TREE MANAGEMENT PLAN
Kings Highway Approaches to Braidwood, NSW

Prepared for

NSW GOVERNMENT
Transport
Roads & Maritime
Services

By

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1.0 Introduction

In response to a series of motor vehicle crashes along sections of the Kings Highway near Braidwood, Roads and Maritime Services (RMS) has carried out investigations to review the road safety issues in this area. As a consequence of that work, a number of treatments are being considered to improve road safety including the management of the avenue trees on either side of Braidwood. In determining the road safety works, RMS acknowledges the heritage significance and community values associated with the existing roadside trees.

This Tree Management Plan (TMP) provides guidelines for the long term management and maintenance of the avenue trees along the sections of the Kings Highway that form the northern and eastern approaches to Braidwood (Refer Figure 1). In preparing this TMP, careful consideration has been given to the results of a comprehensive study of the key issues relating to tree management and road safety. This plan includes technical recommendations for managing the existing avenue trees as well as new plantings.

Outcomes from community consultation, which included a series of meetings and workshops, have been taken into account in preparing this plan. Members of the community have expressed their view in consultation forums (held 13 October 2011, 3 May 2012 and 24 July 2012) that the avenues of trees along the Kings Highway on the approaches to Braidwood form a valuable part of the cultural landscape that they identify with.

Key values include the avenue structure with trees planted at regular spacing on either side of the road together with the seasonal changes that are reflected through variation in leaf colour together with leaf fall that reveals the tree branching form.
A key principle of this plan is therefore to maintain the distinctive landscape character of the avenues by outlining a strategy for tree replacement to ensure sections of avenue will be formed by symmetrically arranged trees of the same species, age and size (relative to each other).

2.0 Context

The township of Braidwood is listed on the NSW Heritage Branch State Heritage Register (Database number 01749). In that heritage listing, the following references are made to the roadside trees on the northern approach to the township:

“The trough of depression had passed by 1936 when the avenue of Lombardy and Golden poplars was planted at the northern entrance to town to celebrate the 25th year of King George V’s reign.” (State Heritage Register, 2006)

“Aesthetic views of the town include: the approach from Canberra, where the town is framed by a row of Poplars;” (State Heritage Register, 2006)

The existing avenue of trees on the northern approach to Braidwood has two distinct groupings of trees; predominantly Golden Poplars (*Populus x canadensis* ‘Serotina Aurea) interplanted with Lombardy Poplars (*Populus nigra* ‘Italica’) on the outer northern approach and a short avenue of Pin Oaks (*Quercus palustrus*) planted at the entrance to Braidwood town. There is also a prominent row of large mature pine trees set back from the road corridor associated with the showground frontage (Refer Figure 2).

The Golden Poplar trees are arranged in a pattern of alternate pairs at approximately 18-20m spacing growing in grass verges with the distance from the edge of the road travel lane varying from approximately two and a half – five metres. For a distance of about 250m along this section of road a number of Lombardy Poplars are interspersed between the Golden Poplars, which are the dominant species.

The Golden Poplars, and probably the Lombardy Poplars, were planted in about 1936. A number of these trees are mature and becoming senescent, consequently their replacement should be planned to occur in batches, rather than as single replantings.

The short avenue of Pin Oaks (*Quercus palustrus*) was planted in 1984 as a gift to the community from the local Garden Club. These trees are planted at a spacing of approximately 11-13m in a pattern of opposite pairs and are aligned approximately three – five metres from the edge of the travel lane on the edge of grass swales.

The road corridor along the eastern approach to Braidwood is narrower than the northern approach. The existing dominant tree avenue on the outer eastern approach is a distinct grouping of Lombardy Poplars (*Populus nigra* ‘Italica’) arranged in a pattern of opposite pairs at approximately 30m spacing. These trees are generally located between three – five metres from the edge of the road travel lane (Refer Figure 3).

Tree planting along the remainder of the eastern approach to Braidwood is fragmented and consists of a variety of species planted at irregular spacing.
3.0 Objectives

The objectives of this Tree Management Plan are to:

- Conserve the avenues of trees in a manner that retains their cultural heritage values in accordance with the provisions of the Australian ICOMOS, Burra Charter.
- Provide a design for replacement planting and avenue realignment over the longer term as the existing avenue trees reach the end of their life cycle.
- Provide guidance for ongoing maintenance of the existing avenue trees as well as newly planted trees.
- Consider road safety and operational requirements while implementing the design.
4.0 Principles and Guidelines

4.1 Consistency with Road Safety

Considering road safety standards, any new trees will only be planted outside defined clear zones (generally nine metres where the speed limit is 100km/h) with the exception of those areas described below which recognise the importance of maintaining the distinctive avenues. The three areas listed below are the only sections of the highway near Braidwood where RMS will consider the planting of new trees within the clear zone.

The scope of this plan is for the long term management of roadside trees and it does not include details of road safety treatments proposed by RMS. A companion document to be prepared by RMS will provide details of proposed short term road safety treatments considerate of this plan. Such treatments, for example, may include the installation of safety barriers.

