandalism were found to be reduced in areas with appropriate vegetation.

Westpahl, L. (2003) describes a range of social benefits derived from involvement in urban greening projects. Shorter periods recuperating in hospitals, reduced crime, improved business incomes, stronger club memberships, stronger community ties and improved cognitive functioning were observable in individuals and groups in the presence of higher levels of vegetation.

THE COST OF URBAN TREES

The cost of planting, establishing and maintaining urban trees is dependent on a range of factors. In 2001, staff of the City of West Torrens began a research project to determine the lifetime costs associated with several representative street tree species. Space available to trees, suitability to site conditions (such as rainfall and soil characteristics), mature size, growth rate, growth habit, life span and maintenance requirements were found to each have individual and interrelated influences on tree performance and cost.

Conflicts between trees and built infrastructure impact both on the health and maintenance cost of the tree and on the serviceability and maintenance cost of the hardscape. Failing to adequately plan sufficient space for urban trees increases cost. Guidelines on minimum space requirements for street trees suggest a planting space of more than two metres square is required, but that conflicts are likely in nature strips with less than three metres between the kerb and footpath, see O’Brien, D. (1993); Shigo, A. (1991); D’Amato, N. *et. al* (2003)

- Balancing the interactions of street trees and their planting sites is critical in minimising costs and maximising benefits. Both hardscape and trees are significant investments. Common sense suggests that both investments require simultaneous optimisation.
- The mature size of street trees largely determines the impact they have on street amenity. Planting smaller trees in preference to fewer large trees has been common practice to minimise hardscape maintenance and service impact costs. As tree purchase, planting and establishment costs are similar for large and small trees this practice increases costs to the community while reducing the benefits provided by the trees.
- Tree lifespan directly influences the period during which benefits can be derived and the frequency with which trees must be replaced. Maximum benefit is obtained from long-lived species. Frequent replacement of short-lived species exposes Councils to increased risk from deteriorating trees and reduces the period of benefit.
- Faster growing trees provide benefits sooner than slower species but the faster a street tree grows the more frequently it may require pruning to establish structure or to avoid problems. Some fast growing species develop into large specimens (forest trees) while others may be short lived (colonising species) so they may not make ideal street trees.
- Apically dominant tree species generally require minimal maintenance in street situations. Trees with decurrent habits or multiple leaders require frequent formative pruning, increased long-term maintenance and may have shorter useful life expectancies due to structural issues.

THE COST OF STREET TREE ESTABLISHMENT AND MAINTENANCE

Tree establishment and maintenance practices were documented throughout 2001-2002 to provide a basis for determining approximate lifetime costs for *Callistemon* 'Harkness', *Celtis occidentalis*, *Platanus x acerifolius* and *Pyrus calleryana* street trees. Maintenance time requirements for watering, fertilising, mulching, staking and formative/structural pruning were recorded for each species (Appendices). Gaps in pruning data were filled by pruning individual trees of various ages where recent history was known, eg: a 25 year old *Celtis occidentalis* that had not been pruned for three years was pruned in 45 minutes so an annualised requirement of 15 minutes (0.25 decimal hours) was recorded. Several gaps in data remained so observed trends were extrapolated.

Note that pruning times may vary due to travel distances, weather, community issues and other factors. Tables summarising the findings are presented in Appendices. Costs associated with tree purchase, planting, litter collection, hardscape repair or site specific works such as pruning trees to a boundary are not included in the figures given in the tables. Costs are calculated at $45 per hour.

Species	Life Expectancy	Lifetime Maintenance Requirement		Annualised Cost
		Time (hours)	Cost	
Callistemon Harkness	25 years	13.20	$594	$24
Callistemon Harkness	40 years	18.40	$828	$21
Celtis occidentalis	70 years	42.60	$1,917	$27
Platanus x acerifolius	100 years	39.25	$1,766	$18
Pyrus calleryana	50 years	16.10	$725	$15

Table 1: Approximate lifetime tree maintenance costs for street trees in the City of West Torrens 2002.

STREET TREE PLANNING

Table 1 suggests an economic justification for using larger, long lived, apically dominant species for street planting. The significance of the maintenance cost range becomes more apparent when the population size of urban forests is considered: the annual cost to maintain a forest of 50,000 street trees could vary from $750,000 to $1,350,000.

