

Independent inquiry into management of trees on public land: Final report extract

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Independent Inquiry into Management of Trees on Public Land

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1. Overview

1.1 The Independent Board of Inquiry

In March 2010 the State Executive Committee of the Local Government Association of South Australia (LGA) agreed to conduct, in conjunction with the LGA Mutual Liability Scheme (MLS), an independent Inquiry into the management of trees located on land under the care and control of councils. The purpose of the Inquiry was to provide independent advice to the Local Government Association on the most appropriate future management regime for trees on public land taking into account current and possible future changes in climatic conditions.

The Inquiry was established in response to incidents where trees on public land caused damage to property and people, some with fatal consequences. Following these incidents, the MLS Board identified tree management as one of the most significant emerging risks for councils and the scheme. Concern had been expressed that severe drought had increase the risk of tree damage and that risks could worsen with future climatic conditions. Notwithstanding these risks, trees are also an important and valued asset. Responsible management requires a balance of these two issues.

To review the benefits and risks of trees, and the framework in which they are managed, the Local Government Association State Executive Committee appointed an Independent Board of Inquiry comprising three members with extensive experience in public administration and Local Government.

The Board comprised:

- Brian Cunningham (chair)
- Peter Lockett and
- Mary Marsland.

To assist the Inquiry with technical analysis, consultation and reporting, the Board engaged the consulting firm Ecological Associates.

1.2 Scope of work

The overall objective of this Inquiry was to provide a strategy to protect and enhance the benefits that trees on public land provide while managing the risks of tree and limb failure to public safety and infrastructure. The scope of work was as follows.

- Summarise the physiological and physical responses of trees that threaten public safety and infrastructure including tree and limb failure.
- Describe the impact pathways by which trees threaten public safety and infrastructure including limbs or trees falling on people, buildings, powerlines, street lighting, fences, roads etc. and how people and assets are exposed to threats.
- Identify and evaluate the consequences of tree impacts in terms of magnitude (e.g. cost or injury) and likelihood.
- Determine, through consultation with the MLS and other stakeholders, an 'acceptable level of risk'.
- Identify and evaluate measures to mitigate risks in existing trees such as:
 - surveillance and monitoring
 - tree maintenance (e.g. pruning or watering)
 - planning protocols to reduce exposure, i.e. to isolate trees from human activity and infrastructure
 - tree removal
 - measures that may be outside council's control such as legislative changes or planning policy.
- Identify measures to minimise risks in future tree plantings such as:
 - planning protocols for tree placement, infrastructure placement and use of space near trees
 - tree species selection
 - measures that may be outside council's control such as legislative changes or planning policy.

- Evaluate how these risk management measures will affect the values of trees including biodiversity, landscape amenity and heritage.
- Synthesise these investigations in a risk management strategy for adoption by councils that balances the protection of tree benefits with the reduction of risk to acceptable levels and identify the possible resource implications for councils arising from this strategy.
- Make recommendations for the broader use and adoption of the findings.

1.3 Process of the Inquiry

The Inquiry was undertaken independently of the Local Government Association by a Board that has no direct involvement with Local Government in South Australia. The Inquiry Board acted as a neutral agent on key matters where opinions differ both within Local Government and in the wider community.

The first step in the Inquiry was to seek community opinion on:

- the risks and liabilities associated with tree and limb failure on public land
- the social and environmental benefits provided by trees on public land
- current and future tree management strategies.

This involved the preparation of an Issues Paper (released in July 2010) and a call for written submissions from key stakeholders, including local councils, private and public organisations, government agencies and private individuals. In addition, a number of meetings were held with key stakeholder organisations coordinated by Angela Hazebroek of URPS and members of the Board.

Technical expertise was sought from a wide range of experts throughout South Australia and Australia, including council arborists and tree managers, professional arborists, the university and botanical gardens scientists, Treenet and training providers.

The feedback and inputs from a wide variety of community and stakeholder consultations were incorporated into a draft final report and used as a basis for recommendations aimed at mitigating risks associated with tree and limb failure.

The draft final report and findings of the Inquiry were released for consultation to key stakeholders on October 25 2010.

The Final Report presents the findings and recommendations of the Inquiry. It provided:

- an overview of the role of trees in the landscape and the benefits they provide
- a review of the causes of tree and limb failure
- a review of the consequences of tree and limb failure in terms of personal injury, property damage and management costs
- a review of failure issues and their management in South Australia and elsewhere
- recommendations for managing tree and limb failure.

The Local Government Association of South Australia (LGA) State Executive Committee approved the release of the final report of the Independent Inquiry into Management of Trees on Public Land on 20 January 2011 - the final report has been available since then.

The LGA in conjunction with the LGA Mutual Liability Scheme (MLS) conducted a workshop on 31 March 2011 with Councils in South Australia to discuss the implications of the recommendations in the report and possible implementation strategies and resource implications.

Based on the report, the workshop and further research by MLS staff, a final implementation strategy is currently being developed and will be presented for endorsement to the LGA State Executive Committee on 15 September 2011 meeting. All Councils will be advised of the outcomes of this meeting in October 2011 including a timeframe for the development of the various tools and actions contained in the recommendations as endorsed by the Local Government Association State Executive.

1.4 Definition of Public Land

While many of the issues raised in this report are also relevant to private land, this Inquiry is specifically focussed on the risks associated with trees on public land. For the purposes of this Inquiry, public land refers to land owned by councils, and land in the care, control or management of councils pursuant to any Act of Parliament, and includes public roads as defined in the Local Government Act 1999.

1.5 Risk management terminology

Risk management is only one aspect of this Inquiry, but risk management terminology is used throughout this report. The following introduces the reader to terms and concepts adapted from the Australian/New Zealand Standard AS/NZS ISO 31000:2009, Risk management - Principles and guidelines.

Risk *assessment* involves identifying and evaluating risk factors: what makes tree and limb failure likely?; how are people and infrastructure exposed to falling trees and limbs?; are the risks acceptable or unacceptable?

Risk *management* involves developing options (i) to reduce the likelihood of tree and limb failure and (ii) to eliminate or reduce the exposure of people and infrastructure to failure hazards. Risk management options therefore include measures to maintain tree health and integrity, to prune and remove dangerous trees and to plan tree planting or buildings, footpaths, roads and other infrastructure to reduce exposure.

