

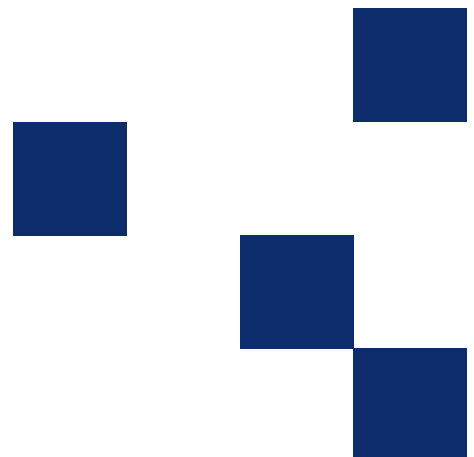
# **TREE MANAGEMENT PLAN**

## **Kings Highway Braidwood**

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# TREE MANAGEMENT PLAN

## Kings Highway Approaches to Braidwood, NSW

Prepared for



By







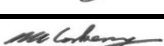



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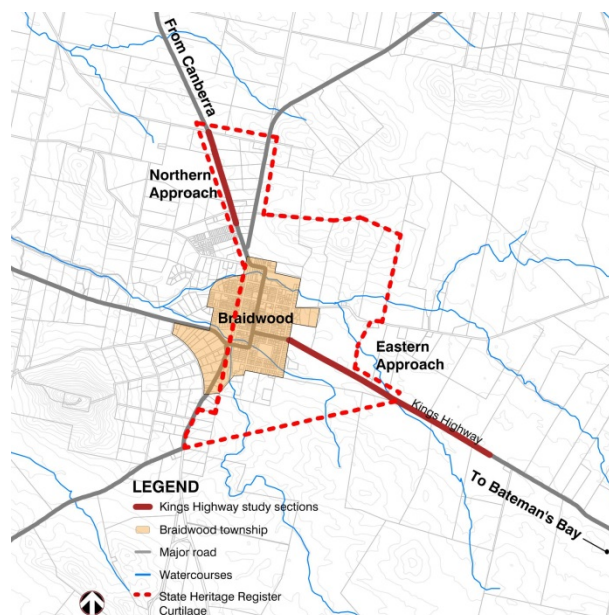
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# 1.0 Introduction

In response to a series of motor vehicle crashes along sections of the Kings Highway near Braidwood, Roads and Maritime Services has carried out investigations to review the road safety issues in this area. As a result, a number of solutions are being considered to improve road safety including the management of the individual trees which make up the avenues on either side of Braidwood. In determining the road safety work, Roads and Maritime Services acknowledges the heritage significance and community values associated with the existing roadside trees. Roads and Maritime Services is not only committed to the management of the existing trees within the avenues, but also to the establishment of new road side trees that will replace the existing avenues as they decline and eventually reach the end of their life cycle.

This Tree Management Plan (TMP) provides guidelines for the long term management, maintenance and eventual replacement of the avenue of 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. The TMP includes technical recommendations for managing the existing trees that make up the avenues, as well as new replacement plantings.



**Figure 1: Study area for the Tree Management Plan**

Outcomes from community consultation, which included a series of meetings and workshops together with submissions on a draft TMP, have been taken into account in preparing this TMP. 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 TMP 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 trees arranged in a similar layout as the existing trees and 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). The boundary of the listing includes the Kings Highway approaches to Braidwood and any works within that boundary require approval of the Heritage Council or a prior exemption from such approval. The heritage listing makes the following references to the roadside trees along 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’) that are interspersed with Lombardy Poplars (*Populus nigra* ‘Italica’) on the outer northern approach and a short avenue of Pin Oaks (*Quercus palustris*) planted at the entrance to Braidwood township. There is also a prominent row of large mature pine trees set back from the road corridor within the adjoining showground (**Refer Figure 2**).

The Golden Poplar trees are arranged in a pattern of alternating pairs at a spacing of approximately 18-20 metres and growing in grass verges with the distance from the edge of the road travel lane varying from approximately two and a half to five metres. For a distance of about 250 metres 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 (going through a period of decline) and their replacement should be planned to occur in batches along identifiable sections of highway, rather than as individual tree plantings.

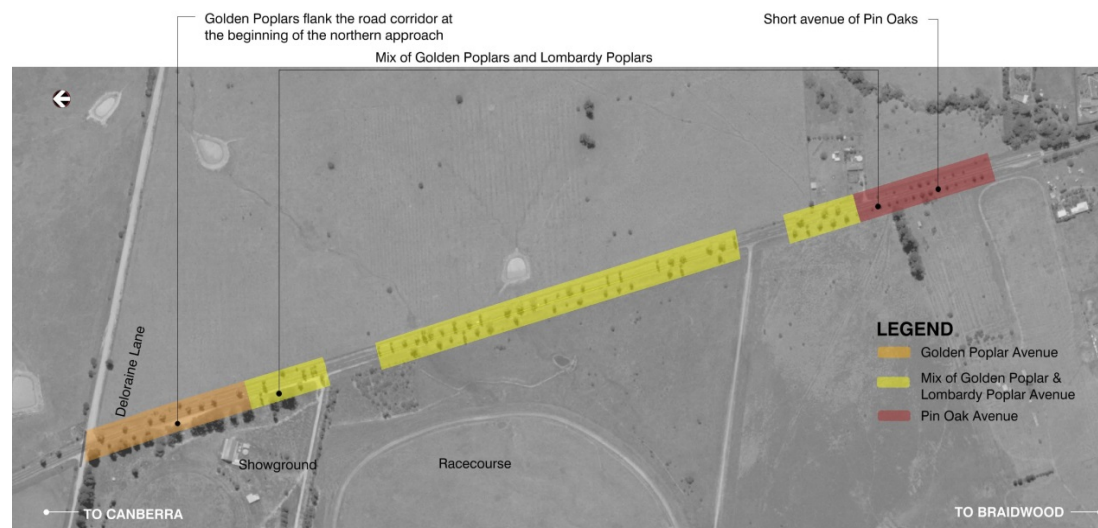
The short avenue of Pin Oaks (*Quercus palustris*) was planted in 1984 as a gift to the community from the local Garden Club. These trees are planted at a spacing of approximately 11-13 metres in a pattern of opposite pairs. They are aligned along the edge of grass swales (low areas that may collect water) on both sides of the highway, approximately three and a half metres from the edge of the travel lane.

The road corridor along the eastern approach to Braidwood is narrower than the northern approach with the boundary fence located closer to the highway. 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

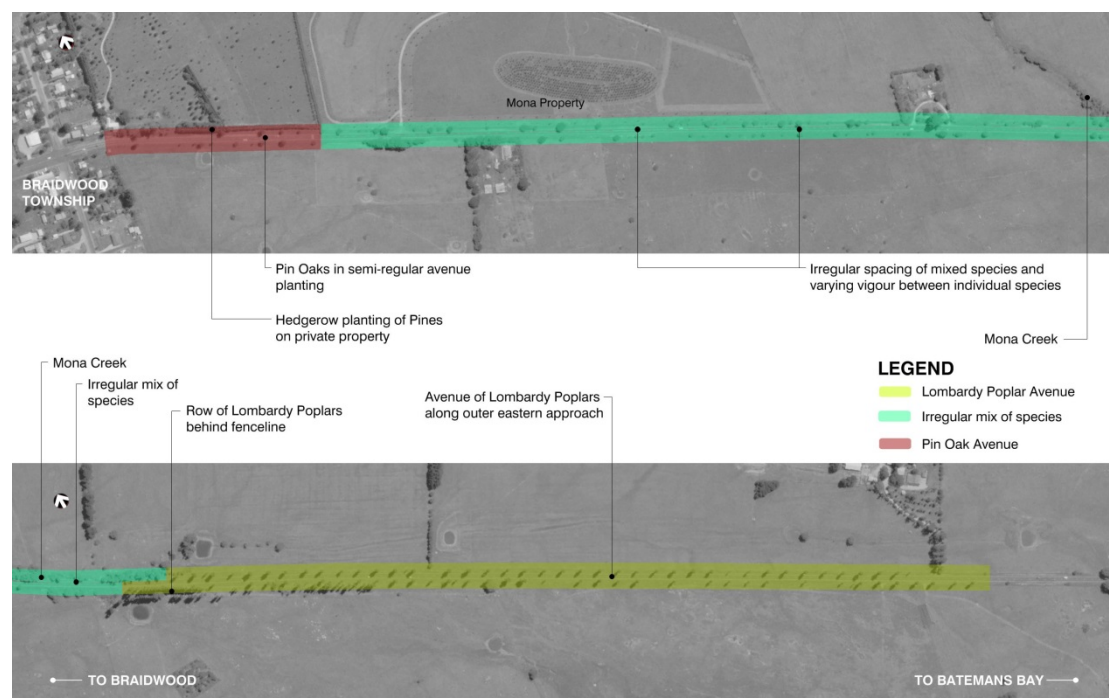


30 metre spacing. These trees are generally located between three to five metres from the edge of the road travel lane of the highway (**Refer Figure 3**).

Trees planted along the remainder of the eastern approach to Braidwood are fragmented and include a variety of species planted at irregular spacing with many large gaps between them.



**Figure 2: Location of existing trees on the Kings Highway northern approach to Braidwood**



**Figure 3: Location of existing trees along the eastern approach to Braidwood: Closer to town (top), outer eastern section (bottom)**

## 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 and strategy for replacement planting and avenue realignment over the longer term as the existing trees within the avenues reach the end of their life cycle.
- Provide guidance for ongoing maintenance of the existing trees within the avenues as well as newly planted replacement trees.
- Consider road safety and operational requirements while implementing the design.