Consider the lifespan of the trees in table 1. A *Platanus* might realistically survive for 100 years in which time a nearby *Callistemon* might be replaced three times. The cost of four *Callistemon* would be $2,376 compared to the *Platanus'* $1,766. The *Callistemon* would provide little benefit and require high maintenance four times (during the immature stages) compared to the *Platanus'* once. These figures are compared graphically in figure 1.

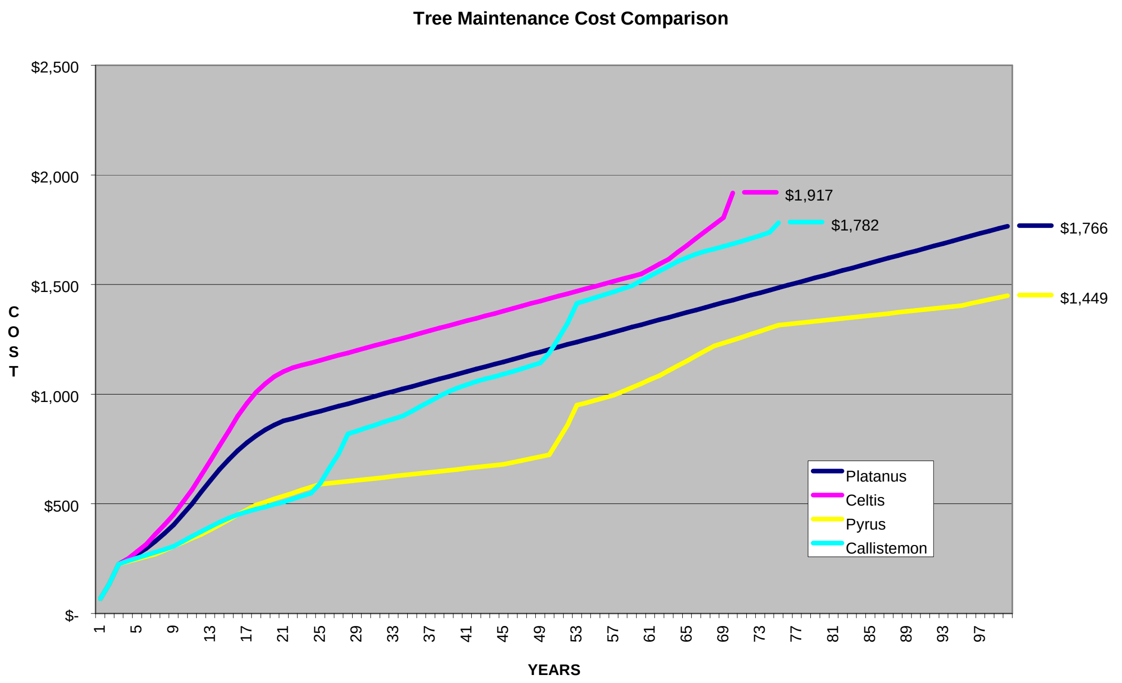

Figure 1: Long term cumulative cost of tree establishment, *Celtis* $1,917 (1 tree ~70 years), *Callistemon* $1,782 (3 trees ~75 years), *Platanus* $1,485 (1 tree ~75 years), *Pyrus* $1,315 (2 trees ~75 years).

Consider the mature span of the *Callistemon*, *Pyrus*, *Platanus* and *Celtis*. Developing a continuous canopy for an avenue one kilometre in length will require approximately 100 *Platanus*, 133 *Celtis*, 200 *Pyrus* or *400 Callistemon*. The cost to maintain a continuous canopy with these species is summarised in Table 2 below.

	Callistemon	*Pyrus*	*Celtis*	*Platanus*
Canopy spread at maturity	5m	10m	15m	20m
Quantity per kilometre	400	200	133	100
Annualised cost per tree	$24	$15	$27	$18
Annualised cost per kilometre	$9,600	$3,000	$3,591	$1,800

Table 2: Estimated annual maintenance cost of avenues of *Callistemon*, *Pyrus*, *Celtis* and *Platanus*.

STREET TREE PLANTING AND REPLACEMENT RATES

How many street trees should a council maintain? Is there an ideal number? The City of West Torrens has approximately 27,000 rateable properties, would one tree per property give a desirable urban forest density? West Torrens has 295 kilometres of council-managed roadway and 30 kilometres of state-managed roads. The maximum length of roadside available for tree planting is therefore 650km. The number of trees required to create continuous avenues in this length of roadway is dependent on spacing, as summarised below in Table 3.