The most appropriate options will depend on the magnitude of the risk. Expensive and dramatic options such as tree removal may be appropriate where tree failure is imminent and lives are threatened. However, risk management options have a cost in terms of their impact on the biodiversity, landscape and other values of trees and the cost of the works. Costs must be balanced against the magnitude of the risk when selecting the most appropriate management option.

Risk Assessment

All trees present a degree of risk, however remote, of injury or property damage – only a small number actually hit someone or something. Trees present risks in relation to:

- the potential for the tree or its limbs to fail AND
- its potential to strike a target.

A target can be anything of value that may be struck when a tree fails (e.g. person, building, fence, vehicle).

The level of risk posed by trees depends on a combination of factors related to the tree itself and the context in which it is growing. Risks are assessed in terms of:

- likelihood of tree or limb failure (in relation to tree health and integrity)
- likelihood of exposure (whether a frequently used playground or a rarely used camp site is exposed)
- target value (whether people, minor infrastructure or major infrastructure are exposed)
- severity of the impact (in relation the size and weight of the tree or limb and the damage it can cause).

Risk assessment methods generally rely on visual inspection of trees by expert arborists who assess the likelihood of tree or limb failure from defects or weakness in the tree. Based on these inspections, a number of risk management options can then be carried out. Inspections may be conducted when a hazardous tree is identified, as part of a strategic tree monitoring program, or when trees are being evaluated for removal for some other purpose, such as to allow developments.

Risk Management

After risks are assessed, the most appropriate management measure is identified. Effective risk management will reduce the likelihood or severity of a risk to an acceptable level. A range of options may be available to achieve this. The most appropriate option must be chosen with respect to costs, which will include:

- impacts on habitat value
- impacts on amenity value
- impacts on heritage value
- the monetary cost of the works.

1.6 Disclaimer

The authors of the report ask readers to note that every care has been taken in the preparation of the analysis, findings and recommendations of this report.

However, councils should be aware that the recommendations of this report are generic and broad in nature, and are intended to provide general guidance to councils across a wide variety of important issues relating to tree management policies and related responsibilities.

Accordingly, councils should have the continuing responsibility to frame, modify or adapt tree management policies in accordance with the particular circumstances (including resources) relevant to each council, and to take such actions under any such policies having regard to the specific prevailing and relevant circumstances. In particular, councils should be ready to obtain specific technical, expert or professional advice when and as required by particular conditions or situations.

2. Discussion and Recommendations

2.1 Synopsis

The following synopsis of findings underpins the recommendations outlined in this chapter.

Trees provide a range of important benefits to the urban environment and as part of the natural landscape. Key benefits include their amenity value, biodiversity value, historic value and in their role in moderating urban temperatures.

There are risks associated with trees, in particular the risk of personal injury and property damage associated with falling trees and limbs. These incidents are very rare; the risks are much lower than for other hazards encountered in daily life, such as motor vehicle accidents.

While the community and the natural landscape benefit from the presence of trees, these impacts, when they do occur, affect individuals. The personal cost of injury or property damage can be very high; occasionally the consequences are tragic.

There are three reasons to believe that the incidence of tree and limb failure (on both public and private land) will increase over the next two to three decades:

- tree senescence – all trees have a natural life span and there is evidence to suggest that a large proportion of existing trees will move into an older senescent age group in which the likelihood of failure is higher;
- urban consolidation – increasing population density in urban areas results in a greater competition for limited space, and evidence shows that the lack of sufficient space for tree canopies and root systems is a significant factor contributing to tree and limb failure; and
- drought and climate change – increasing summer temperatures, reduced rainfall and reduced watering can reduce the health of trees and their capacity to withstand the stresses that trigger tree and limb failure events.

The Local Government Act and Civil Liability Act provide councils in South Australia with a limited immunity from liability for property damage and/or injury caused by trees that are associated with roads. However councils may be liable for damages for personal injury under the common law of negligence. Where an incident occurs, the reasonableness of a council's behaviour in all the circumstances seems to be a determining factor.

The Inquiry has found that councils in general take a reactive approach to tree risk management. As the incidence of tree and limb failure is likely to grow, the Inquiry does not believe this is a sustainable approach in the long term. Councils and others can intervene to reduce the incidence of tree and limb failure. However, no intervention can eliminate the risks and hazards completely.

Importantly, actions that reduce tree failures improve trees generally; the injuries and defects that lead to failures are reduced, maintenance costs are lower, and trees achieve a better form and live longer. Tree replacement costs are also reduced.

Improvements in tree management must be considered in proportion to tree risks, which vary from council to council according to the profile of their tree population and how people and property are exposed to potential failures.

Community expectations of trees in the landscape and perceptions of risk also vary. It is appropriate that each council forms its own view about the best response to tree management, taking into account

community values, community attitudes to risk, the general public benefit provided by trees, council's resources and the competing demands on those resources.

The following recommendations are made with the understanding that many regional councils, and some metropolitan councils, have care and control of considerable areas of native or remnant vegetation, particularly along roadsides. The additional complexity and burden (for example, in the case of clean-up after storms) for these councils may cause them to embrace these recommendations on a more limited or staged basis given the resource implications.

2.2 Tree Management Policy

Recommendation 1: The Board recommends that all councils develop and adopt a formal Tree Management Policy with appropriate linkages to the council's strategic management plans.

A Tree Management Policy provides a central reference point for the management of trees within a council. Although tree management represents a sizable component of the annual budget of many councils, the objectives of this investment are rarely defined. The linkages to the council's infrastructure and asset management plan and the long term financial plan should be explicit.

A Tree Management Policy sets out the objectives that a council wants to achieve through the management of trees. It guides how trees are planned, how risks are managed, the resources required to achieve the objectives and how other council activities relate to tree management.

A Tree Management Policy:

- sets objectives for trees in the landscape, including the benefits trees provide and how these benefits are realised;
- reflects the setting of the council, including its landscape, history, biodiversity and community expectations;
- provides a long-term perspective, including planning for trees at maturity and planning for tree replacement at the end of their functional life;
- sets out the extent to which councils will formally adopt a framework to proactively manage the risks associated with trees on public land;
- identifies the preferred risk assessment methodology which the council will consistently apply;
- sets out how the council itself will manage its various functions (planning, engineering, parks and gardens etc.) to ensure an integrated approach to managing trees and achieving the objectives of the policy;
- presents ongoing costs in a comprehensive way, to allow efficiencies to be identified and priorities to be targeted;
- identifies future resourcing requirements (e.g. trained staff) and enables plans to be made; and
- identifies the key conflicts related to tree management and how these should be managed, e.g. sharing of information within councils and cooperation with utilities.