Clear zones are defined in Austroads guides and Roads and Maritime Services (RMS) supplements which are available on the RMS web site (http://www.rms.nsw.gov.au).

RMS will consider tree planting within the clear zone along the following sections of the Kings Highway due to the limitation on space within the road corridor:

1. Near the Braidwood Showground and Racecourse
   - between Deloraine Lane and 100m north of Station Street, which is
   - a distance of 1.3 km, subject to trees being planted
   - at least six metres from the edge of the travel lane.

2. The location of the existing avenue of Lombardy poplars (east of Braidwood)
   - about two – three km east of Braidwood
   - extending for a distance of 1.2 km
   - east of the gate on north side of the Highway about 1.8 km east of Monkittee St
   - west of the western gate on the south side of the Highway about 3.0 km east of Monkittee St, subject to trees being planted
   - at least 5.5 metres from the edge of the travel lane.

3. Just east of Monkittee Street
   - on the south side of the Highway extending for a distance of 300m
   - west of a point 400m east of Monkittee Street, subject to trees being planted
   - at least 5.5 metres from the edge of the travel lane.

RMS will also investigate options to plant new avenues outside the clear zone to allow for better long term road safety.

Implementation of road safety works has the potential to impact existing trees. This may include physical damage to tree roots and stems as well as soil compaction and changes to drainage patterns. Any work needs to be planned and implemented in a way that does not damage the existing trees or the growing conditions required to sustain them.

4.2 Tree Avenue Structure

The listing of Braidwood on the NSW Heritage Branch State Heritage Register specifically refers to the avenue of Lombardy and Golden poplars along the Kings
Highway northern approach to Braidwood that frames views of the township. The local community has clearly stated that the key value they associate with these trees is the avenue structure and seasonal effect.

A key principle of this plan is to maintain the landscape character of the tree avenues by implementing a program of tree management and replacement.

The new avenues will comprise trees of the same or similar species, age and size (relative to each other) to be planted in a symmetrical arrangement to retain the avenue structure. This will require inter-planting offset from existing avenue trees so that the planted trees have the space to grow to sufficient height before the existing trees are removed.

The alignment of the new avenues also considers adjacent infrastructure that may prevent a satisfactory length, spacing or lateral placement of trees. Opportunities for continuous lineal plantings of trees that are not affected by overhead or underground services, property accesses or other infrastructure must be iteratively considered at each planting event. This includes considering avenue plantings outside the road reserve. Details of how the tree avenue structure is to be retained are described below.

Along the northern approach to Braidwood, retain the tree avenue structure by implementing a program of tree management and replacement planting that includes:

- Re-establishment and extension of an avenue of Golden Poplars (*Populus x canadensis* ‘Serotina Aurea’) planted in symmetrically opposite pairs at 18 metre spacing along both sides of the northern approach. (refer Appendix A – Concept Sketches, Plans A, B & C and Sections AA, BB & CC)

- Widening of the space between trees across the roadway by planting new trees at a minimum six metres distance from the edge of the travel lane. Along the section of the Kings Highway adjoining the Showground and Racecourse the preferred option is to plant within those properties rather than within the road corridor. (refer Appendix A – Concept Sketches, Plans A & B and Sections AA & BB)

- Removal of the existing trees after the new avenue trees are established and have attained an acceptable form and size as determined by Palerang Council in consultation with RMS.

Along the eastern approach to Braidwood, retain the tree avenue structure by implementing a program of tree management and replacement planting that includes:

- On the outer eastern approach, replacement of the avenue with a single species of fastigiate (tall and slim) trees similar in form to the existing Lombardy Poplars (*Populus nigra* ‘Italica’). The new trees are to be planted in symmetrical opposite pairs at 30 metre spacing and a minimum 5.5 metres from the travel lane. (refer Appendix A – Concept Sketches, Plan E and Section EE)

- A single row of ornamental Pears (*Pyrus calleryana* ‘Capital’) planted at 12 metre spacing and a minimum of 5.5 metres from the travel lane along the southern edge of the highway within the urban speed zone at the eastern edge of Braidwood. The row of planted trees will form an avenue with the existing row of evergreen trees growing in private property adjoining the northern edge of the road corridor. (refer Appendix A – Concept Sketches, Plan D and Section DD)
• Removal of the existing trees in these locations after the new avenue trees are established and attain an acceptable form and height as determined by Palerang Council in consultation with RMS.
4.3 Tree Species Selection

Selection of the proposed tree species has taken into account a range of considerations that include:

- Suitability to climate, microclimate and soils (which are generally low fertility sandy loams derived from Braidwood granites).
- Longevity of the species growing in the difficult conditions provided by road corridors.
- Suitable scale and form which does not create additional maintenance requirements.
- Low susceptibility to pest and disease damage.