Species	*Callistemon*	*Pyrus*	*Celtis*	*Platanus*
Spacing	5m	10m	15m	20m
Quantity required in 650km (800 streets)	131600	66,600	44,933	34,100
Annualised maintenance cost	$3,158,400	$999,000	$1,213,191	$613,800

Table 3: Number of street trees required to create continuous avenues throughout West Torrens and their associated annual maintenance costs.

The number of trees required to "green" a city will obviously depend on the mix of species used, the spacing based on their mature size, and the length of roadway to be planted. Clearly the apically dominant, large species are significantly cheaper to maintain in the long term.

Tree replacement has the effect of increasing resource requirements for the urban forest as maintenance needs are highest for immature trees (see Figure 2). As the increased requirement compounds for each tree planted, keeping maintenance requirements to a minimum requires that the minimum number of immature trees be maintained. Annual tree planting rates should therefore be the minimum required to maintain the optimal number of trees for any given area.

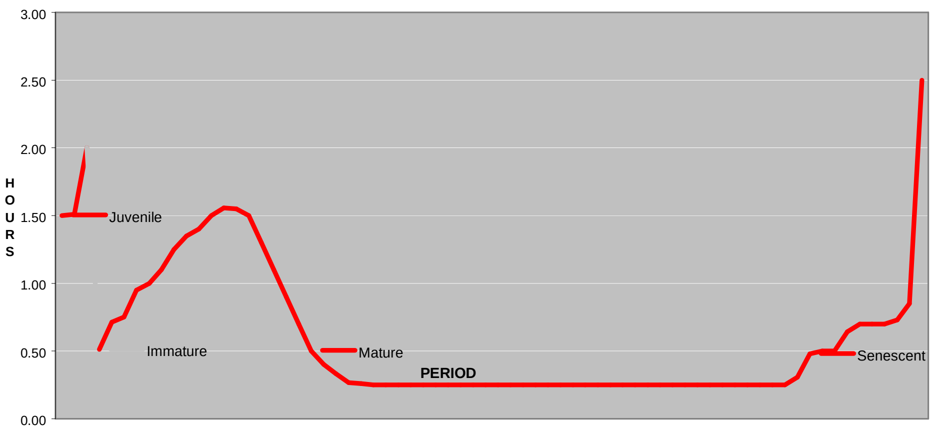

Figure 2: Representative tree maintenance requirements (hours required annually) as a function of stage of life cycle. Note the discontinuity between juvenile and immature stages (normally year 2 or 3) due to cessation of manual watering after establishment.

Establishing an urban forest with trees of evenly distributed ages and life expectancies will allow for a range of benefits:

- maintenance costs and resources will be minimal
- replacement planting will match tree removal rate
- impact of tree replacement on amenity and environment will be minimal.

Thus if 68,000 trees are required in a given urban forest (as estimated for the City of West Torrens) and the trees have an average life expectancy of 50 years, 1360 trees should be established each year. A more intensive planting program will result in the desired number of trees being planted earlier, with the undesirable consequences of massive increases in short term maintenance needs and subsequent large-scale replacement programs required in the future (see Figure 3).