Tree Management Policies have been developed by a number of councils in South Australia and interstate. Examples policies and strategies include those developed by the City of Burnside, Hume City Council, Bayside City Council and the City of Sydney.

Recommendation 2: The Board recommends Tree Management Policies be developed through consultation and include procedures to keep the community informed of tree values (including community education programs), the adopted objectives of tree management and how they are being achieved.

Tree Management Policies should reflect the values and interests of the community in each council. There are strongly held opinions within the community of the value and appropriate setting for trees (Appendix C). A Tree Management Policy provides a framework to engage with the community on the benefits and risks of trees and to respond to community values and expectations.

Recommendation 3: The Board recommends the Local Government Association develop a template Tree Management Policy that councils can use to develop their own specific policy.

A substantial proportion of the effort in developing a policy is in determining its scope and content. A single template would simplify this process and would ensure that all policies meet minimum criteria. The template should provide guidance on current legal arrangements in relation to trees, minimum risk management requirements, government policy, information sources and institutional arrangements.

Councils would adapt the template to reflect their local situation and community expectations.

2.3 Proactive management of tree risks

Recommendation 4: The Board recommends all councils adopt a proactive approach to managing the risks in existing trees.

Currently, the majority of councils apply a mostly reactive approach to risk management in existing trees. This involves responding to reports of unsafe trees from the public, incidental observations made by council staff carrying out other duties, and through clean-up operations following major storm events.

The predominantly reactive approach may result from councils' interpretation of the immunities for liability in the Local Government Act and Civil Liabilities Act. These immunities do not require councils to act to manage risks unless they have been made aware of them. This can encourage councils to minimise their knowledge of risks and thereby reduce the workload and effort to manage tree risks.

However this interpretation can be criticised. If councils did not know of a tree failure risk but a court determines that they should have known, they may be held liable for damages. The immunities will have limited value if councils have adopted policies or practices to deliberately avoid identifying risks that are obvious or reasonable to have known.

Furthermore, it can be argued that it is not in the public interest for councils to avoid knowledge of high risks. Risks may be considered obvious, or reasonable to know, where:

- there is a high degree of exposure (e.g. a park, playground, building or road);
- the tree is large and an impact would be severe; and
- defects are clearly identifiable.

A reactive approach can also be criticised as not being cost-effective. A reactive approach seeks to reduce tree management costs by only responding to incidents when they occur. A proactive approach that identifies risks and manages them would involve a greater initial investment in both costs and skilled resources required. However, councils interstate that have adopted proactive management approaches, report a long term reduction in costs, as the demands to clean-up after storms, to conduct risk-management pruning, to manage community complaints and to manage damage caused by failures are reduced.

The objective of proactive risk management is to increase tree health and integrity. This approach has the benefits of reducing failure risks as well as increasing tree longevity, improving tree structure, tree amenity and biodiversity values.

Several interstate councils have adopted proactive tree management strategies (e.g. City of Sydney, City of Hume). In the City of Hume, the implementation of a proactive management approach has led to significant reductions in the number of tree-related public requests and after-hour callouts (B. Kenyon, pers. comm.). The clean-up effort following severe storms has been reduced from up to 10 – 12 weeks (prior to proactive management) to around half a day. This has resulted in a dramatic decrease in the amount of over-time paid to council staff and reduced the need to employ external contractors to help with storm clean-up. The severity of damage caused by failures is lower due to a reduction in the number of whole tree failures and a reduction in the size of failures. As a consequence, the average size of insurance claims processed for the City of Hume has been reduced substantially (B. Kenyon, pers. comm.).

Anecdotal evidence from some South Australian councils also indicates that the incidence of tree failures has reduced since the implementation of a more proactive tree management approach (e.g. City of Gawler, City of Charles Sturt).

Proactive tree risk management comprises the following elements:

- establishing a register of priority trees which may include trees of high value, high failure potential, high exposure or high public concern;
- assessing (inter alia) tree failure risk;
- identifying actions to manage risk;
- establishing and following a program to implement actions; and
- ongoing tree surveillance and maintenance of the tree register.

It is essential that any proactive risk assessment and management procedures that are adopted by councils are carried out as planned, albeit with regard to the resources of the council. Councils will be exposed to claims of negligence if risks are not identified or managed according to adopted procedures.

Proactive management is not appropriate where there are large numbers of trees with low levels of exposure, such as the extensive areas of remnant trees in reserves in regional councils. For regional councils, a proactive management program may be limited to a small number of high-risk trees located in built-up areas or frequently visited tourist attractions.

Recommendation 5: The Board recommends all councils have a tree register which is an essential component in the proactive management of tree risks.

Recommendation 6: The Board recommends the Local Government Association develop a tree register template, and identify possible technology options to simplify, integrate and coordinate relevant information for decision making. The tree register template can be modified by councils according to their own resources and objectives.

A tree register is a database that records the location, species, condition, values, and risks of trees [104]. It is used to plan work including actions to maintain tree health (such as addressing watering deficiencies), formative pruning, risk management actions (such as pruning or reducing the exposure of targets) or renewal. The data used in the tree register will depend on the adopted tree risk assessment methodology (see Section 6.3).

Some South Australian councils have established registers for a subset of their trees that have high management importance (e.g. significant trees or trees in high use areas). There is a cost to establish the register, and ongoing resources are required to maintain the register.

The scale of a tree register should reflect two key considerations:

- the resources of the council to develop and maintain the register; and
- the risk to personal safety and property associated with tree failure.

The number of trees on the register and the frequency with which they are assessed can be prioritised according to factors such as target occupancy and target value, tree age, species and condition, aesthetic or heritage value, and community expectations. Importantly, tree registers provide a place to store all tree risk assessments, including those made in response to public inquiries. At present most councils do not have formal arrangements for storing and retrieving this data.

The type and amount of information collected will depend on the situation of the tree, where target value and the likelihood of damage will be high for most street trees, but will vary widely amongst reserve trees [109]. Assessment involves visual inspection at ground level, perhaps with the use of binoculars, unless there is a requirement for a more detailed inspection that requires the use of elevated platforms or towers.