## 4.0 Principles and guidelines

### 4.1 Consistency with road safety

Apart from the exceptions below, new trees will only be planted outside defined clear zones in order to meet road safety standards. Clear zones are based on several conditions and are defined in Austroads guides and Roads and Maritime Services supplements available on the Roads and Maritime Services web site (<http://www.rms.nsw.gov.au>).

The only sections of highway near Braidwood, where Roads and Maritime Services is considering the planting of trees within the clear zone are described below.

Recognising the cultural and heritage significance of the avenues of trees along the approaches to Braidwood, Roads and Maritime Services is committed to maintaining avenues and 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 100 metres north of Station Street (which is a distance of 1.3 kms), subject to trees being planted at least five and a half metres from the edge of the travel lane.
2. The location of the existing avenue of Lombardy Poplars about two – three kms east of Braidwood (which is a distance of 1.2 kms) subject to trees being planted at least five and a half metres from the edge of the travel lane. New trees would be contained between existing property accesses.
3. Just east of Monkitee Street on the south side of the highway extending for a distance of 300 metres west of a point 400 metres east of Monkitee Street, subject to trees being planted at least five and a half metres from the edge of the travel lane.

The general strategy is to plant new trees as close as possible to the highway to maximise the avenue character while being set back far enough to meet road safety requirements and allow adequate offsets to safety barriers.

Implementation of road safety work 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 will therefore need to be planned and implemented in a way that does not damage the existing trees or the growing conditions required to sustain them.

The scope of this TMP covers the long term management of roadside trees and it does not include details of road safety treatments proposed by Roads and Maritime Services. A companion document to be prepared by Roads and Maritime Services will provide details of the proposed short term road safety treatments taking account of this TMP. Such treatments will include the installation of safety barriers.

## 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 TMP is to maintain the landscape character of the tree avenues by implementing a program of planting in the near future that will form replacement trees to maintain the avenues when existing trees reach the end of their life cycle or need to be removed.

The new sections of tree avenues to be planted will comprise tree stock of the same species and of similar age and size (relative to each other) in an arrangement that replicates as much as possible the existing avenue character. This will require inter-planting that is offset from existing trees within the avenues so that the planted trees have adequate space to grow to sufficient height before the existing trees need to be removed.

The alignment of the new avenues has also taken account of adjacent infrastructure that may prevent a satisfactory length of avenue, adequate spacing or lateral placement of trees in relation to the highway. Opportunities to continue lineal plantings of trees that are not affected by overhead or underground services, property accesses or other infrastructure must be considered when each planting event takes place. Details of how the tree avenue structure is to be retained are described below.

Along the northern approach to Braidwood, the tree avenue structure is to be retained 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 a staggered arrangement at 18 metre spacing along both sides of the northern approach, except where this is prevented by overhead powerlines along the eastern side of the highway immediately north of the township boundary. (refer Appendix A – Concept Sketches, Plans A, B & C and Sections AA, BB & CC)
- Planting new trees at a minimum distance of five and a half metres from the edge of the travel lane, which will increase the width of the tree avenue to some extent while still maintaining the avenue character. (refer Appendix A – Concept Sketches, Plans A & B and Sections AA & BB)
- Removal of existing trees after the new trees are established and have attained an acceptable form and size as determined by Palerang Council in consultation with Roads and Maritime Services.

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

- On the outer eastern approach, planting single species of fastigiated (tall and slim) trees similar in form to the existing Lombardy Poplars (*Populus nigra* 'Italica'), in rows of symmetrical opposite pairs at 30 metre spacing and five and a half metres from the travel lane of the highway to create a new avenue of trees. (refer Appendix A – Concept Sketches, Plan E and Section EE)
- The existing trees in this location would be removed after the new avenue trees have attained an acceptable form and height as determined by Palerang Council in consultation with Roads and Maritime Services.
- Along the southern edge of the highway within the urban speed zone at the eastern edge of Braidwood a single row of ornamental Pears (*Pyrus calleryana* 'Chanticleer') is to be planted at 12 metre spacing, five and a half metres from the travel lane. This row of planted trees will form an avenue with the existing row of evergreen trees growing in private property along the northern edge of the road corridor. (refer Appendix A – Concept Sketches, Plan D and Section DD)
- Along the section of highway immediately east of the proposed row of ornamental Pears there is no existing avenue of trees. Consequently it is not intended to plant new trees to form an avenue in this location. Long distance views to the south from the highway are to be maintained while existing rows of ornamental trees planted inside the adjoining private property immediately north of the road corridor will form a distinctive edge to this section of the highway as those trees mature.

### 4.3 Tree species selection

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

- Suitability to climate, microclimate and soils (which are generally low fertility soils derived from Braidwood granites).
- Longevity of the species growing in the difficult conditions prevailing along the highway corridor.
- Suitable scale and form which does not require a higher level of maintenance than the existing tree species.
- Low susceptibility to damage by pests and disease.

In situations where existing tree species are satisfying these 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 of damage from disease or pests and therefore species and cultivars have been selected that are relatively resistant to known diseases and pests in the area.

The scale, canopy shape and density of the existing avenue trees along the Kings Highway at Braidwood accentuate the sense of place. Consequently the selection of species to be used for replacement planting aims to ensure they have comparable scale and canopy density, and that views from the highway to the adjoining rural landscape are maintained even as the tree canopies grow and mature.

The selection of tree species and cultivars aims to ensure that 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, including existing roadside trees, have all been considered in the species selection. Operational conditions and requirements have also been taken in to account in the tree species selection to minimise risks associated with branch drop, potential for suckering and avoiding the need for pruning or crown lifting to maintain clearances from moving vehicles, sightlines and overhead utilities. Species that cause damage to roadside infrastructure or hinder normal road operation due to inappropriate form have been avoided.

Some of the planted trees that are currently growing along the Braidwood section of the Kings Highway do not meet all of the above criteria. For example the particular cultivar of Lombardy Poplars forming the avenue along the eastern approach to Braidwood regularly produces suckers. The Pin Oaks planted along the northern approach to Braidwood have a spreading canopy habit that requires regular pruning of branches to maintain clearance to the highway carriageways. In addition the Pin Oaks planted along the eastern edge of the highway in this location are within the clearance zone of the existing overhead power lines that run along the edge of the highway corridor. Consequently these trees will need to be removed but the row of Golden Poplar trees along the western side of the highway will be extended to the south to replace the Pin Oaks in that location.

### **Northern approach**

The existing Golden Poplar *Populus x canadensis* 'Serotina Aurea' is the proposed species to be planted along the northern approach to Braidwood. Key characteristics 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 Kings Highway environment at Braidwood. 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 Golden Poplar 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 foliage that colours early in autumn.

The relatively broad crown and low branching habit of the existing Pin Oaks planted close to the highway will create a vehicle hazard unless they are pruned. They will also require severe pruning to maintain clearance from existing overhead powerlines along the eastern edge of the highway reserve. The resulting canopy shape will prevent the Pin Oaks from achieving an avenue character comparable to the Golden Poplars.

### **Eastern approach**

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

Key aspects of the proposed Lombardy Poplar cultivar include:

- Cultural Values: The Lombardy Poplar is already present and using a similar cultivar for the replacement planting will ensure continuity of the avenue character created by the existing trees, which is valued by members of the local community.
- Suitable Form: The Lombardy Poplar has a distinctive tall (approximately 20-22 metres high) and narrow vertical form (approximately four metres wide) that frames views to the landscape from the highway 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 of Kings Highway to Braidwood.
- Hardiness: The species tolerates poor soil conditions and has adapted well to the harsh climatic conditions of the Kings Highway environment at Braidwood.
- Reduced Maintenance: Grafting onto rootstock that has minimal-suckering habit will minimise the potential for the new trees to sucker.

A species of ornamental Pear (*Pyrus calleryana* 'Chanticleer') is proposed for planting along the southern side of the highway corridor within the urban speed zone at the eastern entry to Braidwood township. This species grows to a height of approximately 11 metres with a similar fastigate 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, which will contrast with the dark green evergreen canopy of the existing dense row of cypress pine trees growing along the northern edge of the highway within adjoining private property. It is a smaller scale tree than the Lombardy Poplars, which makes it comparable to street trees within the adjoining portion of Braidwood township.

## **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 will be propagated from cuttings taken from selected trees growing along the northern approach to Braidwood. These cuttings will 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 considered, would be to procure the planting stock from nurseries. However, initial investigations indicated 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 adopted.

Production of 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 same species are reliably available from specialist nurseries.

Trees to be supplied for establishment of new avenues will need to be uniform in size and form. Tree stock to be used for each stage of planting should be supplied from a single propagation batch. Propagation batches should only be split if there will be a long period between stages of the planting works that would make it impractical to hold and manage tree stock from a single batch in the nursery.

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 costs of transport and planting are reasonable. This will also allow the trees to be grown to adequate height and to develop good structure above and below ground to meet the specified quality requirements.

- The indicative height of a 100 litre (container grown) tree should be two and a half to three and a half metres and a 150 litre tree should be three to four metres depending on the species.
- Planting trees from 100 -150 litre will require 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 is 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 new 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 the existing soil conditions and identify the physical and chemical improvements required to allow successful establishment of the planted trees. These soil improvements will ensure the planted trees achieve the optimum growth rate and habit for the species in this location.