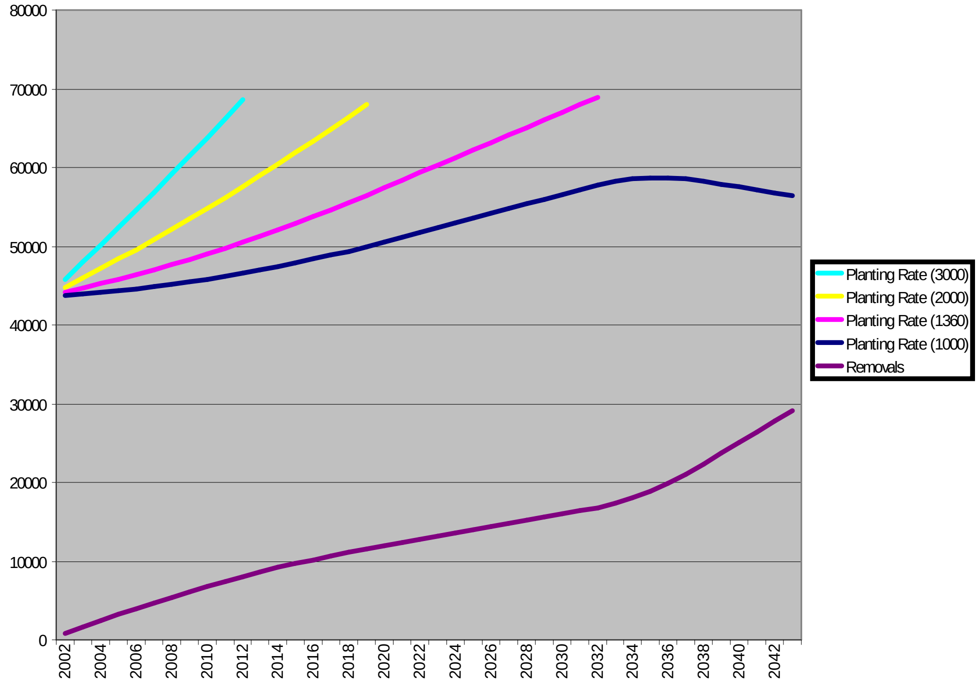

Figure 3: Total tree numbers resulting from annual planting programs of 1000, 1360, 2000 and 3000 trees beginning in 2002

Planting large numbers of trees in the short term has the immediate disadvantage of high maintenance requirements and the long-term problem of large numbers of aged trees requiring replacement. Alternatively, planning long-term planting programs to establish and maintain an optimum number of trees allows for consistent staffing, maximum city-wide amenity, maximum environmental benefit and minimal cost to the community.

CONCLUSION

Annual costs of maintaining street trees vary from approximately $15 to $30 per year over the life of the tree (not including tree purchase, planting and removal). The annual net benefit provided by a typical small street tree in Adelaide is $171 (Killicoat, P. *et al* 2002). This figure does not include a range of the benefits such as:

- increased life of public infrastructure
- increased life of private property
- improved social networking and informal support mechanisms
- reduced crime rates
- improved cognitive functioning

Thus a conservative approximation of the value of investment in street trees (allowing $2,500 for planting and removal costs, annualised at $50) is between 214% and 260% return on investment.

Returns on tree assets are reduced in cases where there are conflicts between various infrastructure components. Clearance pruning of overhead power lines, removing tree root sewer chokes, replacing damaged concrete and paving, and early tree replacement costs are all met by the community whether through council rates or utilities bills. As many of these conflicts are managed through regulations under various Acts, local government is often unable to optimise urban forest benefits and meet the desires of the community with regard to tree planting and amenity.

Restricting the scale of urban trees and urban forests to reduce their impacts and costs is not the answer. Restricting urban forests restricts their cost-effective provision of essential ecological and social services. Urban forests must be expanded, but in ways where there is minimal conflict with other city infrastructure. The basic needs of street trees must be considered and met in the design and construction of our cities.

Plans for our cities must require the establishment and maintenance of sustainable urban forests. Rather than restricting urban forestry, legislation and regulation must establish a "level playing field" across local government boundaries to assist consistent urban forest management. It must consider long term costs and benefits as well as short term benefit associated with development value.

Effective urban forestry will play a major role in our future through its contribution to city sustainability. It will help us to enjoy this future by enhancing the functioning of our society. It will reduce the financial cost of our future through its contribution to the management of environmental issues. It will assist us to better appreciate and understand this future through its influence on cognitive functioning.

Local government urban forestry can help us to create a better future, to enjoy it more and in the process it can make us better individuals. Local government urban forestry offers unique challenges and opportunities.

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Appendix 1: Estimated Maintenance Requirements for Nettle Tree (*Celtis occidentalis*)