Tree registers should include details of the tree's characteristics and condition as well as the presence of any potential targets that could be impacted by tree failure. Examples of the components that commonly make up a tree register are listed in Table 1.

Most tree registers contain a subset of these components, but tree condition, structural weaknesses, target attributes and failure potential are essential components if the register is to be used for the purpose of risk assessment. The amount of data collected will depend on the Risk Assessment Method selected.

Tree values are an important component for deciding the most appropriate management option. For example, a tree of exceptional size, or of cultural or heritage significance will have greater effort invested into its retention than a poor specimen with little aesthetic appeal. An apparent shortcoming of most tree registers is that they do not take into account biodiversity values such as remnancy status and habitat value (e.g. presence of hollows, food sources, wildlife corridor etc.). Environmental values (e.g. energy savings, carbon sequestration, storm-water interception) are also not considered, most likely because these are very difficult to quantify. It is essential to record these values for them to be protected when risk reduction options are determined.

Once established, ongoing funding is required to ensure that the register is maintained and kept up to date through regular tree surveillance. The frequency of assessments will depend on the level of risk identified for each tree.

Table 1: Examples of tree register components (based on tree registers obtained for the City of Burnside, City of Adelaide, City of Hume, Kia Municipal Council, ACT Government, the Botanic Gardens of Adelaide and Homewood Consulting Pty. Ltd.)

Component	Description
Species	
Location	
Characteristics	Size (height, canopy width, trunk diameter) Age (juvenile, semi-mature, mature, senescing) Previous pruning
Condition	Leaf density Vigour Epicormic growth
Local conditions	Landscape (lawn, windbreak, pavement) Recent site disturbance Wind exposure
Structural weaknesses	Dead limbs Crown and trunk defects (decay, cracks/splits, included bark, codominant forks etc.) Architecture (lean, unbalanced crown, excessive end weight etc.) Insects and disease (e.g. borers) Root decay or damage
Space availability	Adequacy of space available for the tree to reach its full potential
Past pruning	Type of pruning
Impact to infrastructure	Roots lifting footpaths, roads, kerb, fences etc. Proximity to overhead powerlines Verge crossings
Useful life expectancy	E.g. 0, less than 5 years, 5–10 years, 10–20 years, more than 20 years
Aesthetic value	Shade, impact on aesthetics of block, part of avenue or group, screen, significant tree, heritage value etc.
Target attributes	Use under tree (road, building, vehicle, pedestrians) Frequency of use Possibility of moving targets or restricting access
Risk assessment	Based on failure potential, size of part, and target attributes
Risk reduction options	Remove target, Pruning, Tree maintenance, Tree removal
Management actions required	E.g. aerial inspection, removal of dead branches, structural pruning to remove defects, weight reduction, formative pruning, tree removal.
Work Priority	Urgent, high, moderate, low, very low, none
Evaluation schedule	Frequency of assessment required

Recommendation 7: The Board recommends a standard approach be used for collecting data on tree and limb failures across councils in South Australia

The collection of data on tree failure incidents is required to properly assess risks, to allocate resources to priority issues and to manage trees cost-effectively. Data is also required to correctly identify the causes of failure so that preventative actions can be developed. Councils currently collect little or no tree failure data, so that this risk cannot be compared to other risks that councils manage.

Council staff members currently attend trees that have failed on public land. A number of simple metrics could be collected at this time in a standard form with minor additional effort. A number of high priority areas are set out in Table 2.

Table 2. Tree failure data collection priorities

Data	Value
Species that has failed	Species that fail regularly could be subject to increased surveillance and excluded from future planting lists.
Tree age	The age at which trees of certain species tend to fail will assist in planning when tree scapes should be renewed.
Weather conditions at time of failure (wind strength, temperature)	Data on weather conditions will help characterise the causes of failure and whether they can be managed.
Type (limb, tree) and weight of failure	The severity of the failure will help characterise the severity of risk events.
Was there a detectable defect (disease, poor architecture, injury, root damage)?	Better information on defects that lead to failure will assist in future diagnosis and prediction of failure.
Was there a detectable stress (change in paving, change in watering regime)?	Better information on stresses that lead to tree failure will improve management of the space around trees.

A standard approach should be used for data collection across councils in South Australia. While local data collection will assist individual councils in planning tree management, information that can be shared will greatly increase the size and value of the data set and improve management more widely.

The data requirements should be kept simple and quick to record, enter and report. This will increase the likelihood that data collection and reporting is maintained.

Trees that have suffered limb failure should be recorded on the database as a high priority for ongoing surveillance. Trees that have lost limbs are considered to be susceptible to subsequent failures.

Recommendation 8: The Board recommends all councils adopt the preliminary screening assessment methodology developed by the Botanic Gardens of Adelaide.

Risk assessment determines the tree management priorities based on the risk of failure.

Preliminary risk assessment methods are available for assessing large numbers of trees. They are rapid and require limited training and have been developed for non-expert use to assess the safety of individual trees in areas of intense public use. A preliminary assessment methodology is suitable for prioritising trees which should be subjected to a more detailed expert evaluation.

The methodology developed by the Botanic Gardens of South Australia has been adapted by the Department for Environment and Natural Resources (DENR) to make risk assessments of large trees with high exposure i.e. picnic grounds, car parks and campsites. This involves a one-day training program carried out by professional arborists, in which DENR staff are trained to carry out basic tree evaluations and risk assessments. Expert arborists are consulted when detailed risk assessment is required, or to validate evaluations that involve some uncertainty.

Recommendation 9: The Board recommends the Local Government Association explores the development of a South Australian standard or standards for risk assessment and in the interim each council adopt one detailed risk assessment methodology that is well-regarded and ensure relevant staff have been properly trained in its application.

Detailed risk assessment methods are designed to assess individual trees including the likelihood and nature of failure and the exposure of targets. Detailed risk assessments are appropriate where trees have high biodiversity or landscape value and risk mitigation measures (pruning or removal) would severely impact on these values. They are also appropriate where the value of targets is very high. Detailed risk assessments generally require a high level of arborist expertise and training in a specific methodology.

A number of risk assessment methods have been developed to assess individual trees, which vary in their complexity, subjectivity and outputs. There is an element of uncertainty in all risk assessments – failures are

not entirely predictable and evaluation methods can be affected by personal judgement. Despite efforts over many years a national standard for tree risk assessment has not yet been adopted.