In situations where existing tree species are satisfying the selection criteria they will be used to sustain the avenue character and provide historical continuity. Use of a single species does increase the potential risk from disease or pests and therefore species and cultivars have been selected that are relatively resistant to disease and pest attack.

While the scale and density of the tree canopy of the existing avenue trees along the Kings Highway at Braidwood accentuate the sense of place, the selection of species to be used in replacement planting will aim to ensure they have an appropriate size, scale and canopy density, and that views from the highway to the adjoining rural landscape are maintained even as the tree canopies grow.

The selection of tree species and cultivars aims to ensure they will thrive under the prevailing site conditions. Soil depth, fertility, moisture, drainage, aspect, microclimate, land use, underground and above ground services as well as competition from other plants have been considered in the selection. Operational conditions and requirements are also considered in the tree selection to minimise risks associated with branch drop, potential for suckering and avoiding pruning or crown lifting required to maintain clearances from moving vehicles, sightlines and overhead utilities.

Selection of tree species is consistent with roadside management requirements, and species that cause damage to roadside infrastructure or hinder normal road operation due to mismanagement or poor form have not been proposed.

Some of the planted trees currently growing along the Braidwood section of the Kings Highway do not meet the above criteria. For example the Lombardy Poplars forming the section of avenue along the eastern approach to Braidwood sucker regularly and the Pin Oaks planted along the northern approach to Braidwood have a spreading branching habit that will require regular pruning to maintain clearances to the carriageways. Consequently in order to meet the various species selection criteria it will be necessary to replace them with other species or cultivars.

Northern Approach

The existing Golden Poplar *Populus x canadensis* ‘Serotina Aurea’ is the preferred species to be used along the northern approach to Braidwood. Key aspects of this species are:

- Cultural Values: The Golden Poplar is already present and using it for the replacement planting will ensure continuity of the avenue character (that the community values) and historical continuity to the original planting.
• **Suitable Form:** The Golden Poplar can grow to a height of 18 metres forming an ovate to oval habit and canopy spread of around 10 m which makes it suitable for avenue planting. The existing avenue trees display desirable characteristics for avenue trees having good proportion and relatively consistent form and average height of 16 metres.

• **Hardiness:** The Golden Poplar tolerates poor soil conditions and has adapted well to the harsh climatic conditions of the Braidwood roadway environment. This species also appears to have good resistance to Poplar Rust.

• **Safe Structure:** The Golden Poplar has sound branching structure and therefore is generally not prone to inherent defects.

• **Longevity:** The existing trees are approaching 80 years of age which indicates the species has appropriate longevity in the prevailing growing conditions of the Kings Highway corridor at Braidwood.

• **Predictable Growth Rate:** The species has a moderate to fast growth rate.

• **Seasonal Variation:** The foliage of this deciduous species is well regarded for its distinctive golden yellow autumn foliage that colours early in autumn.

The existing Pin Oaks are not considered to be a suitable species to achieve the avenue character due to their relatively broad crown and low branching habit.

**Eastern Approach**

The preferred species/cultivar for replacement planting along the outer section of the eastern approach to Braidwood will be a similar species to the Lombardy Poplar but a form grafted on to rootstock selected for minimal suckering and maximum disease resistance.

Key aspects of a Lombardy Poplar cultivar are:

• **Cultural Values:** The Lombardy Poplar is already present and using a similar cultivar for the replacement planting will ensure continuity of the avenue character associated with the existing trees that the community values.

• **Suitable Form:** The Lombardy Poplar has a distinguishing tall (approximately 20-22m high) and narrow vertical form (approximately four metres wide) that frames views to the landscape and is particularly visible from surrounding rural residences and roads. Its narrow width is suitable for the relatively narrow road corridor that precludes the use of broader canopy tree species along the eastern approach.

• **Hardiness:** The species tolerates poor soil conditions and has adapted well to the harsh climatic conditions of the Braidwood roadway environment.

• **Reduced Maintenance:** Grafting onto minimal-sucker ing rootstock will minimise the species tendency to sucker.

Another tree species of ornamental Pear *Pyrus calleryana* ‘Capital’ is proposed for planting along the southern side of the road corridor in the urban speed zone at the eastern entry to Braidwood township. This species grows to a height of 11 m with a similar fastigiate form to the Lombardy Poplar and is selected for its relative hardiness and drought tolerance. It will also provide seasonal variation with abundant white blossoms in spring and reddish purple coloured foliage in autumn. It is a smaller scale tree than the Lombardy Poplars, which is appropriate closer to town.
4.4 Planting Stock Propagation

Propagation and nursery production of tree stock must be carefully managed and follow best practice procedures to ensure availability of healthy stock of the selected species and cultivars at the required size for planting. The recommended standard for all supplied tree stock is described in ‘Specifying Trees: a guide to assessment of tree quality’ (Clark 2006.)