Good surface and subsoil drainage will be 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 will be required to ensure tree growth achieves the required visual and structural integrity of the avenue appearance. To achieve this outcome each tree planting location must be verified on site so that the relevant recommendations of this TMP determined and implemented.

Information about all tree planting that is carried out must be provided to Palerang Council for inclusion in 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 suitably qualified and experienced people with the required resources. An arborist should provide expert advice on pruning and other works that are required 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 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 tree avenue landscape character. A program of regular inspections and removal of suckers and wild seedlings 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 highway.
- **Work in vicinity of existing trees**

All existing avenue trees that are to be retained must be protected throughout the duration of any other works occurring within the predicted mature drip line or the vicinity of those trees. The terms, principles and requirements for protecting trees that are detailed in AS4970-2009 are to be applied where appropriate. Further protection or other site management requirements must be described in the works specifications.

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 corridor in order to avoid or minimise damage. Measures include careful consideration of species selection, soil type, planting technique, available root space and the need for root control.

Infrastructure located on land that is not under the control of Roads and Maritime Services or Palerang Council 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 requirements on such adjacent land. Liaison between infrastructure managers and arborists is essential to ensure damage to infrastructure is prevented.

- **Pest and disease control**

The monitoring and control of pests and diseases should include the following actions by Council:

- Regular inspections
- Assessment of the nature and significance of damage
- Implementing necessary remedial action as soon as possible, 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 the best approach is to minimise harm. It is recommended that Palerang Council seek to develop relationships with surrounding councils 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 engagement**

There is opportunity to involve community members, including land owners adjoining the highway, in the implementation of this TMP while taking account of workplace health and safety issues. Palerang Council will consider the extent and timing for ongoing community engagement and involvement of community members. Such involvement may involve tree management activities in situations where safety requirements can be met.

The owners of properties adjoining the Kings Highway in which hedgerows and other roadside trees are growing should be consulted by Palerang 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 Kings Highway at Braidwood.

## 4.8 Tree removal

The timing and extent of tree removal, which may be whole or partial, needs to be determined through consultation with all stakeholders to ensure that all relevant factors are considered. 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 the extent to which the tree avenue character is perceived by road users and the local 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 suitable the environment is to the health of the trees. The life span of the avenue trees may 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 that period an arborist may be required to determine whether an individual tree can be safely retained as part of the avenue. Removal of all or part of trees therefore at some time becomes a necessary and a regular requirement of tree management.

Planning the removal of existing trees needs to be coordinated with a program of replacement tree planting. The assessment of the health of individual trees and their suitability to be safely kept needs to be carried out by a qualified arboriculturist in accordance to a programme of tree inspections to be coordinated by Palerang Council.

In order to maintain the tree avenue structure, original trees will be removed in groups after the new avenue trees are established along substantial sections of the highway and have attained an acceptable form and height as determined by Palerang Council in consultation with Roads and Maritime Services. It is recommended that newly planted trees reach a minimum height of five metres before the existing trees that they are replacing are removed. This minimum height can be expected to be reached within about five years if the new trees are planted when they are two to three metres high. A decision on the timing and procedure for removal of the existing avenue trees should be made through consultation between Palerang Council, community representatives and Roads and Maritime Services. In making this decision, account will need to be taken of possible competition for water and nutrients between the existing and new trees. A key consideration will be the extent to which the new trees create the appearance of an avenue, particularly when viewed by motorists travelling along the highway.

## 4.9 Implementation program

Effective implementation of this TMP will need to take place over a number of years and requires the ongoing firm commitment of stakeholders and allocation of necessary resources. Key stakeholders include Roads and Maritime Services, Palerang Council, 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 work. Roads and Maritime Services 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.

### Roads and Maritime Services

- Implementation of road safety improvements together with the initial stages of this TMP, including:
  - tree procurement
  - planting
  - establishment
- Implementation of a tree stock propagation program.
- Consultation with Palerang Council, adjoining property owners and community groups.

### Palerang Council

- Ongoing maintenance and implementation of this TMP.
- Ongoing community engagement and consultation following road safety improvements and initial stages of this TMP.
- 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.

### Community groups

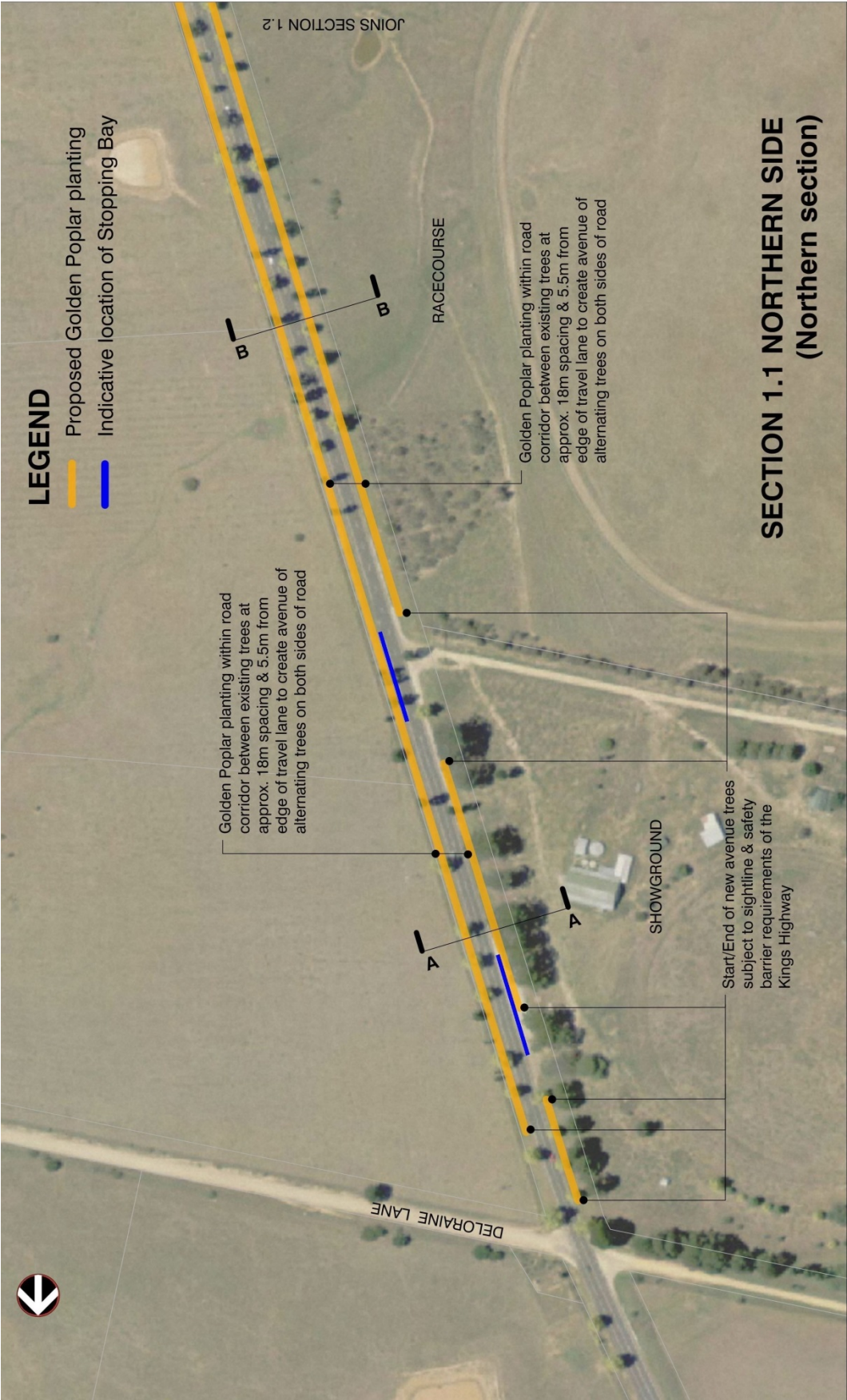
- Involvement with Council and Roads and Maritime Services in relation to the initial tree planting program and providing information about the condition of planted trees.
- Potential involvement in tree management within private properties adjoining Kings Highway approaches to Braidwood.