To minimise the inherent degree of uncertainty associated with detailed risk assessments, councils should choose a single methodology that is applied consistently. Councils should also ensure staff are appropriately trained to apply this method.

The Local Government Association could explore the development of a South Australian standard or standards for risk assessment in collaboration with 'Standards Australia' based on similar work on the development of governance standards for SA councils. If a South Australian standard was developed, all SA councils should adopt that standard. Risk assessments methods should be periodically reviewed against best practice.

Recommendation 10: The Board recommends councils should be aware of and consider the merits of alternative options to manage risk, where the last resort option would be to remove the tree.

Once a risk assessment has been undertaken, it is necessary to determine what measures need to be undertaken (if any) to manage the risk. The most appropriate options will depend on the magnitude of the risk. Expensive and dramatic options such as tree removal may be appropriate where tree failure is imminent and lives are threatened. However, risk management options have a cost in terms of their impact on the biodiversity, landscape and other values of trees and the cost of the works. Costs must be balanced against the magnitude of the risk when selecting the most appropriate management option.

A particular conflict can arise when assessing large, old trees. These trees usually provide the most valuable habitat (e.g. nesting hollows) but may also pose a greater public risk. It is therefore important to apply a balanced approach when assessing and managing risk, taking both public safety and habitat value into consideration. Where possible, relocation of the target (e.g. infrastructure such as seating and picnic sites) or public exclusion would be a more ecologically sensitive way to reduce risk, rather than limb or tree removal.

Risk management options involve reducing the hazard presented by the tree or reducing target occupation in the vicinity of the tree. The range of options may include:

- Moving the target - the exposure of people and property to failing trees and limbs can be reduced by relocating footpaths, picnic tables, benches, campsites, carparks etc. away from dangerous trees. The costs of moving existing infrastructure can be considerable, but can be negligible when infrastructure is first planned.
- Protecting the target from impact - structures such as roofs over walkways or picnic areas can be constructed so that they will reduce the impact of falling branches. Such structures must be built to take into account the size of potential failures. Although the costs associated with building large structures can be considerable, they may be appropriate in situations with high pedestrian traffic and high value trees. In some situations, erecting protective shade structures over picnic areas may be more cost-effective than tree removal, or may be considered worthwhile given the value of the tree.
- Discouraging target occupation - people are usually drawn to the shade beneath large trees, particularly if the area is grassed. The use of mulch or landscaping can discourage people from occupying the space beneath potentially hazardous trees. This could be complemented by the simultaneous provision of alternative shaded areas.
- Exclusion from the site - denying public access to a site containing one or more hazardous trees may be necessary as a temporary or permanent measure if an area is deemed unsafe, for example following a severe storm or bushfire. Placing a fence around a heritage tree or hazardous trees in part of a reserve or campground may be an effective means of separating potential targets from the hazard with little cost.
- Removal of dangerous branches - unstable branches may be selectively removed from trees where they present a significant hazard. Branches are unsound if they show signs of decay, injury, cracks or weak branch unions. Branch removal can affect the appearance and habitat value of the tree and can cost thousands of dollars.
- Pruning - pruning is a preventative measure to manage tree and limb failure risks. Overextended branches can be shortened to reduce weight and lessen mechanical strain and poor architecture can sometimes be corrected with proper pruning.

- Cabling and bracing - cabling and bracing can be used to manage risk by reducing stress on weakened branch unions and correcting trees with poor architecture. Cabling and bracing is an intensive approach to maintain trees and is usually only carried out if the tree has significant heritage or landscape value.
- Tree removal - removal may be necessary for trees that are fundamentally unsound and present a significant risk to people or property. Trees may be unsound when they are dead, have significant trunk decay, severe root problems, severe lean or poor architecture. Tree removal can cost thousands of dollars and involves the complete loss of the benefits provided by the tree.

2.4 Measures to prevent the development of defects in new plantings

Recommendation 11: The Board recommends that councils develop protocols for site and species selection, nursery stock selection, and planting and establishment techniques.

Many of the defects, that develop in trees and lead to later failure risks, can be prevented by investing effort in the development of sound plants. An additional benefit of these measures, that is unrelated to tree risk management, is that trees will more effectively achieve their landscape, biodiversity or other objectives and will have lower long-term maintenance costs.

Species selection

Sound tree management practices begin with the selection of appropriate species that fulfil the objective(s) for the tree to be planted (e.g. aesthetic, biological or functional requirements), while minimising any negatives that may be associated with that species. It is imperative that species selection takes into account all of the biological and environmental factors that will affect the tree's life-time performance. New plantings should also consider the species diversity (to lower the incidence of insect and disease outbreaks), and age diversity (to avoid the development of aged cohorts that incur high management costs over a short period of time).

Councils must ensure that tree selection complies with relevant legislation such as the Electricity Act 1996 and the SA Sewerage Act 1929, as well as the requirements of other service providers (e.g. AGL, Origin, Telstra). Where councils opt to plant trees that do not comply with these legal requirements, they must be prepared to provide additional resources to manage trees in accordance with the relevant legislation.

Several councils have established a list of species suitable for planting in their area. Treenet is conducting ongoing trials of species suitable for street tree plantings. While species lists can provide a guide for tree selection within a geographical area, they do not take into account the local conditions associated with a particular site.

More comprehensive tree selection methods could be adopted to define the species most suitable for a particular location. For example, Bayside City Council (Victoria) has developed a protocol that scores the suitability of trees for a given location [122]. The selection method takes into account: tree management (size, form, limb drop potential, pruning tolerance etc.); site condition (tolerance of compaction, salt, drought, disturbance, water logging, shade); community expectation (evergreen/deciduous), indigenous, wildlife benefit, flowering, fruit); and site characteristics (e.g. consistency with current plantings, space availability, powerlines). In addition to providing guidance to council tree managers, a specified tree selection method could be used as a tool for planners and developers, reducing future risks associated with inappropriate species selection.

Nursery stock selection

The selection of high quality nursery stock can be ensured by adopting a set of standards to which councils and developers must adhere. For example, all planting stock used by the Hume City Council must meet the requirements of their Plant Material Supply Specification [123]. Criteria include: specific crown to root ball ratios; absence of pests and diseases; crown symmetry; stem and branch structure with a central leader, not multi trunks; self-supporting trunk (no stakes); trunk position in centre of root ball; root direction (no circling or girdling), and the size of root ball occupancy. This includes a quality control component where both the supplier and the client must inspect stock prior to delivery.