The Golden Poplars should be propagated from cuttings taken from selected trees growing along the northern approach to Braidwood. These cuttings will then need to be grafted onto suitable root stock in a nursery and grown on in the nursery to the required size for planting. Production of 100 litre trees would be expected to take approximately 12 to 18 months from the time the cuttings are taken while 150 litre trees would be expected to take an additional 12 months. An alternative may be to procure the planting stock from nurseries. However, initial investigations indicate that the supply of Golden Poplars is very limited. In addition the historical connection to the original tree stock would be lost if this option were to be followed.

The tree stock to be planted along the eastern approach to Braidwood will also involve a process of grafting cuttings of the selected cultivar onto suitable root stock and then growing it on in a nursery to the required size for planting. It is not necessary to select cuttings from the existing Lombardy Poplars as new strains of the species are reliably available from specialist nurseries.

Trees to be supplied will need to be uniform in size and form. Tree stock to be used for each stage of work is to be supplied from a single propagation batch if possible. Propagation batches should only be split if there will be a long period between stages of the planting works, which makes it impractical to hold and manage tree stock from a single batch.

A nominated planting stock size of 100-150 litres will ensure that the trees are advanced enough to provide immediate visual and amenity benefits and have adequate resistance to damage while ensuring the transport and planting costs are reasonable. This will also allow the trees to be grown to adequate height and develop good structure above and below ground to meet the specified quality requirements.

- The indicative height of a 100L (container grown) tree should be two and a half – three and a half metres and a 150L tree should be three – four metres depending on the species.
- Planting trees from 100 -150L requires mechanical assistance to move and position the tree stock.

More details are presented in Appendix B – Quality and performance recommendations

4.5 Tree Planting

The program of roadside avenue tree planting along the Kings Highway at Braidwood is to be carried out in accordance with best practice methods. The layout of trees to be planted will maintain the avenue structure while taking account of property boundaries and highway infrastructure. Spacing between trees to be planted will need to relate to the existing avenue of trees so that a similar structure is created while ensuring that competition between the existing mature trees and newly planted trees is minimised.
Careful attention will need to be given to the planting process to ensure successful establishment of the replacement trees that will form the avenues along the northern and eastern approaches to Braidwood. Refer to Appendix B, which incorporates quality and performance recommendations for planting.

Soil testing will be required to determine what soil conditioning and improvements are required to allow successful establishment of the planted trees. This will ensure the planted trees achieve the optimum growth rate and habit for the species in this location.

Surface and subsoil drainage is essential for optimum plant growth. Trees should not be planted in situations where the soil will remain waterlogged for extended periods without adequate drainage treatment. It is recommended that trees are planted at the sides and not at the lowest level of drainage swales. If proposed tree planting locations coincide with impeded subsoil, surface ponding or waterlogging and no other options are available, then drainage works are recommended to ensure the visual and structural integrity of the tree avenue is maintained. In all instances each tree planting location must be verified on site for site specific recommendations.

Tree planting information must be provided to Palerang Council for inclusion in the Council’s asset inventory.

4.6 Maintenance

A program of ongoing maintenance of the avenue trees will involve scheduled inspections and tree maintenance works by people with the required skills and resources. An arborist should provide expert advice on pruning and other works to maintain existing trees at an acceptable level of health and safety as well as ensuring that pruning of newly planted trees is carried out in accordance with best practice to achieve the required form.

Other maintenance programs and procedure considerations include:

- **Weed and sucker management**
  Suckers and wild seedlings from species such as poplars and willows need to be controlled to prevent them from dominating road side areas and degrading the avenue landscape character. A program of regular inspection and removal is required to ensure these weed trees are removed while they are relatively small. Control of the roadside weed trees is also essential to maintain normal safe operation of the roadway.

- **Work in vicinity of existing trees**
  All existing avenue trees to be retained must be protected throughout the duration of any other works occurring in the expected mature dripline, or vicinity, of those trees. The terms, principles and requirements for protecting trees are detailed in AS4970-2009. Further protection or other site management requirements must be described in the specifications for works.

  Site protection controls also include preventing access over the root zones of existing trees and not creating storage or work zones under the canopy of trees.

- **Infrastructure Protection**
  Protection measures are required when any tree planting is proposed in the vicinity of above and below ground infrastructure that is within the road reserve to avoid or
minimise damage. Measures include careful consideration of species selection, soil type, planting technique, available root space and the appropriateness of root control.

Infrastructure located on land beyond of the control of road management authorities can also be affected by trees. Consequently the proposed tree planting needs to be designed to avoid placing any undue burden in the form of risk or maintenance on such adjacent land. Liaison between infrastructure managers and arborists is essential to ensure infrastructure damage is prevented.

- **Pest and disease control**
  The monitoring and control of pests and diseases should include the following actions by Council:
  - Regular inspection
  - Assessment of the nature and significance of damage
  - Undertaking action a soon as necessary, depending on the nature of the damage
  - Reporting details of the damage and remedial action taken

The concept of total eradication of pests and disease is not practical in most situations and harm minimisation should be seen as the best approach. Palerang Council should seek to develop relationships with surrounding municipalities and agencies as well as local community groups to share information about known past and present issues in the area and resources to respond to the management challenges associated with pest and disease control.