# **APPENDIX A – Concept sketches**

## **A.1 Proposed long term concept**

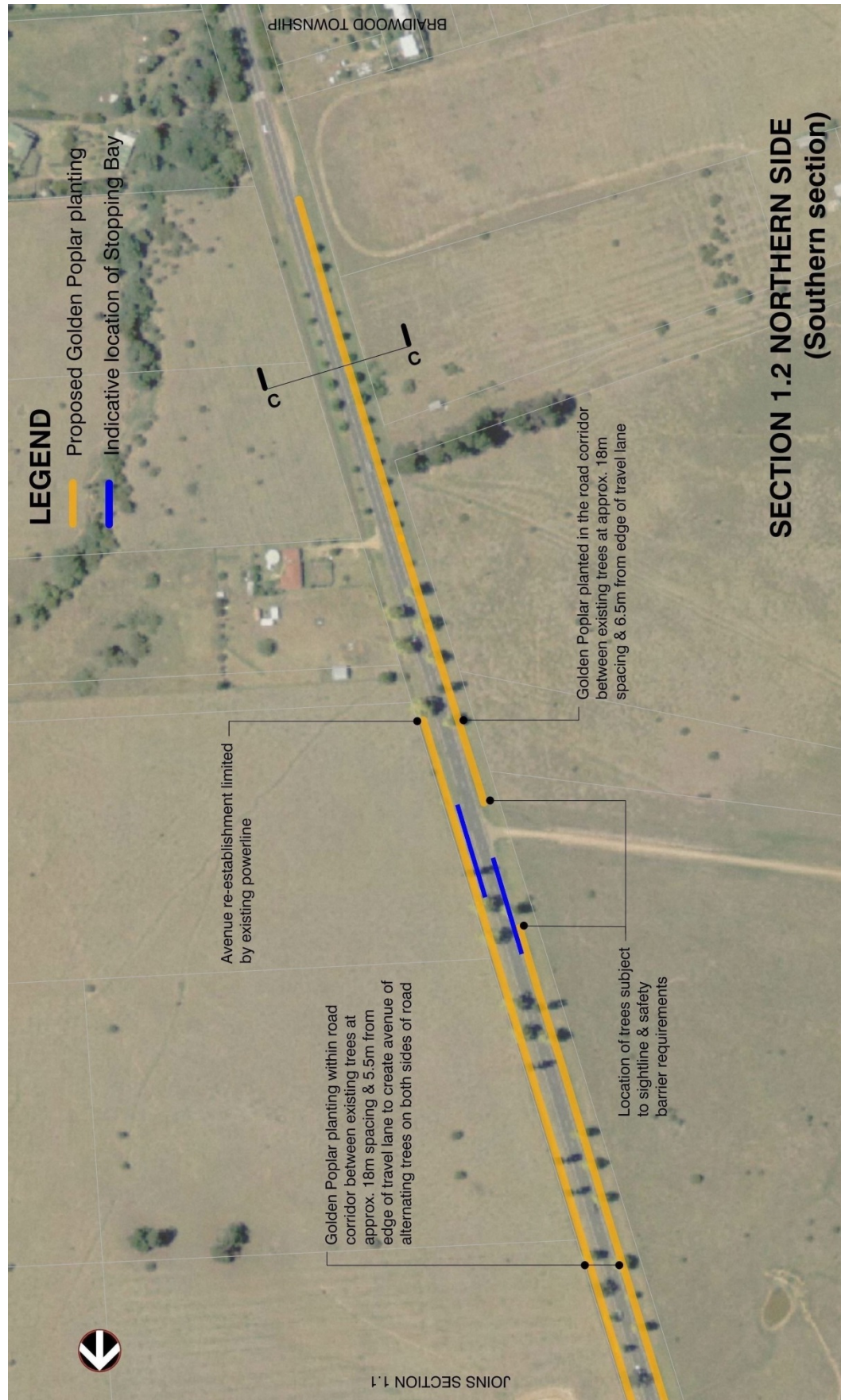
- Section 1.1 Northern side (Northern section)
- Section 1.2 Northern side (Southern section)
- Section 2.1 Eastern side (Immediately east of town)
- Section 2.2 Eastern side (West of Mona Creek)
- Section 2.3 Eastern side (East of Mona Creek)
- Section 2.4 Eastern side (Far eastern section)

A.1.1 Section 1.1 Northern side (Northern section)



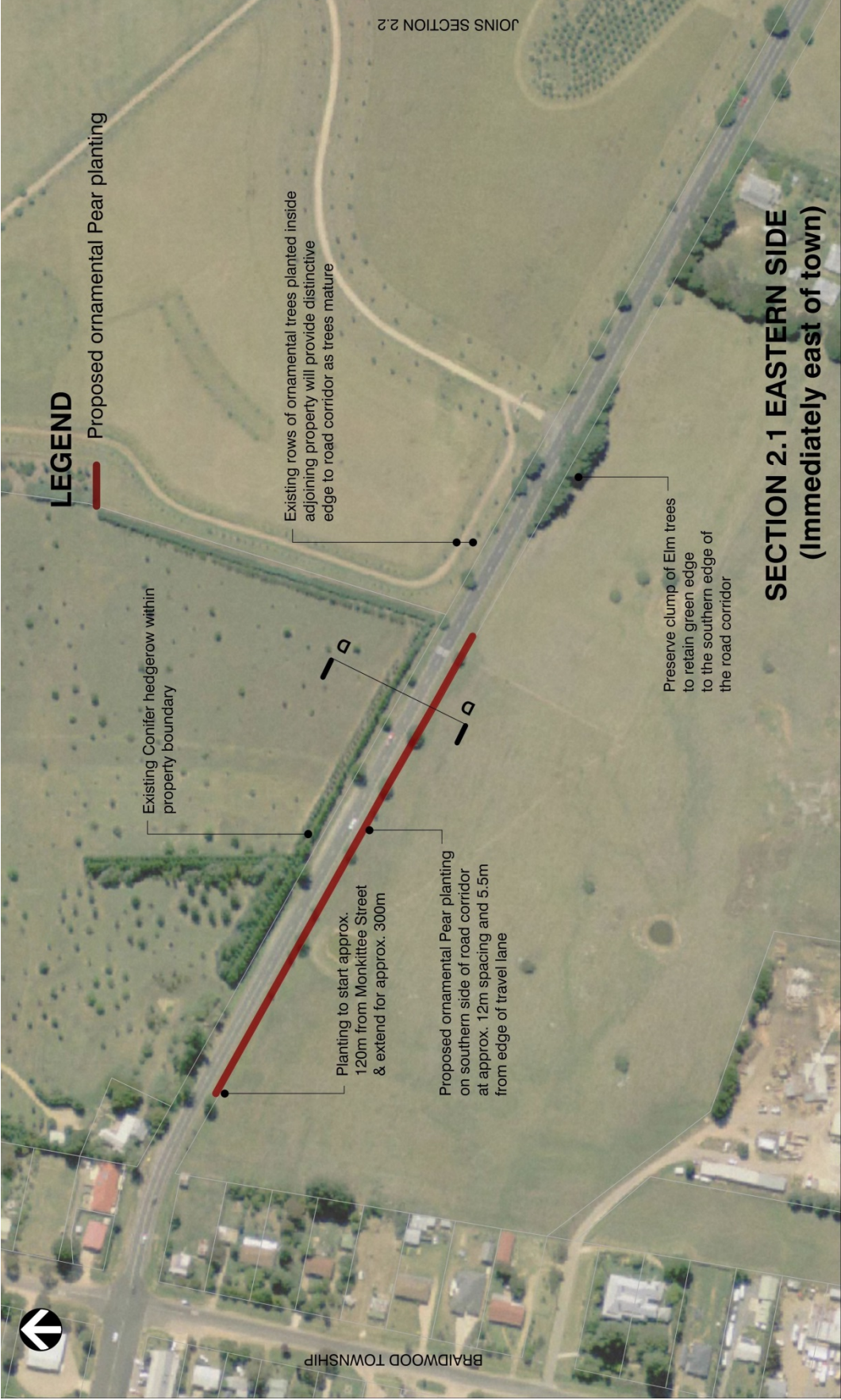


## A.1.2 Section 1.2 Northern side (Southern section)

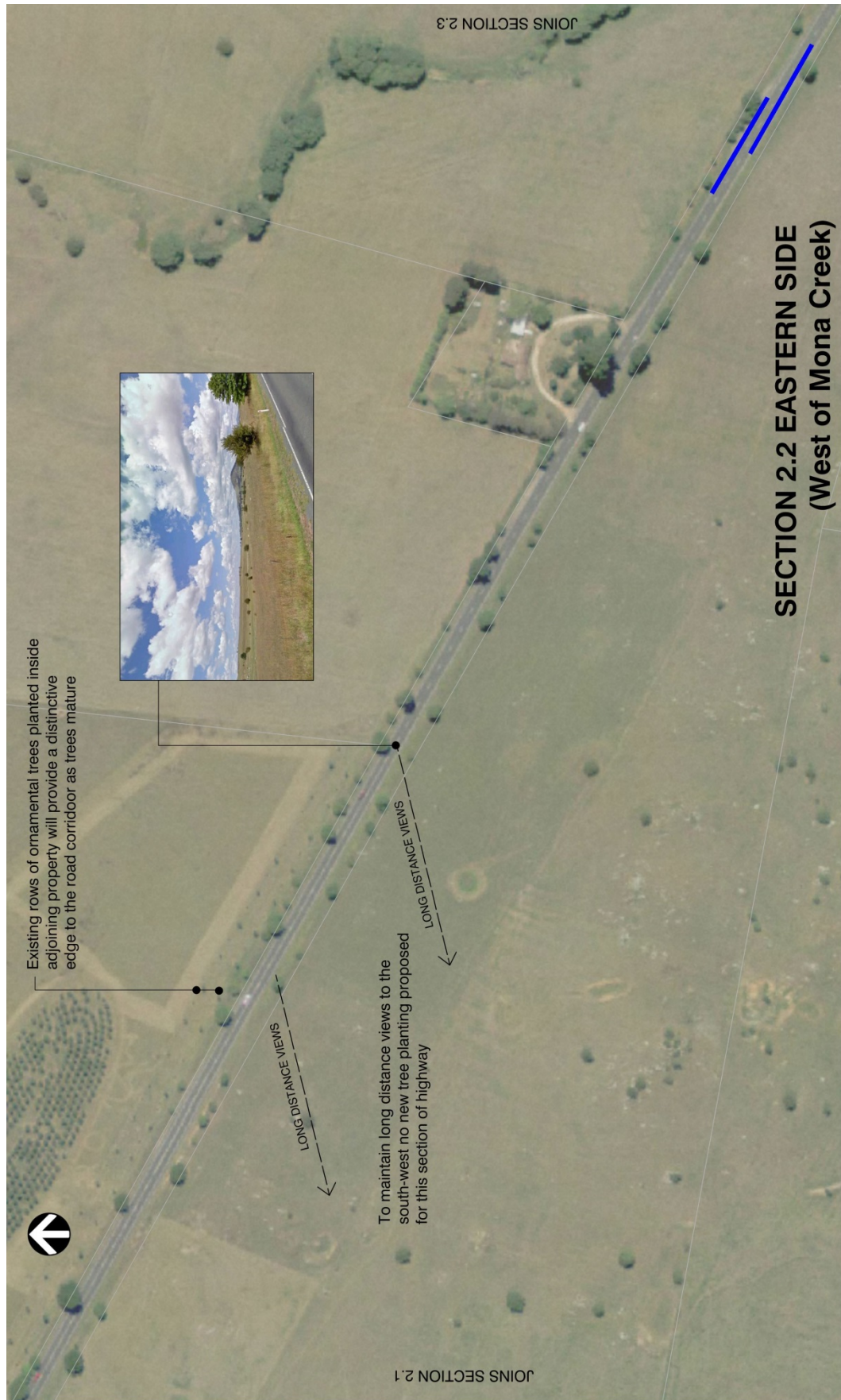




A.1.3 Section 2.1 Eastern side (Immediately east of town)