Specifications for the supplying and purchasing of trees have been developed by the National Building Specification (NATSPEC guide: Specifying Trees) [124]. Councils may opt to develop their own specification based on these standards.

Planting and establishment

Specifications should be developed for tree planting and establishment to ensure consistency and best practice methods within councils and to set standards for the planting of trees on development sites. The City of Hume has developed Tree Planting Specifications that include aspects such as the timing of planting, storage and handling, layout, site preparation, planting pit dimensions, root ball preparation, setting of plants within pit, backfilling, staking, water basins, mulching, irrigation and asset registration [123].

The City of Hume is also guided by its Tree Establishment Maintenance Specifications, which standardise practices including irrigation, mulching, water basin maintenance, fertilising, pest and disease control, weed control, pruning, tree protection, performance monitoring, ongoing scheduled and prioritised arboricultural management [123].

New plantings should take into consideration the principles of water sensitive urban design, particularly in light of a changing climate. Measures that maximise storm-water capture and soil water penetration, such as permeable paving and tree pits, will promote the establishment of healthy trees, that are less prone to failure.

Formative pruning

Formative pruning during juvenile life-stages will help to prevent the development of defects as well as maintain a healthy and aesthetic tree population. Many councils are unable to dedicate resources to a regular formative pruning program, and the majority of trees are not maintained once they are established (3 – 5 years after planting).

Pruning of mature trees is mainly undertaken for the purposes of maintaining clearance envelopes (e.g. roads and footpaths, utility cables) and for risk reduction. It is essential that pruning practices are carried out to a standard that avoids the development of structural weaknesses. Techniques such as lopping are now recognised as unacceptable practices in councils but are sometimes still carried out by utility workers during line-clearance operations.

The Australian Standard (AS 4373-1996): Pruning of Amenity Trees describes methods for pruning trees and encourages practices and procedures that reduce the risk of hazard development, branch failure, fungal infection or premature tree death. It includes formative pruning, hazard reduction, selective pruning and thinning. The Standard recommends that “pruning be carried out by tree workers who through related training, on-the-job experience and qualifications are familiar with the principles, techniques and hazards of this work”.

Councils should provide resources for formative pruning programs, and all pruning practises should be carried out in accordance with AS 4373-1996.

2.5 Land Use Planning

Recommendation 12: The Board recommends the Local Government Association approach the Minister for Urban Development and Planning to propose that Development Plans should specifically ensure there is space for trees and that these areas are sufficient to cater for the needs of trees throughout their entire lifespan.

Planning controls have a significant role in reducing future failure risks by:

- reducing the exposure of people and buildings to tree and limb failure; and
- reducing the conflicts for the space required by trees and infrastructure that lead to tree damage.

A major cause of defects that predispose trees to failure is the competition for space required by trees at maturity. Trees require space for roots to provide stability, collect moisture and take up nutrients. Their canopy also requires space to collect light, provide a balanced architecture and to provide aesthetic and other benefits. The canopy and root space may be required for other uses such as powerlines, road way clearance envelopes and sight lines, underground services, road and footpath construction and buildings. These other uses may result in pruning or root damage, which expose trees to infection and may reduce tree stability. Activities that alter the soil environment, particularly introducing impervious paving, can reduce tree health.

Urban developments near large remnant trees can result in tree removal on the grounds of failure risk management. Large remnant trees may be retained in new developments because of their habitat and aesthetic value and because of the requirements of the significant tree provisions of the Development Act. However, if the areas under the trees are planned for high-exposure uses such as gardens or buildings, they result in a high tree failure risk. The eventual removal of the trees for risk management reasons becomes almost inevitable, but could have been avoided if high-exposure uses were excluded from the space around these trees.

As demand for land increases, urban infill and subdivision will continue to rise, and the amount of private land set aside for vegetation will continue to decrease. This will place more pressure on councils to provide green space, and will increase the burden on councils to manage conflicts with trees located on public land. It is therefore essential that Development Plans specifically ensure there is space for trees and that these areas are sufficient to cater for the needs of trees throughout their entire lifespan.

Planning for trees should be considered from three perspectives:

- ensuring sufficient public land (and the associated airspace) is available within new developments and sub-divisions for trees to prosper, especially along suburban streets and in parks and gardens;
- protecting the space that is required for existing trees when they reach maturity; and
- selecting trees that are suited to these spaces.

Planners (in consultation with tree managers) should play a more active role in ensuring sufficient space is allocated to trees to ensure they are protected from competing uses. Development Plans should specify the space required by trees and plan other land uses around them to avoid conflicts. Specific attention is required to the relationship between underground services and the space allocated to trees, and the relationship between street trees, driveways, fences, front yards and the structures on private property. Planning controls can be placed on subdivisions or for the construction of buildings under existing trees to ensure there are spaces for planted trees to fill at maturity.

The selection of tree species is principally the role of tree managers who consider the soil environment and the canopy space available for the tree at maturity.

2.6 Supervision of developments

Recommendation 13: The Board recommends councils should supervise new developments more closely in relation to trees, with similar performance expectations as for other infrastructure.

Recommendation 14: The Board recommends the Local Government Association approach the Minister for Urban Development and Planning to investigate the feasibility of using bonds paid by developers or land owners to reduce the incidence of tree damaging activities associated with development

Private companies construct new urban developments as commercial enterprises and councils assume responsibility for the public infrastructure of the development including roads, footpaths, parks, and stormwater infrastructure.

Standards are in place to ensure that engineering works are completed to an acceptable high quality and that councils do not assume responsibility for faulty works with long-term liabilities for maintenance and repair. Council planners and engineers usually work closely with developers to ensure that infrastructure complies with standards and the Development Plan. On-site inspections are made before infrastructure is handed over.

Landscaping can be a significant component of new developments, but is rarely subject to the same scrutiny. Reported problems include:

- the tree species that are selected are not reviewed and may be problematic or inappropriate;
- poor nursery stock is used with long term consequences for tree health and integrity;
- planting sites are poorly prepared with long term consequences for tree health and integrity;
- planted trees are not subject to formative pruning, appropriate watering or other care;
- surface drainage patterns are altered, affecting the health of existing trees;
- Australian Standards to protect the canopy and root zone of trees from damage are not followed and not enforced; and

- landscaping and tree planting works are not inspected prior to handover so that defective works are not identified and addressed by the developer.