### 4.7 Community Involvement

There is opportunity to involve community members, including land owners adjoining the highway, in the implementation of this plan while taking account of health and safety issues. Palerang Council will consider the extent and timing for ongoing engagement and involvement of community members. Such involvement may involve tree management activities in situations where safety requirements can be met. In particular the proposed planting of avenue trees along the northern approach to Braidwood within the Racecourse and Showground properties could include community volunteers in collaboration with the Management Trusts.

The owners of properties adjoining the Kings Highway in which hedgerows and other roadside trees are growing should be consulted by Council to confirm arrangements for maintenance of these tree resources to ensure they continue to contribute to the avenue structure and landscape quality of the Highway corridor.

### 4.8 Tree Removal

The timing and extent of tree removal, which may be whole or partial, needs to be determined with all stakeholders to ensure there is due consideration of all factors. These include road safety requirements, the health and condition of existing trees, as well as the growth rate of replacement trees that have been planted and perception of the avenue for road users and community.

The avenue trees along the Kings Highway are living organisms and therefore go through a life cycle that is finite. The length of their life cycle not only depends on the
genetic composition of the species but also how amenable the environment is to them. Their life span may also be significantly reduced by various forms of damage and adverse growing conditions. Ultimately the trees will reach maturity and go through a period of decline before dying. The period of decline is called senescence, and during this period an arborist may be required to determine whether the subject tree can be safely retained as part of the avenue. Removal of all or part of trees therefore becomes a necessary and a regular requirement of tree management.

Planning the removal of existing trees that have reached the end of their effective safe life needs to be coordinated with the program of replacement tree planting. The assessment of each tree’s health and ability to be safely kept is to be provided by a qualified arboriculturist in accordance to a programme of tree inspections by Palerang Council.

In order to maintain the avenue structure, original trees will be removed in groups along substantial sections of the highway. It is recommended that newly planted trees reach a minimum height of five metres before the existing trees they are replacing are removed. A decision on the timing and procedure for removal of such trees will be made through consultation between Palerang Council, community representatives and RMS.

4.9 Implementation Program

Effective implementation of this plan will need to take place over a number of years and requires the firm commitment of stakeholders and allocation of necessary resources. Key stakeholders include RMS, Palerang Council, the Racecourse and Showground Trusts as well as community groups and adjoining landowners. Roles and responsibilities of the various stakeholders will need to be identified and agreed. Similarly, the source of necessary resources will need to be determined at the start of the program of works. RMS will seek funding to include the establishment of new avenues as part of the total road safety response.

The suggested roles and responsibilities of the various stakeholders are indicated below.

**RMS**
- Implementation of road safety improvements including initial stages of this plan, including:
  - tree procurement
  - planting
  - establishment
- Implementation of a tree stock propagation program.
- Consultation with Council, trusts and community groups.

**Palerang Council**
- Ongoing maintenance and implementation of this plan.
- Ongoing community engagement and consultation following road safety improvements and initial stages of this plan.
- Ongoing management of tree stock propagation and supply program.
- Monitoring and reviewing the condition of existing roadside trees.
- Issuing approval for tree removal.
- Monitoring maintenance of roadside trees after establishment.
- Post-establishment maintenance of roadside trees.
Showground and Racecourse Trusts

- Consultation with Council and community groups involved in planting and maintenance of trees within the Showground and Racecourse sites.
- Monitoring of trees planted within grounds.

Community Groups

- Consultation with Council and RMS in relation to the initial tree planting program and providing information about the condition of planted trees.
- Involvement of community volunteers in tree management within the Showground and Racecourse sites.
- Potential involvement in tree management within private properties adjoining Kings Highway approaches to Braidwood.
APPENDIX A – Concept Sketches

A.1 Proposed Long Term Concept

- Section 1.1 Northern Approach (Northern section)
- Section 1.2 Northern Approach (Southern section)
- Section 2.1 Eastern Approach (East of town)
- Section 2.2 Eastern Approach (West of Mona Creek)
- Section 2.3 Eastern Approach (East of Mona Creek)
- Section 2.4 Eastern Approach (Far eastern section)
A.1.1 Section 1.1 Northern Approach (Northern section)
A.1.2 Section 1.2 Northern Approach (Southern section)
A.1.3 Section 2.1 Eastern Approach (East of town)
A.1.4 Section 2.2 Eastern Approach (West of Mona Creek)

NOTE:
No new tree planting proposed for this section.
A.1.5 Section 2.3 Eastern Approach (East of Mona Creek)
A.1.6 Section 2.4 Eastern Approach (Far eastern section)
A.2 Typical Layout

- Plan A & Section AA Northern Approach (Northern section)
- Plan B & Section BB Northern Approach (At Racecourse)
- Plan C & Section CC Northern Approach (Southern section)
- Plan D & Section DD Eastern Approach (Western section)
- Plan E & Section EE Eastern Approach (Eastern section)
A.2.1 Plan A & Section AA Northern Approach (Northern section)
A.2.2 Plan B & Section BB Northern Approach (At Racecourse)

TYPICAL CROSS SECTION BB
Golden Poplar planting at maturity

Golden Poplar planting at maturity behind fenceline

Boundary fenceline

6 m min.