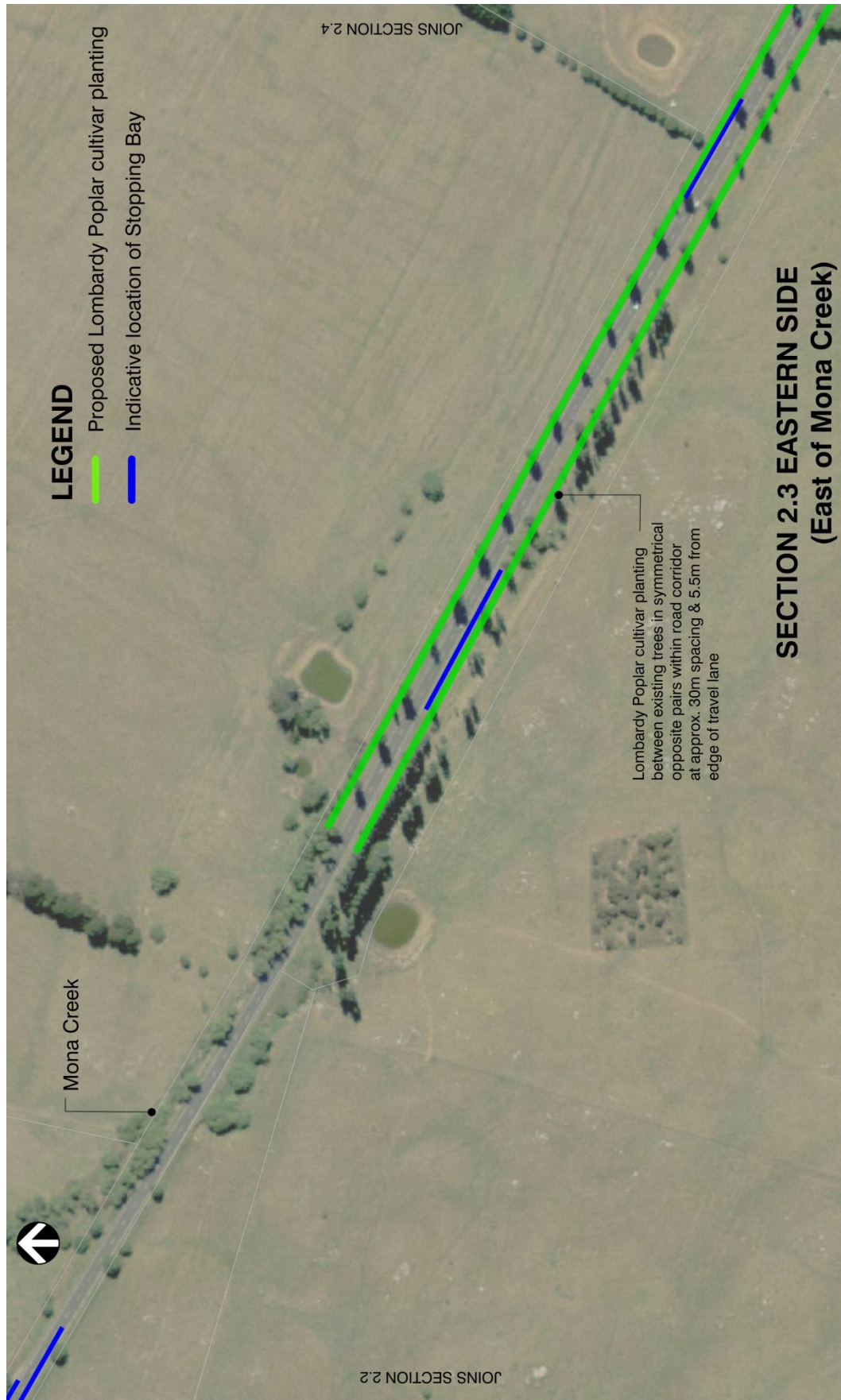


#### A.1.4 Section 2.2 Eastern side (West of Mona Creek)

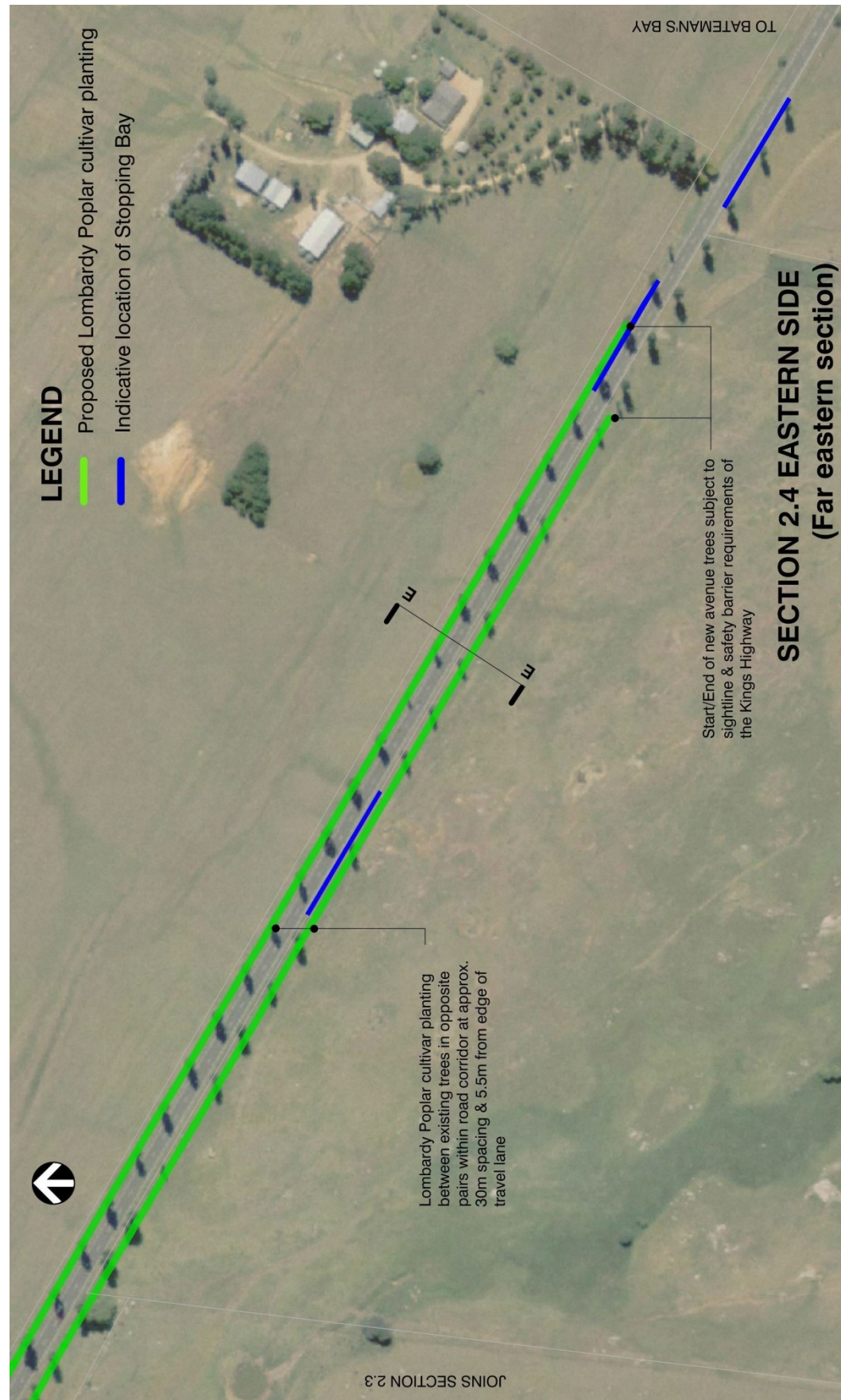




## A.1.5 Section 2.3 Eastern side (East of Mona Creek)



### A.1.6 Section 2.4 Eastern side (Far eastern section)



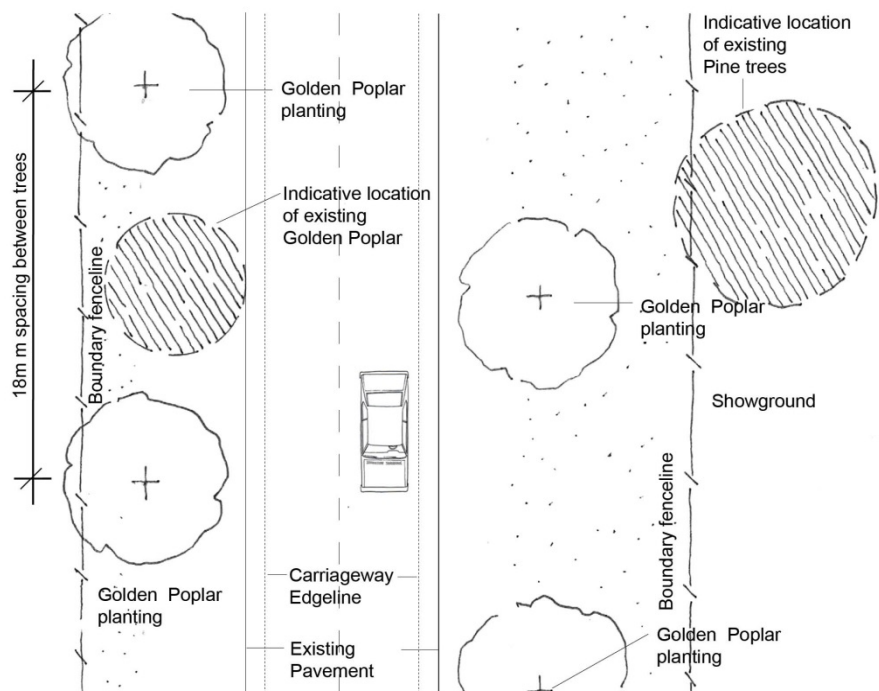
## **A.2 Typical layout**

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



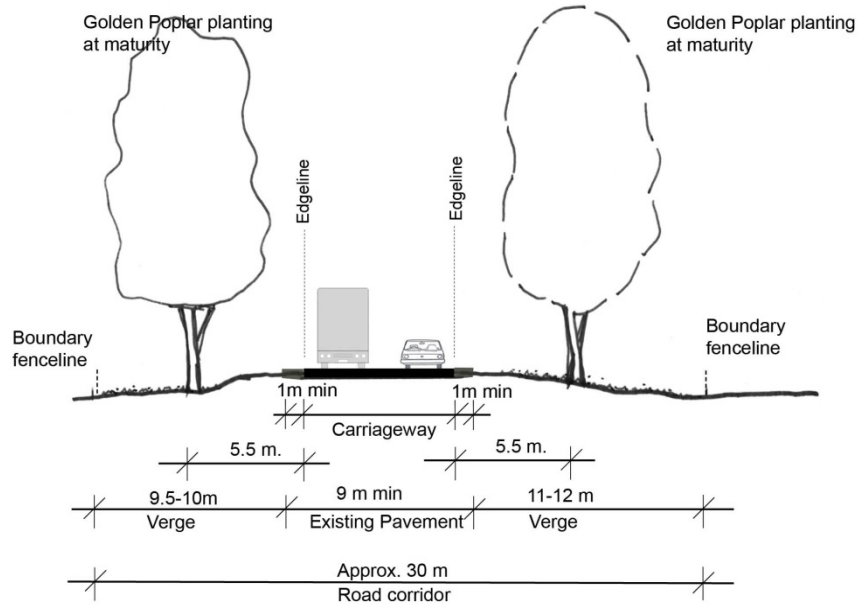
## Kings Highway Braidwood Roadside Tree Management Plan