	Year	Hrs / yr	Accumulated hours	Accumulated cost
Juvenile	1	1.50	1.50	$ 68
	2	1.50	3.00	$ 135
	3	2.00	5.00	$ 225
Immature	4	0.50	5.50	$ 248
	5	0.75	6.25	$ 281
	6	0.75	7.00	$ 315
	7	1.00	8.00	$ 360
	8	1.00	9.00	$ 405
	9	1.00	10.00	$ 450
	10	1.25	11.25	$ 506
	11	1.25	12.50	$ 563
	12	1.50	14.00	$ 630
	13	1.50	15.50	$ 698
	14	1.50	17.00	$ 765
	15	1.50	18.50	$ 833
	16	1.50	20.00	$ 900
	17	1.30	21.30	$ 959
	18	1.10	22.40	$ 1,008
	19	0.90	23.30	$ 1,049
	20	0.70	24.00	$ 1,080
Mature	21	0.50	24.50	$ 1,103
	22	0.40	24.90	$ 1,121
	23	0.25	25.15	$ 1,132
	24	0.25	25.40	$ 1,143
	25	0.25	25.65	$ 1,154
	26	0.25	25.90	$ 1,166
	27	0.25	26.15	$ 1,177
	28	0.25	26.40	$ 1,188
	29	0.25	26.65	$ 1,199
	30	0.25	26.90	$ 1,211
	31	0.25	27.15	$ 1,222
	32	0.25	27.40	$ 1,233
	33	0.25	27.65	$ 1,244
	34	0.25	27.90	$ 1,256
	35	0.25	28.15	$ 1,267
	36	0.25	28.40	$ 1,278
	37	0.25	28.65	$ 1,289
	38	0.25	28.90	$ 1,301
	39	0.25	29.15	$ 1,312
	40	0.25	29.40	$ 1,323
	41	0.25	29.65	$ 1,334
	42	0.25	29.90	$ 1,346
	43	0.25	30.15	$ 1,357
	44	0.25	30.40	$ 1,368
	45	0.25	30.65	$ 1,379
	46	0.25	30.90	$ 1,391
Mature	47	0.25	31.15	$ 1,402
	48	0.25	31.40	$ 1,413
	49	0.25	31.65	$ 1,424
	50	0.25	31.90	$ 1,436
	51	0.25	32.15	$ 1,447
	52	0.25	32.40	$ 1,458
	53	0.25	32.65	$ 1,469
	54	0.25	32.90	$ 1,481
	55	0.25	33.15	$ 1,492
	56	0.25	33.40	$ 1,503
	57	0.25	33.65	$ 1,514
	58	0.25	33.90	$ 1,526
	59	0.25	34.15	$ 1,537
	60	0.25	34.40	$ 1,548
Senescent	61	0.50	34.90	$ 1,571
	62	0.50	35.40	$ 1,593
	63	0.50	35.90	$ 1,616
	64	0.70	36.60	$ 1,647
	65	0.70	37.30	$ 1,679
	66	0.70	38.00	$ 1,710
	67	0.70	38.70	$ 1,742
	68	0.70	39.40	$ 1,773
	69	0.70	40.10	$ 1,805
	70	2.50	42.60	$ 1,917

Note: Maintenance hours include watering, fertilising, mulching, staking and formative / structural pruning only. Figures do not include tree purchase, planting or site specific works such as pruning trees to a boundary. Litter collection and built infrastructure repair requirements are not included. (Cost calculated at $45 per hour)

Appendix 2: Estimated Maintenance Requirements for Gawler Hybrid Bottlebrush (*Callistemon* "Harkness")

Case 1: Lifespan cut short due to inadequate space and resulting conflicts (typical of 1960's and 70's plantings)

	Year	Hrs / yr	Accumulated hours	Accumulated cost
Juvenile	1	1.50	1.50	$ 68
	2	1.50	3.00	$ 135
	3	2.00	5.00	$ 225
Immature	4	0.30	5.30	$ 239
	5	0.30	5.60	$ 252
	6	0.30	5.90	$ 266
	7	0.30	6.20	$ 279
	8	0.30	6.50	$ 293
	9	0.30	6.80	$ 306
	10	0.50	7.30	$ 329
	11	0.50	7.80	$ 351
	12	0.50	8.30	$ 374
	13	0.50	8.80	$ 396
	14	0.45	9.25	$ 416
	15	0.40	9.65	$ 434
	16	0.35	10.00	$ 450
Mature	17	0.30	10.30	$ 464
	18	0.25	10.55	$ 475
	19	0.25	10.80	$ 486
	20	0.25	11.05	$ 497
	21	0.25	11.30	$ 509
	22	0.30	11.60	$ 522
	23	0.30	11.90	$ 536
	24	0.30	12.20	$ 549
	25	1.00	13.20	$ 594

Note: Maintenance hours include watering, fertilising, mulching, staking and formative / structural pruning only. Figures do not include tree purchase, planting or site specific works such as pruning trees to a boundary. Litter collection and built infrastructure repair requirements are not included. (Cost calculated at $45 per hour)

Case 2: Expected lifespan under best street tree conditions.