8-9 m
Verge

Roadway

12-13 m
Verge

Approx. 30 m
road corridor

TYPICAL PLAN B
Golden Poplar planting

Indicative location of existing Golden Poplars

Racecourse

Golden Poplar planting in opposite pairs

15m spacing between trees

Boundary fenceline

Golden Poplar planting in opposite pairs

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A.2.3 Plan C & Section CC Northern Approach (Southern section)
A.2.4 Plan D & Section DD Eastern Approach (Western section)

TYPICAL CROSS SECTION DD

Single row of Pyrus 'Capitata' at maturity

Existing Conifer hedgerow within property boundary

Boundary fenceline

5.5 m min

6-7 m

Verge

7-8 m

Roadway

Verge

Approx. 20 m

road corridor

TYPICAL PLAN D

12 m spacing between trees

Existing Conifer Hedgerow within property boundary

Boundary fenceline

Pyrus 'Capitata' Planting

Pyrus 'Capitata' Planting
A.2.5 Plan E & Section EE Eastern Approach (Eastern section)
1. TREE PLANTING 100L - 150L & TREE PROTECTION GUARD

NOTE: Do not install timber rails to side adjoining fence side where tree planting occurs in locations 1m or less offset from adjoining property fencelines.
APPENDIX B – Quality and Performance Recommendations

These recommendations are provided to:

- Assist the preparation and implementation of specifications for the supply, installation and maintenance of new avenue tree plantings along the Kings Highway near Braidwood.
- Give guidance to the best quality and positive performance of the plantings.
- Fulfil the long-term establishment and symmetry of the trees.

These recommendations have been prepared with an understanding that work specifications may be drawn from various sources, including:

- RMS QA Specification R179
- Specifying Trees: a guide to assessment of tree quality (Clark 2006)
- AS4373-2007 Pruning of amenity trees
- AS4970-2009 Protection of trees on development sites
- Palerang Council standards and specifications.

B.1 Planting Stock Propagation

B.1.1 Supply

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<td>To ensure qualifications and ability to produce correctly-specified advanced tree stock.</td>
<td>Call for expressions of interest from suitably qualified tree supply companies who have demonstrated capacity, quality standards and commitment to best practice in plant material propagation (Clark 2003).</td>
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<tr>
<td>To ensure that stock supplied can be assessed for compliance with the quality specifications.</td>
<td>Tender for the supply of the required trees.</td>
</tr>
<tr>
<td>To ensure that tree stock supplied is true to species requirements and is a matched batch for avenue symmetry and tree habit.</td>
<td>Prepare a supply contract with the selected supplier or suppliers for the required quantity of tree stock at the nominated size and with supply dates.</td>
</tr>
<tr>
<td>To ensure quality of stock during the grow-on period and that stock meets quality standards required prior to planting.</td>
<td>The contract should contain a minimum of two witness points including inspection of stock immediately prior to dispatch to site.</td>
</tr>
</tbody>
</table>
| To ensure that all stock will have the best capacity for successful establishment. | Tree stock should comply with the above and below-ground and other requirements of ‘Specifying Trees: a guide to assessment of tree quality’ (Clark 2006.) Issues include: Above Ground
  - True to type
  - Clear labelling
  - Trunk form and taper |
<table>
<thead>
<tr>
<th>Tree canopy form and health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree condition</td>
</tr>
<tr>
<td>Grafting quality</td>
</tr>
</tbody>
</table>

**Below Ground**

- Root system development, dimensions and form
- Correlation of the root system to the trunk and soil surface.
### B.2 Tree Planting

#### B.2.1 Soil Testing and Improvement

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that soil conditions at the planting locations are suitable for establishing advanced stock and healthy growth.</td>
<td>Site soil testing should be carried out by a qualified soil scientist using a NATA accredited testing laboratory at the proposed tree planting locations. The soil test certificate should contain the date of testing and details of the types of test undertaken and their results, including cation analysis, pH values, salt content, and particle analysis.</td>
</tr>
<tr>
<td>To create site soil conditions that will sustain vigorous tree growth.</td>
<td>Incorporate the recommendations for soil improvements from the soil tests into the planting specification.</td>
</tr>
<tr>
<td>To ensure that soil conditions meet the recommended site soil improvements as applied by the contractor.</td>
<td>Record the date and actions taken for soil improvements.</td>
</tr>
</tbody>
</table>

#### B.2.3 Drainage

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that drainage works are carried out to avoid ponding and waterlogging in the vicinity of proposed tree planting locations, and to take advantage of passive irrigation opportunities.</td>
<td>Prepare a surface and subsurface drainage plan for proposed tree planting locations. Check drainage on site. Review any impacts to drainage patterns if there are changes to the road formation.</td>
</tr>
</tbody>
</table>