A closer level of supervision should apply to new developments in relation to trees, with similar expectations as for other infrastructure. Clearer guidance should be given to developers and stricter compliance conditions should be enforced.

This will involve a greater demand on the time of arborists and more resources will be required. However these costs should be considered in relation to the cost of the original investment in tree planting which includes the cost of land set aside for trees, the cost of supply and planting, and the value that trees add to the development. These costs should also be considered in relation to the remediation and maintenance costs borne by councils for substandard landscaping.

Tree-damaging activities could be further reduced by applying bonds to contractors [104]. For example, a bond set aside for the planting and establishment of new trees on development sites would encourage appropriate care and maintenance of trees. This would ensure the establishment of healthy populations of trees with a lower potential to fail. Bonds could also be applied to existing trees to discourage tree-damaging activities during the construction processes. To act as a deterrent the bond would need to be substantial and related to prior valuation [104].

2.7 Training and qualifications

Arborists

Recommendation 15: The Board recommends the Local Government Association engage with the Primary Industry Skills Council, in consultation with relevant industry associations and professional bodies, to review the training standards and practices, and independent quality control for arborist training in South Australia, especially as they compare to other states.

Arborists have a central role in the management of tree failure risks and the promotion of the benefits that trees provide. Arborists are required to evaluate the likelihood of tree failure, to identify measures to reduce risk to acceptable levels while minimising impacts on trees. Arborists are required to supervise work crews undertaking tree management tasks such as pruning and shaping. Arborists also provide advice to other council staff, particularly engineers and planners on measures to avoid damage to trees and to promote tree health.

Arborists are qualified through certificate training in Horticulture – Arboriculture. Certificate III qualifies arborists to independently manage trees, to provide advice on tree planting and maintenance and to evaluate the health and value of trees. Certificate IV provides a higher level of expertise and qualifies arborists to supervise and train staff. Certificate V is a diploma qualification and is suited for arborists who run independent businesses.

The standard of training in South Australia has been consistently questioned by trainers, council staff and independent arborists during this Inquiry. In relation to tree and limb failure, poor training has been particularly associated with:

- incorrectly assessing safe trees as dangerous;
- incorrectly assessing dangerous trees as safe;
- recommending inappropriate measures to mitigate failure risk; and
- poor tree pruning practices.

Poor diagnosis results from inadequate knowledge of tree defects, their causes and effects. Poor pruning for risk management or general clearance requirements can injure trees, further reducing tree health and increasing the likelihood of tree failure in the future.

Training for arborists in South Australia is provided by public and private training providers. A number of issues have been raised about this training, which include:

- Councils may not be engaging staff and contractors with the skills and qualifications commensurate with the tasks and activities required to properly manage trees.
- Arborist training in South Australia follows the National Training Package curriculum, which has been criticised as being open to broad interpretation that allows for lower training effort and

standards. A further criticism is that it does not set specific training requirements for South Australian species and conditions, so that arborists receive general training and are uninformed about the tree management issues they are likely to encounter in South Australia.

It is beyond the scope of this Inquiry to make detailed recommendations for tertiary education in relation to arboriculture. However, this has been reported strongly and consistently from both the training and professional sectors as a major issue in the quality of tree failure management and in tree management generally in South Australia.

Work Crews and contractors undertaking pruning and excavation

Recommendation 16: The Board recommends the Local Government Association work with councils to identify the skills and qualifications required by employees and contractors undertaking arboriculture work for councils.

Recommendation 17: The Board recommends that private contractors who prune trees or excavate near trees on public land be required to comply with contractual requirements to notify councils of the potential impact of their activities on trees, and excavation practices that can avoid damage to trees.

Pruning, line-clearance and shaping of trees is undertaken by council work crews, ETSA work crews or their external contractors. In many cases, the work crews' pruning practices are considered to be poor. Such practices may actually create defects that generate future failure risks and unnecessarily compromise the aesthetic, biodiversity and other values of trees.

In many cases work crews only have training in chainsaw operations and maintenance. Tree managers have suggested that additional training for work crews would greatly improve tree outcomes. Training in tree pruning practices for the work crews or contractors could be set as a requirement by councils. Such training could be provided by senior arborists as an in-service course arranged by the Local Government Association in South Australia or through an external service provider.

Similarly an important tree failure hazard is root severance, which destabilises trees and makes them prone to failure. Roots are frequently severed when underground services are installed or repaired. Trees may remain in good health even though their anchorage has been compromised, and failure may not occur until some time later. After the works are completed and the surface has been filled and finished, it is impossible to assess whether any root damage has taken place.

Contractors who excavate near council trees are generally required to notify council staff so that the potential for damage can be identified and protective measures can be put in place. In practice, however, council staff generally have limited time to visit sites and contractors frequently fail to notify councils.

It is proposed that the LGA Mutual Liability Scheme consider reviewing its 'model contract' documentation to require notification of councils and to provide guidelines that can be provided to contractors to assist them to determine when notification is required.

2.8 Significant trees

Recommendation 18: The Board recommends the Minister for Urban Development and Planning consider the matters raised in this report which impinge on 'regulated' and 'significant' trees in the current consultation on the draft Development (Regulated Trees) Variation Regulations 2010 and introduce regulations which require an applicant seeking to have a significant tree removed or pruned because of concerns about safety to obtain an assessment from an experienced and independent arborist (i.e. independent of tree removal contractors).

The Development Act provides for the protection of significant trees within certain parts of the state that are either nominated as significant or meet particular size criteria. The Act requires that development approval is given for actions that remove or substantially damage the tree, but that permission for pruning or removal may be given where trees pose a threat to safety or property.

Problems around significant tree assessments relate mostly to private land where landholders apply to remove trees, so that the issue is outside the scope of this Inquiry. However, it is possible for landholders to apply for the removal of significant trees on land adjacent to their property, which may be public land.

The quality of professional assessments of significant trees has been questioned. There is concern among council staff, planners and professional arborists that some arborists may be poorly qualified, and that tree assessments can sometimes be biased.

The potential of tree failure is frequently used as the basis of tree removal applications. Such assessments should be made by qualified arborists, however the criteria to determine these qualifications are not clear. In light of the concern over arborist training (see Section 0), the reliability of arborist opinion has been questioned.