	Year	Hrs / yr	Accumulated hours	Accumulated cost
Juvenile	1	1.50	1.50	$68
	2	1.50	3.00	$135
	3	2.00	5.00	$225
Immature	4	0.30	5.30	$239
	5	0.30	5.60	$252
	6	0.30	5.90	$266
	7	0.30	6.20	$279
	8	0.30	6.50	$293
	9	0.30	6.80	$306
	10	0.50	7.30	$329
	11	0.50	7.80	$351
	12	0.50	8.30	$374
	13	0.50	8.80	$396
	14	0.45	9.25	$416
	15	0.40	9.65	$434
	16	0.35	10.00	$450
Mature	17	0.30	10.30	$464
	18	0.25	10.55	$475
	19	0.25	10.80	$486
	20	0.25	11.05	$497
	21	0.25	11.30	$509
	22	0.30	11.60	$522
	23	0.30	11.90	$536
	24	0.30	12.20	$549
	25	1.00	13.20	$594
	26	0.30	13.50	$608
	27	0.30	13.80	$621
	28	0.30	14.10	$635
	29	0.30	14.40	$648
	30	0.30	14.70	$662
	31	0.30	15.00	$675
	32	0.30	15.30	$689
	33	0.30	15.60	$702
	34	0.30	15.90	$716
	35	0.30	16.20	$729
	36	0.30	16.50	$743
	37	0.30	16.80	$756
	38	0.30	17.10	$770
	39	0.30	17.40	$783
	40	1.00	18.40	$828

Appendix 3: Maintenance requirements for Callery Pear tree (*Pyrus calleryana*)

	Year	Hrs / yr	Accumulated hours	Accumulated cost
Juvenile	1	1.50	1.50	$ 68
	2	1.50	3.00	$ 135
	3	2.00	5.00	$ 225
Immature	4	0.25	5.25	$ 236
	5	0.25	5.50	$ 248
	6	0.25	5.75	$ 259
	7	0.25	6.00	$ 270
	8	0.40	6.40	$ 288
	9	0.40	6.80	$ 306
	10	0.40	7.20	$ 324
	11	0.40	7.60	$ 342
	12	0.40	8.00	$ 360
	13	0.50	8.50	$ 383
	14	0.50	9.00	$ 405
	15	0.50	9.50	$ 428
	16	0.50	10.00	$ 450
	17	0.50	10.50	$ 473
	18	0.50	11.00	$ 495
	19	0.30	11.30	$ 509
Mature	20	0.30	11.60	$ 522
	21	0.30	11.90	$ 536
	22	0.30	12.20	$ 549
	23	0.30	12.50	$ 563
	24	0.30	12.80	$ 576
	25	0.30	13.10	$ 590
	26	0.10	13.20	$ 594
	27	0.10	13.30	$ 599
	28	0.10	13.40	$ 603
	29	0.10	13.50	$ 608
	30	0.10	13.60	$ 612
	31	0.10	13.70	$ 617
	32	0.10	13.80	$ 621
	33	0.10	13.90	$ 626
	34	0.10	14.00	$ 630
	35	0.10	14.10	$ 635
	36	0.10	14.20	$ 639
	37	0.10	14.30	$ 644
	38	0.10	14.40	$ 648
	39	0.10	14.50	$ 653
	40	0.10	14.60	$ 657
	41	0.10	14.70	$ 662
	42	0.10	14.80	$ 666
	43	0.10	14.90	$ 671
	44	0.10	15.00	$ 675
	45	0.10	15.10	$ 680

	Year	Hrs / yr	Accumulated hours	Accumulated cost
Senescent	46	0.2	15.30	$ 689
	47	0.2	15.50	$ 698
	48	0.2	15.70	$ 707
	49	0.2	15.90	$ 716
	50	0.2	16.10	$ 725

Note: Maintenance hours include watering, fertilising, mulching, staking and formative / structural pruning only. Figures do not include planting time or site specific works such as pruning trees to a boundary. Litter collection and built infrastructure repair requirements are not included. (Cost calculated at $45 per hour)

Appendix 4: Estimated Maintenance Requirements for London Plane tree
(Platanus x acerifolia)