TYPICAL PLAN A

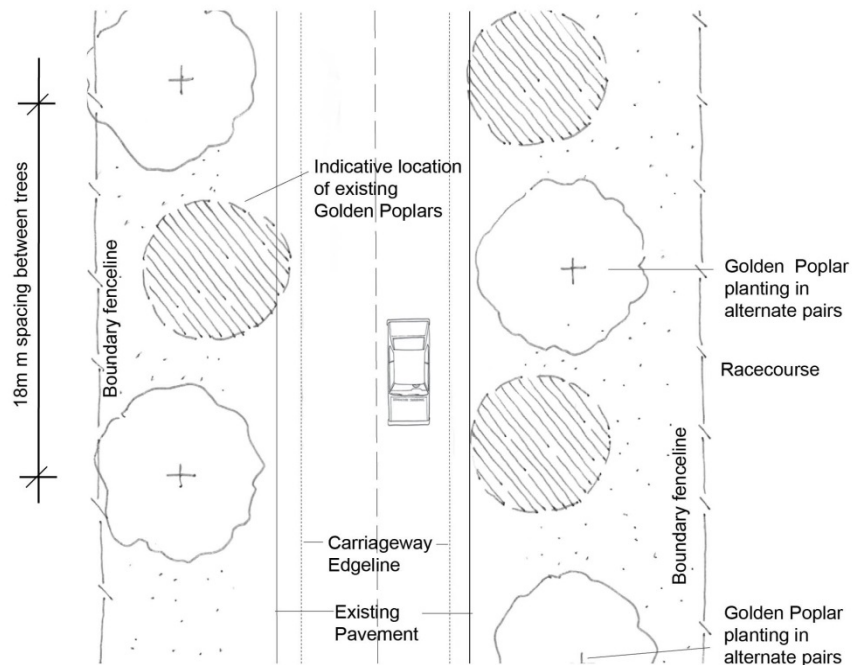


## A.2.2 Plan B & Section BB Northern side (At Racecourse)

TYPICAL CROSS SECTION BB

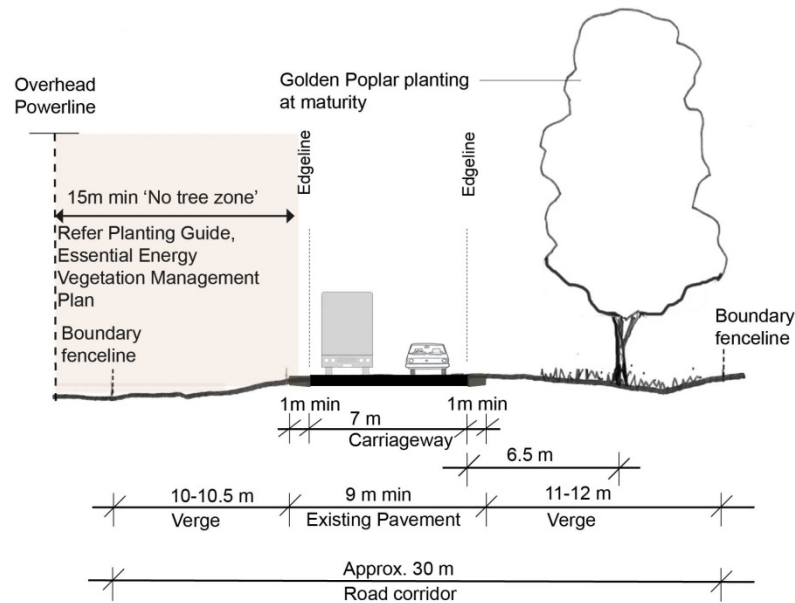


TYPICAL PLAN B

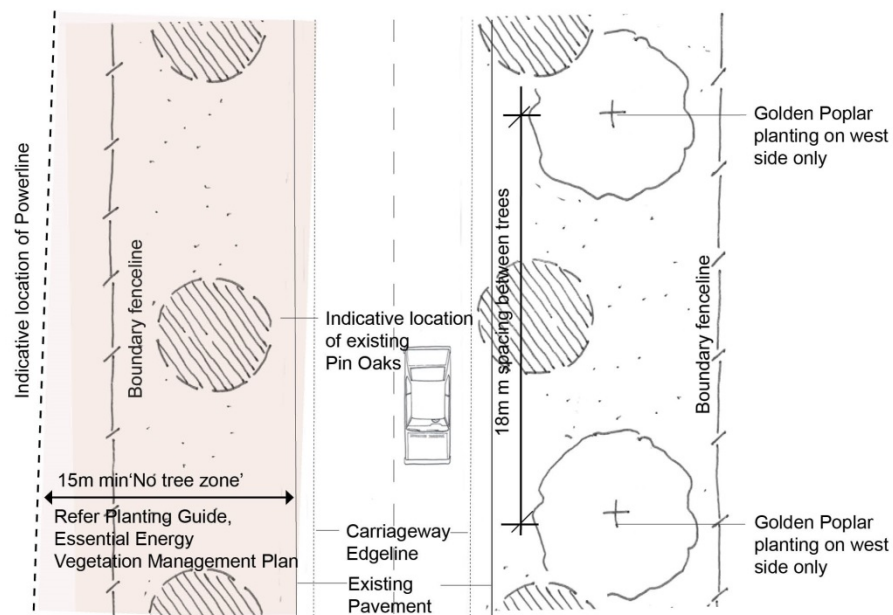


## A.2.3 Plan C & Section CC Northern side (Southern section)

TYPICAL CROSS SECTION CC

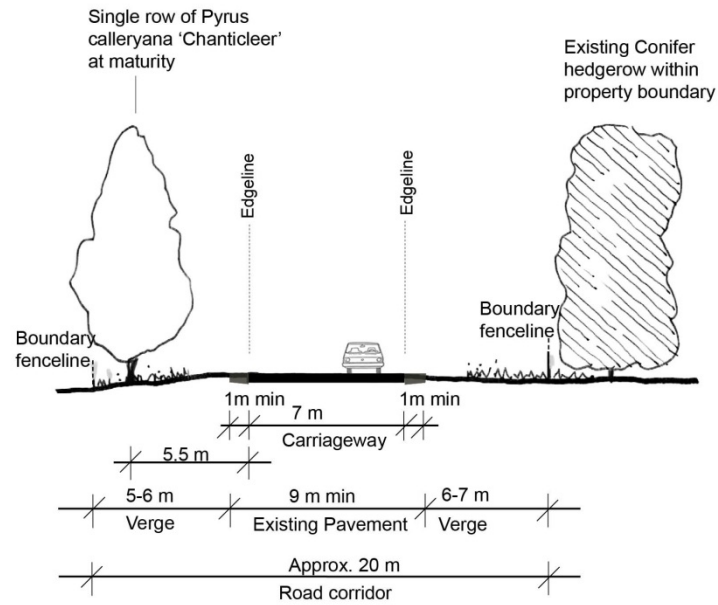


TYPICAL PLAN C

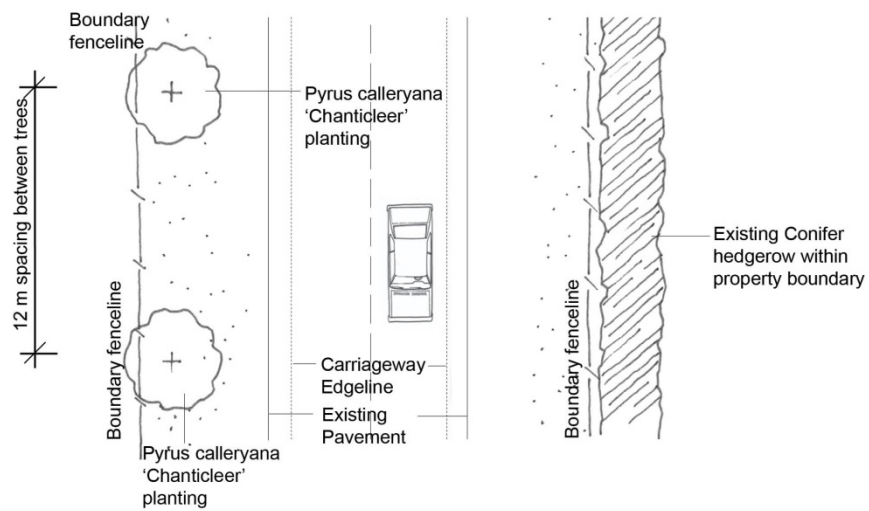


## A.2.4 Plan D & Section DD Eastern side (Western section)

TYPICAL CROSS SECTION DD

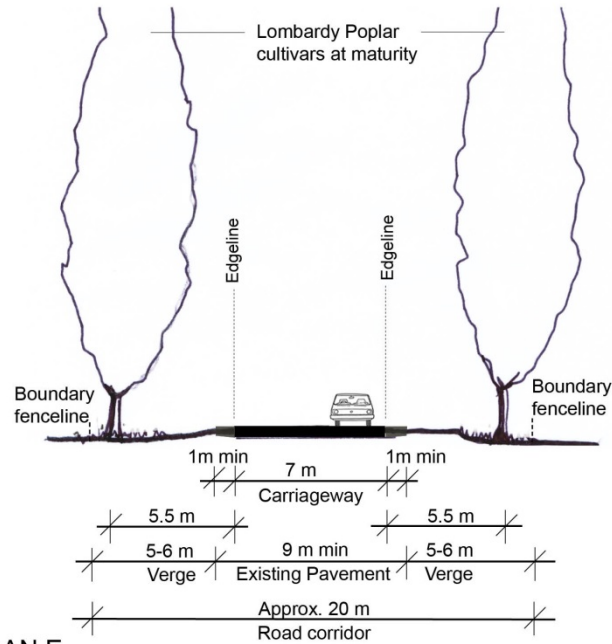


TYPICAL PLAN D

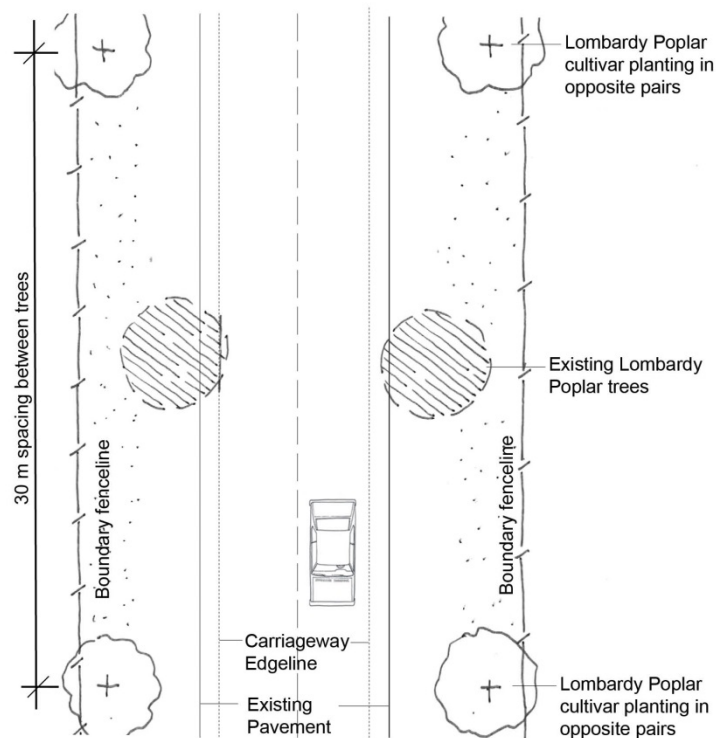


## A.2.5 Plan E & Section EE Eastern side (Eastern section)

TYPICAL CROSS SECTION EE

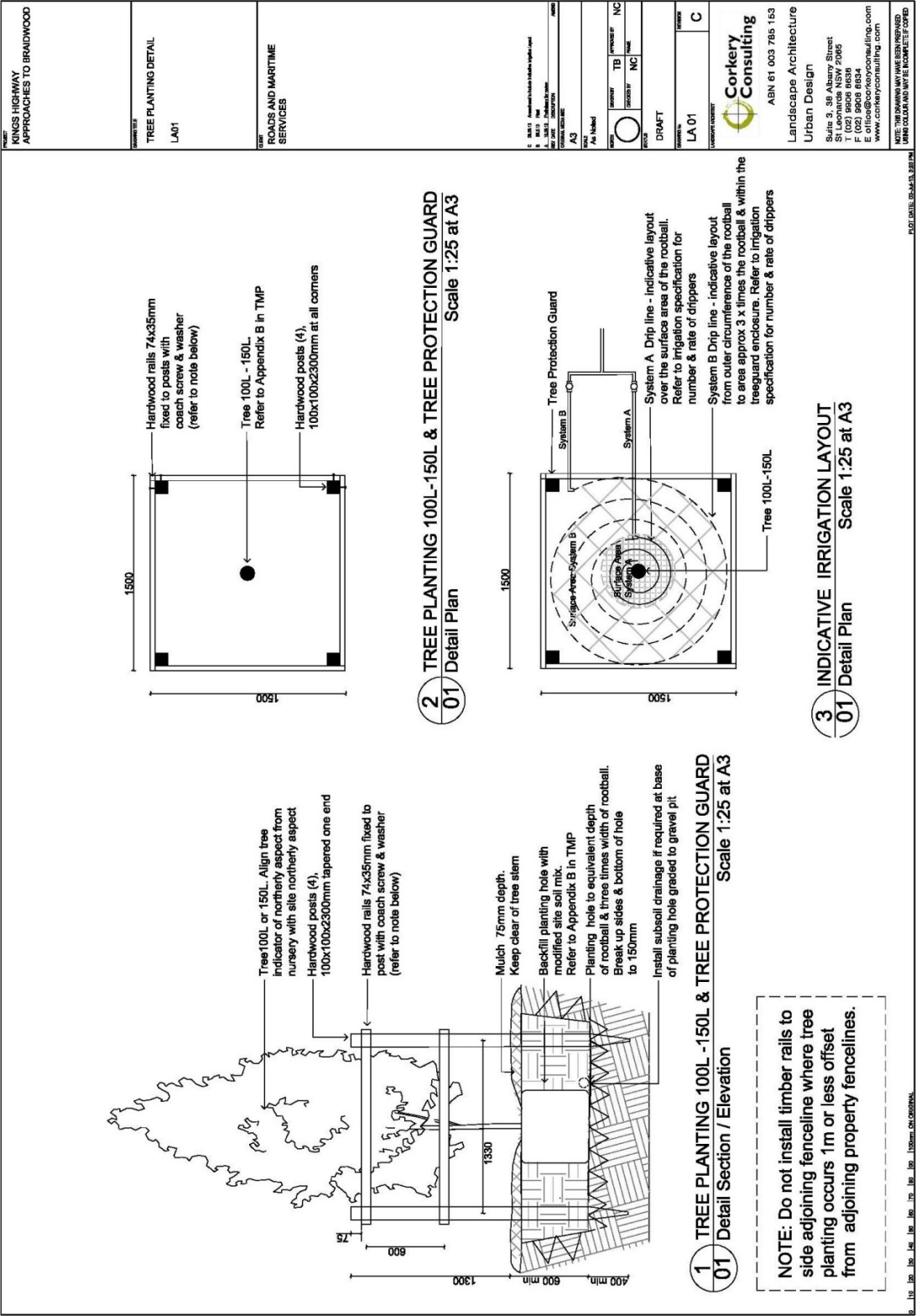


TYPICAL PLAN E





# A.3 Planting and tree protection detail



# 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:

- Roads and Maritime Services 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

Objectives	Recommendations
To ensure qualifications and ability to produce correctly-specified advanced tree stock.	Obtain quotes from suitably qualified tree supply companies who have demonstrated capacity, quality standards and commitment to best practice in plant material propagation (Clark 2003).
To ensure that stock supplied can be assessed for compliance with the quality specifications.	Issue orders for the supply of the required trees with attached performance requirements.
To ensure that tree stock supplied is true to species requirements and is a matched batch for avenue symmetry and tree habit.	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.
To ensure quality of stock during the grow-on period and that stock meets quality standards required prior to planting.	The contract should contain a minimum of two witness points including inspection of stock immediately prior to dispatch to site.