Applicants seeking to remove significant trees have an interest in the tree's removal and will take steps to increase the success of their application. This could include seeking an arborist who is more likely to provide a favourable opinion or seeking opinions from additional arborists until a favourable opinion is provided. Concern has been expressed that arborists may not act independently if the applicant has also engaged them to remove the tree or if there is a close relationship or understanding between the applicant and developer in favour of tree removal.

These conflicts have been acknowledged in other states, where some councils will only accept recommendations to remove significant trees that have been prepared by independent arborists who are not associated with contractors that undertake tree removal work.

At the time of writing of this report the Board noted that the Minister for Urban Development and Planning was consulting on draft regulations to the Development Act regarding regulated and significant trees which included reference to the matters identified by the Board.

2.9 Coordination with utilities

Recommendation 19: The Board recommends the Local Government Association, having regard to the specific obligations of councils under Regulations 4 and 10 of the Electricity Act 1996, redouble its efforts on working arrangements with ETSA Utilities to develop alternative approaches to manage tree selection and pruning which respect the value of trees and minimise failure risks.

The Board is aware that the LGA has existing mechanisms to liaise with ETSA Utilities on the management of trees adjacent to their infrastructure (especially regarding pruning practices) and this mechanism should be used to progress the additional matters identified by the Board.

ETSA has a legal obligation to manage trees in specified clearance envelopes to maintain electricity supply and minimise fire risk. Councils manage trees for the purposes of promoting tree health, achieving tree objectives in the landscape and minimising ongoing maintenance costs. These objectives result in conflict where tree pruning undermines tree health and stability or where the trees planted under powerlines inevitably grow to a height where they increase the line-clearance burden on ETSA.

Some measures are available to manage the conflicting objectives and establish cooperative arrangements between ETSA and councils. However, these measures have had limited success. Councils can arrange to pay ETSA to prune trees to a higher standard where tree form and health is better protected. Alternatively they can maintain the clearance envelope around powerlines under their own pruning programs, with the objective of reducing threats to tree health. ETSA also provides a list of species that are approved under the Electricity Act for planting in the vicinity of powerlines.

However, councils have expressed limited confidence in the pruning standards that ETSA applies and ETSA has expressed dissatisfaction with the line clearance performed by councils. Councils are also reluctant to plant species approved under the Electricity Act, which do not provide the form required of street trees.

Recommendation 20: The Board recommends the Local Government Association establish a working party to review how below and above ground activities by utilities affect trees, how councils are notified of work, the capacity of councils to respond to notification and the expertise available in councils to provide advice on the protection of trees.

The differing objectives of utility providers (e.g. telecommunications, electricity, gas and water utilities) and councils are an ongoing source of conflict that can result in poor tree condition, increased risk of failure and friction between these groups.

Council tree managers require the time and expertise to advise utility providers of how to avoid damage to trees. They also depend on utility providers on advising of them of upcoming work with sufficient time to respond. Both of these matters are deficient in many cases.

2.10 Summary of recommendations

Topic	Recommendation	
Tree Management Policy	1	All councils develop and adopt a formal Tree Management Policy with appropriate linkages to the council's strategic management plans.
	2	Tree Management Policies be developed through consultation and include procedures to keep the community informed of tree values (including community education programs), the adopted objectives of tree management and how they are being achieved.
	3	The Local Government Association develop a template Tree Management Policy that councils can use to develop their own specific policy.
Proactive management of tree risks	4	All councils adopt a proactive approach to managing the risks in existing trees.
	5	All councils have a tree register which is an essential component in the proactive management of tree risks.
	6	The Local Government Association develop a tree register template, and identify possible technology options to simplify, integrate and coordinate relevant information for decision making. The tree register template can be modified by councils according to their own resources and objectives.
	7	A standard approach be used for collecting data on tree and limb failure across councils in South Australia.
	8	All councils adopt the preliminary screening assessment methodology developed by the Botanic Gardens of Adelaide.
	9	The Local Government Association explores the development of a South Australian standard or standards for risk assessment and in the interim each council adopt one detailed risk assessment methodology that is well-regarded and ensure relevant staff have been properly trained in its application.
	10	Councils should be aware of and consider the merits of alternative options to manage risk, where the last resort option would be to remove the tree.
Measures to prevent the development of defects in new plantings	11	Councils develop protocols for site and species selection, nursery stock selection, and planting and establishment techniques.
Land use planning	12	The LGA approach the Minister for Urban Development and Planning to propose that Development Plans should specifically ensure there is space for trees and that these areas are sufficient to cater for the needs of trees throughout their entire lifespan.
Supervision of developments	13	Councils supervise new developments more closely in relation to trees, with similar performance expectations as for other infrastructure.
	14	The Local Government Association approach the Minister for Urban Development and Planning to investigate the feasibility of using bonds paid by developers or land owners to reduce the incidence of tree damaging activities associated with development.

Training and qualifications	15	The Local Government Association engage with the Primary Industry Skills Council, in consultation with relevant industry associations and professional bodies, to review the training standards and practices, and independent quality control for arborist training in South Australia, especially as they compare to other states.
	16	The Local Government Association work with councils to identify the skills and qualifications required by employees and contractors undertaking arboriculture work for councils
	17	Private contractors who prune trees or excavate near trees on public land be required to comply with contractual requirements to notify councils of the potential impact of their activities on trees, and excavation practices that can avoid damage to trees.
Significant trees	18	The Minister for Urban Development and Planning consider the matters raised in this report which impinge on 'regulated' and 'significant' trees in the current consultation on the draft <i>Development (Regulated Trees) Variation Regulations 2010</i> and introduce regulations which require an applicant seeking to have a significant tree removed or pruned because of concerns about safety to obtain an assessment from an experienced and independent arborist (i.e. independent of tree removal contractors).
Coordination with utilities	19	The Local Government Association, <i>having regard to the specific obligations of councils under Regulations 4 and 10 of the Electricity Act 1996</i> , redouble its efforts on working arrangements with ETSA Utilities to develop alternative approaches to manage tree selection and pruning which respect the value of trees and minimise failure risks.
	20	The Local Government Association establish a working party to review how below and above ground activities by other utilities (i.e. other than ETSA) affect trees, how councils are notified of work, the capacity of councils to respond to notification and the expertise available in councils to provide advice on the protection of trees.

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