	Year	Hrs / yr	Accumulated hours	Accumulated cost
Juvenile	1	1.50	1.50	$ 68
	2	1.50	3.00	$ 135
	3	2.00	5.00	$ 225
Immature	4	0.50	5.50	$ 248
	5	0.50	6.00	$ 270
	6	0.60	6.60	$ 297
	7	0.70	7.30	$ 329
	8	0.80	8.10	$ 365
	9	0.90	9.00	$ 405
	10	1.00	10.00	$ 450
	11	1.10	11.10	$ 500
	12	1.20	12.30	$ 554
	13	1.20	13.50	$ 608
	14	1.10	14.60	$ 657
	15	1.00	15.60	$ 702
	16	0.90	16.50	$ 743
	17	0.80	17.30	$ 779
	18	0.70	18.00	$ 810
	19	0.60	18.60	$ 837
	20	0.50	19.10	$ 860
	21	0.40	19.50	$ 878
	22	0.25	19.75	$ 889
	23	0.25	20.00	$ 900
	24	0.25	20.25	$ 911
Mature	25	0.25	20.50	$ 923
	26	0.25	20.75	$ 934
	27	0.25	21.00	$ 945
	28	0.25	21.25	$ 956
	29	0.25	21.50	$ 968
	30	0.25	21.75	$ 979
	31	0.25	22.00	$ 990
	32	0.25	22.25	$ 1,001
	33	0.25	22.50	$ 1,013
	34	0.25	22.75	$ 1,024
	35	0.25	23.00	$ 1,035
	36	0.25	23.25	$ 1,046
	37	0.25	23.50	$ 1,058
	38	0.25	23.75	$ 1,069
	39	0.25	24.00	$ 1,080
	40	0.25	24.25	$ 1,091
	41	0.25	24.50	$ 1,103
	42	0.25	24.75	$ 1,114
	43	0.25	25.00	$ 1,125
	44	0.25	25.25	$ 1,136
	45	0.25	25.50	$ 1,148
	46	0.25	25.75	$ 1,159
	47	0.25	26.00	$ 1,170
	48	0.25	26.25	$ 1,181
	49	0.25	26.50	$ 1,193
	50	0.25	26.75	$ 1,204
Mature	51	0.25	27.00	$ 1,215
	52	0.25	27.25	$ 1,226
	53	0.25	27.50	$ 1,238
	54	0.25	27.75	$ 1,249
	55	0.25	28.00	$ 1,260
	56	0.25	28.25	$ 1,271
	57	0.25	28.50	$ 1,283
	58	0.25	28.75	$ 1,294
	59	0.25	29.00	$ 1,305
	60	0.25	29.25	$ 1,316
	61	0.25	29.50	$ 1,328
	62	0.25	29.75	$ 1,339
	63	0.25	30.00	$ 1,350
	64	0.25	30.25	$ 1,361
	65	0.25	30.50	$ 1,373
	66	0.25	30.75	$ 1,384
	67	0.25	31.00	$ 1,395
	68	0.25	31.25	$ 1,406
	69	0.25	31.50	$ 1,418
	70	0.25	31.75	$ 1,429
	71	0.25	32.00	$ 1,440
	72	0.25	32.25	$ 1,451
	73	0.25	32.50	$ 1,463
	74	0.25	32.75	$ 1,474
	75	0.25	33.00	$ 1,485
	76	0.25	33.25	$ 1,496
	77	0.25	33.50	$ 1,508
	78	0.25	33.75	$ 1,519
	79	0.25	34.00	$ 1,530
	80	0.25	34.25	$ 1,541
	81	0.25	34.50	$ 1,553
	82	0.25	34.75	$ 1,564
	83	0.25	35.00	$ 1,575
	84	0.25	35.25	$ 1,586
	85	0.25	35.50	$ 1,598
	86	0.25	35.75	$ 1,609
	87	0.25	36.00	$ 1,620
	88	0.25	36.25	$ 1,631
	89	0.25	36.50	$ 1,643
	90	0.25	36.75	$ 1,654
	91	0.25	37.00	$ 1,665
	92	0.25	37.25	$ 1,676
	93	0.25	37.50	$ 1,688
	94	0.25	37.75	$ 1,699
	95	0.25	38.00	$ 1,710
	96	0.25	38.25	$ 1,721
	97	0.25	38.50	$ 1,733
	98	0.25	38.75	$ 1,744
	99	0.25	39.00	$ 1,755
	100	0.25	39.25	$ 1,766