#### B.2.4 Site Preparation

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that site preparation work does not interfere with underground services.</td>
<td>Before any site preparation works or planting holes are dug, the location of underground services are to be determined.</td>
</tr>
<tr>
<td>To ensure that root growth of new trees is: • encouraged to grow parallel to fence lines • not impeded by competition from roots of existing trees.</td>
<td>Prepare the site by deep ripping to minimum 300mm depth in rows parallel to the fence line.</td>
</tr>
<tr>
<td>To ensure that construction activities and site management practices do not impact on the health of existing trees to be retained, or newly planted trees, or the soil around the trees.</td>
<td>No materials or equipment is to be stored within the vicinity of existing trees or on the location of new tree plantings, so that there are no spills, soil compaction or surface damage to tree locations.</td>
</tr>
</tbody>
</table>
### B.2.5 Planting Hole

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that planting holes provide suitable conditions for encouraging new root growth.</td>
<td>Excavate tree planting holes ensuring that the sides do not form a glazed surface that would impede root growth. Sides of the planting hole should be broken up. The planting hole for all new trees should be no less than two times the diameter of the root ball and no deeper than the root crown. Sides of the hole near the top should be tapered to better accommodate the horizontal growth pattern of the tree’s root system.</td>
</tr>
<tr>
<td>To ensure that underground services are not damaged when preparing planting holes.</td>
<td>All personnel working on the site should be made fully aware of the presence and location of underground services.</td>
</tr>
<tr>
<td>To ensure that competition from existing tree roots are minimised and new roots have adequate space to grow.</td>
<td>Install sections of root barrier between the newly planted trees and existing tees to minimise root competition from the existing tree roots and to encourage new planting roots to grow along the rip lines parallel to the fence line.</td>
</tr>
</tbody>
</table>

### B.2.6 Planting

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that adverse weather conditions do not impact on planting quality or plant stock health.</td>
<td>Do not carry out tree planting in adverse weather conditions, which include during and following, rain, strong winds and extended dry periods. When the tree is placed in the hole make the top of the root ball level with the natural ground surface in well drained locations. In poorly drained locations the top of the rootball should be 25mm above the surrounding ground surface. Compact any soil that has been placed under the root ball to position the root ball at the correct height to ensure no shrinkage occurs after the planting process has been completed.</td>
</tr>
</tbody>
</table>
### Objectives

**Recommendations**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that the tree will be self supporting.</td>
<td>The tree should be able to stand in a straight vertical position without support even in inclement weather.</td>
</tr>
<tr>
<td>To ensure initial watering of trees supports healthy growth.</td>
<td>Water each plant immediately after planting in a manner which does not disturb the soil backfill and mulch. Undertake watering at two day intervals until completion of all tree planting.</td>
</tr>
<tr>
<td>To recognise that trees are considered significant community assets.</td>
<td>Add and maintain information for each tree in Council’s asset inventory.</td>
</tr>
</tbody>
</table>

### B.2.7 Backfilling

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that the planting hole is backfilled with soil suitable for tree growth.</td>
<td>Use approved site soil with improvements carried out as recommended by the soil test reports for backfilling the planting hole. Do not use imported soil mix unless it conforms with AS4419. Lightly firm and water backfilling soil to eliminate any voids or air pockets and to ensure close contact with the trees root ball.</td>
</tr>
</tbody>
</table>

### B.2.8 Tree Protection Structures and Tying

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that a suitable protective structure is constructed around each tree.</td>
<td>Construct timber protection structures around each planted tree in accordance with the detail drawing shown in Appendix A.3 Tying should be loose to allow freedom of movement.</td>
</tr>
</tbody>
</table>

### B.2.9 Surface Mulching

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that weed growth is suppressed, soil moisture maintained and the potential for mechanical damage to trees caused by mowers and mechanical edge-trimmers around the base of newly planted trees is avoided.</td>
<td>Place specified surface mulch to a depth of 100mm around the base of newly planted trees within the area of the tree guard or to the specified radial distance from the trunk where the guard cannot be provided symmetrical. Keep mulch clear of the tree trunk. Do not place mulch on surfaces at the invert of a swale.</td>
</tr>
</tbody>
</table>
### B.2.10 Fertilising

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that fertiliser used is suitable for tree growth.</td>
<td>Carry out all fertilising in accordance with the recommendations of the soil test reports. Provide for approval of a sample of the fertiliser to be used with details of a chemical analysis and N:P:K ratio</td>
</tr>
</tbody>
</table>

### B.2.11 Pruning

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that pruning meets quality standards and is carried out by those with suitable qualifications.</td>
<td>Carry out all pruning work in accordance with AS 4373 ‘Pruning of Amenity Trees’. Only someone who is experienced in the approved pruning techniques and standards should be engaged for pruning work. Limit pruning at installation to removal of broken and damaged branches only.</td>
</tr>
</tbody>
</table>