Objectives	Recommendations
To ensure that all stock will have the best capacity for successful establishment.	<p>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.)</p> <p>Issues include:</p> <p><b>Above Ground</b></p> <ul style="list-style-type: none"> <li>• True to type</li> <li>• Clear labelling</li> <li>• Trunk form and taper</li> <li>• Tree canopy form and health</li> <li>• Tree condition</li> <li>• Grafting quality</li> </ul> <p><b>Below Ground</b></p> <ul style="list-style-type: none"> <li>• Root system development, dimensions and form</li> <li>• Correlation of the root system to the trunk and soil surface.</li> </ul>
To ensure the supply contract meets the agreed program and standard of plant material specified.	The tree supply contractor is to provide regular reports, including photographs, based on the NATSPEC Specification.

## B.2 Tree planting

### B.2.1 Soil testing and improvement

Objectives	Recommendations
To ensure that soil conditions at the planting locations are suitable for establishing advanced stock and healthy growth.	<p>Site soil testing should be carried out by a qualified soil scientist and address:</p> <ul style="list-style-type: none"> <li>Physical properties including porosity and compaction</li> <li>Chemical properties including cation analysis, pH values, salt content, and particle analysis</li> <li>Volume of soil available for root growth</li> </ul> <p>Soil samples are to be collected at the proposed tree planting locations and sent to a NATA accredited laboratory for testing.</p> <p>The soil test certificate provided by the laboratory should contain the date of testing and details of the types of test undertaken and their results, together with recommendations to address any limitations to tree growth that are identified by the soil tests.</p>
To create site soil conditions that will sustain vigorous tree growth.	Incorporate the recommendations from the laboratory soil tests for soil improvements into the planting specification.
To ensure that soil conditions meet the recommended site soil improvements as applied by the contractor.	Record the date and actions taken for soil improvements.

### B.2.3 Drainage

Objectives	Recommendations
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.	<p>Prepare a surface and subsurface drainage plan for proposed tree planting locations.</p> <p>Check drainage on site.</p> <p>Review any impacts to drainage patterns if there are changes to the road formation.</p>

## B.2.4 Site preparation

Objectives	Recommendations
To ensure that site preparation work does not interfere with underground services.	Before any site preparation works or planting holes are dug, the location of all underground services is to be determined.
To ensure that root growth of new trees is encouraged and competition from roots of existing trees avoided or minimised.	Prepare the site by deep ripping to minimum 600mm depth in rows parallel to the fence line. Adjust depth of ripping to take account of site conditions identified during the soil testing process, such as area of poor drainage.
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.	No materials or equipment are to be stored within the vicinity of existing trees or on the location of new tree plantings, to ensure there are no spills, soil compaction or surface damage to tree locations.

## B.2.5 Planting hole

Objectives	Recommendations
To ensure that planting holes provide suitable conditions for encouraging new root growth.	Excavate tree planting holes while 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 three 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 root system.
To ensure that underground services are not damaged when preparing planting holes.	All personnel working on the site should be made fully aware of the presence and location of all underground services.

## B.2.6 Planting

Objectives	Recommendations
To ensure that adverse weather conditions do not impact on planting quality or plant stock health.	Tree planting should not be carried out in adverse weather conditions, which include during and following rain, strong winds or extended dry periods.
To ensure that the tree is planted at the correct level relative to the ground surface.	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 root ball 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.
To ensure that the tree will be self supporting.	The tree should be able to stand in a straight vertical position without support even in inclement weather.
To ensure initial watering of trees supports healthy growth.	Establish a watering regime based on an automated irrigation system with watering rates aimed at filling voids in the soil medium. 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.
To recognise that trees are considered significant community assets.	Add and maintain information for each tree in Council's asset inventory.

### B.2.7 Backfilling

Objectives	Recommendations
To ensure that the planting hole is backfilled with soil suitable for tree growth.	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 to AS4419. Lightly firm and water backfilling soil to eliminate any voids or air pockets and to ensure close contact with the trees root ball.

### B.2.8 Tree protection structures

Objectives	Recommendations
To ensure that a suitable protective structure is constructed around each tree, taking account of space available and site context, including clear zone requirements.	Construct timber protection structures around each planted tree in accordance with the detail drawing shown in Appendix A.3.

### B.2.9 Surface mulching

Objectives	Recommendations
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.	Place specified surface mulch to a depth of 75mm 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.

### B.2.10 Fertilising

Objectives	Recommendations
To ensure that fertiliser used is suitable for tree growth.	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.

### B.2.11 Pruning

Objectives	Recommendations
To ensure that pruning meets 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'. Ensure pruning work is only carried out by someone who is experienced in the approved pruning techniques and standards. Limit pruning at installation to removal of broken and damaged branches only.

### B.2.12 Site clean up

Objectives	Recommendations
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.	Remove all excess soil, debris, rubble etc from the site and dispose according to the specification. Sweep the roadway and shoulders clean of clay and soil.

### B.2.13 Sign off witness points

Objectives	Recommendations
To ensure that all stages of the works from tree supply to installation of tree planting are carried out to satisfactory standards.	Include the following sign off witness points: <ul style="list-style-type: none"><li>• Inspection of tree stock in nursery prior to delivery to site.</li><li>• At completion of tree planting hole excavation.</li><li>• Inspection of tree after installation, including mulching &amp; tree protection structure.</li></ul>



## B.3 Maintenance

### B.3.1 Establishment period

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

Objectives	Recommendations
To ensure maintenance staff have an understanding of the project objectives.	Carry out a briefing session with the relevant maintenance staff to explain the objectives of the TMP and how maintenance activities are to be carried out in accordance with those objectives.
To ensure effectiveness of maintenance.	<p>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.</p> <p>Record:</p> <ul style="list-style-type: none"> <li>• date of visit</li> <li>• maintenance works completed</li> <li>• maintenance works in progress</li> <li>• maintenance works required</li> <li>• details of damaged, dead or missing trees including their locations</li> <li>• any damage to the new tree planting</li> </ul> <p>A qualified arborist is 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.</p>
To ensure adequate soil moisture for healthy growth throughout the establishment period.	<p>Establish an irrigation system to create a watering regime that provides for the following (assuming planting in Autumn):</p> <ul style="list-style-type: none"> <li>• First autumn – inner area (close to the tree) to be watered 5-6 times per week.</li> <li>• First Spring/Summer and second Autumn – a wider area to be watered 2-3 times per week.</li> <li>• Second Spring/Summer – outer area (further from the tree) to be watered 2 -3 times per week.</li> <li>• Third Autumn – outer area to be watered once per week.</li> </ul> <p>The appropriate application rates of water are to be calculated taking account of the results of the soil analysis and adjusted as required in response to monitoring of soil moisture.</p> <p>Design of the irrigation system is to include establishment of a reliable water supply, storage and delivery system that has minimal risk of damage from roadside maintenance works and vandalism.</p>

Objectives	Recommendations
	Water to be used for irrigating the trees is to be tested to ensure that it does not contain toxins or pollutants or any substance which would adversely affect the growth of any of the planted trees.
To encourage and maintain healthy growth during the establishment period.	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.

Objectives	Recommendations
To detect as soon as possible any structural defects or poor health and follow up with appropriate remedial treatment.	<p>Inspect the planted trees every twelve months (minimum) and maintain a written report for each inspection detailing:</p> <ul style="list-style-type: none"> <li>• date works completed, including</li> <li>• mulching</li> <li>• fertilizing</li> <li>• pruning</li> </ul> <p>Where trees show evidence of nutrient deficiency, a soil analysis and report should be prepared by a soil scientist to identify the deficiency and provide remedies.</p> <p>Carry out all pruning work in accordance with AS 4373 'Pruning of Amenity Trees'.</p> <p>Where necessary place additional mulch to ensure a depth of 75mm is maintained in accordance with the tree planting detail in Appendix A.3</p>

Objectives	Recommendations
To ensure that trees receive adequate water for optimum growth.	Make arrangements for trees to be watered during periods of extended low rainfall. This may include use of the irrigation system installed with the planting works or supply of water by tanker.
To ensure that planted and existing trees are not damaged by maintenance activities.	Where trees are not protected by guard structures or stakes, a minimum distance of one metre from the base of the tree should not be mown. Mower operators and other maintenance staff should be briefed about the no-mow zone around trees at the beginning of the tree planting and maintenance program. If damage does occur to trees then appropriate treatment works should be carried out in accordance with recommendations of a qualified arborist.
To ensure tree guards are removed when they are no longer required to protect the tree.	When planted trees have attained an acceptable size, as determined by Palerang Council in consultation with Roads and Maritime Services, the tree guards are to be removed and disposed of off-site as part of the post-establishment maintenance works.

## APPENDIX C – References

Australian Standard AS 4373, 2007, *Pruning of Amenity Trees*.

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

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

Clark R. 2006, '*Specifying Trees: a guide to assessment of tree quality*', Natspec

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

NSW Heritage Branch State Heritage Register (Database number 01749)

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

Essential Energy, *Vegetation Management Plan*