### B.2.12 Site Clean Up

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that the site is left in a clean and tidy manner and that no materials are left that could impact on the health of the trees.</td>
<td>Remove all soil, debris, rubble etc from the site and dispose according to the specification. Sweep the roadway and shoulders clean of clay and soil.</td>
</tr>
</tbody>
</table>

### B.2.13 Sign Off Witness Points

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| To ensure that all stages from tree supply to installation of tree planting works is carried out to satisfactory standards. | Include the following sign off witness points:  
  - Inspection of tree stock in nursery prior to delivery to site  
  - At completion of tree planting hole excavation  
  - Inspection of tree after installation, including mulching & tree protection structure. |
## B.3 Maintenance

### B.3.1 Establishment Period

The following objectives and recommendations will ensure that planted trees are adequately maintained during the first 2 years.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| To ensure effectiveness of maintenance. | Make regular inspections at periods not exceeding fourteen (14) days for the first 3 months after planting, then every two months minimum for the remaining establishment and maintenance period. Record:  
  - date of visit  
  - maintenance works completed  
  - maintenance works in progress  
  - maintenance works required  
  - details of damaged, dead or missing trees including their locations  
  - any damage to the new tree planting  
  A qualified Arborist to carry out the inspection program as determined by Palerang Council (including planted and original trees) and prepare a report on the condition of the trees and recommend any remedial works or removals. |
| To encourage and maintain healthy growth during the maintenance period. | Obtain water applied to plants from a source that does not contain toxins or pollutants or any substance which would adversely affect the growth of any of the planted trees.  
A watering regime based on the season, tree size, health and surrounding conditions must be included in the maintenance program.  
Where trees show evidence of nutrient deficiency, obtain a soil analysis and report prepared by a soil scientist to identify the deficiency and provide remedies.  
If soil analysis recommends the application of fertiliser, provide a sample of the fertiliser together with a chemical analysis for approval before use. |
| To suppress weeds from the base of trees. | Maintain mulch to the specified depths and areas. |
| To ensure that a suitable protective structure is maintained around each tree. | Inspect and repair any damaged or loose sections of the tree protection structure.  
Loosen ties, if used, to avoid bark damage as tree grows. |
| To ensure that pruning meets the quality standards and is carried out by those with suitable qualifications. | Carry out all pruning work in accordance with AS 4373 ‘Pruning of Amenity Trees’.  
Only someone who is experienced in pruning techniques should be engaged for pruning work. |
B.3.2 Post Establishment Period

To ensure that planted trees are adequately maintained in the post establishment period, the following objectives and recommendations are proposed.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early detection of structural defects or poor health and follow up with</td>
<td>Inspect the planted trees every twelve months (minimum) and maintain a</td>
</tr>
<tr>
<td>appropriate remedial treatment.</td>
<td>written report for each inspection detailing:</td>
</tr>
<tr>
<td></td>
<td>• date works completed, including</td>
</tr>
<tr>
<td></td>
<td>• mulching</td>
</tr>
<tr>
<td></td>
<td>• fertilizing</td>
</tr>
<tr>
<td></td>
<td>• pruning</td>
</tr>
<tr>
<td></td>
<td>Where trees show evidence of nutrient deficiency, a soil analysis and report</td>
</tr>
<tr>
<td></td>
<td>should be prepared by a soil scientist to identify the deficiency and provide</td>
</tr>
<tr>
<td></td>
<td>remedies.</td>
</tr>
<tr>
<td></td>
<td>Carry out all pruning work in accordance with AS 4373 ‘Pruning of Amenity</td>
</tr>
<tr>
<td></td>
<td>Trees’.</td>
</tr>
<tr>
<td>To ensure that trees receive adequate water for optimum growth.</td>
<td>Arrangements should be made for trees to be watered during periods of extended</td>
</tr>
<tr>
<td></td>
<td>low rainfall.</td>
</tr>
<tr>
<td>To ensure that grass mowing avoids damage to planted and existing trees.</td>
<td>Where trees are not protected by stakes or structures, a minimum distance of 1</td>
</tr>
<tr>
<td></td>
<td>metre from the base of the tree should not be mown.</td>
</tr>
<tr>
<td></td>
<td>Instruct mower operators as part of induction training about the no-mow zone</td>
</tr>
<tr>
<td></td>
<td>around trees.</td>
</tr>
<tr>
<td></td>
<td>If damage does occur to trees appropriate treatment works should be carried</td>
</tr>
<tr>
<td></td>
<td>out.</td>
</tr>
</tbody>
</table>
APPENDIX C – References


Australian Standard AS4419, 2003, Soils for Landscaping and Garden Use

Australian Standard AS4970, 2009, Protection of Trees on Building Site


Ellis, NN and NM, 1989, Braidwood, Dear Braidwood

Larmer, J., Survey of the Village of Braidwood 1839, NSW Archives Office

RTA QA Specification RS179 Landscape Planting

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NSW Environment & Heritage, Braidwood and its setting, p. 30