8. Planted trees

This Chapter provides a description of the existing planted trees along the Project alignment including ACT Registered Tree identified under the ACT Tree Protection Act 2005. This Chapter also provides an indicative estimate of the number of planted trees that would be directly affected by the construction of the Project, and the proposed environmental management measures that would be implemented to minimise potential impacts and improve the existing planted tree arrangement along the alignment.

The Project PEA (Parsons Brinckerhoff, 2014a) initial risk assessment for the Project identified the potential planted tree impacts risks presented in Table 8.1 below.

<table>
<thead>
<tr>
<th>ID</th>
<th>Potential impact</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Risk rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.1</td>
<td>Removal of existing trees along the alignment of the project that make a significant contribution to the visual character/amenity of the receiving environment. For example, the removal of the trees from the centre median and introduction of the rail infrastructure would provide a significant visual change for the approach route into Canberra.</td>
<td>Almost Certain</td>
<td>Major</td>
<td>Significant</td>
</tr>
<tr>
<td>D.2</td>
<td>Direct impacts to significant trees listed under the Tree Protection Act.</td>
<td>Unlikely</td>
<td>Major</td>
<td>Medium</td>
</tr>
</tbody>
</table>

8.1 Environmental conditions and values

Walter Burley Griffin and his wife Marion Mahony were the first to be given the directorship of landscape design and management of the city. Since the Griffins, a succession of city planners and landscape architects has managed the city’s landscape development. The planting of trees throughout the city since Griffin has represented a variety of approaches, from the original European trees planted under Griffin, to the most recent plantings of native but not indigenous trees. Since 1913, Northbourne Avenue experienced three distinct successions of tree plantings, from an initial formal avenue of trees to the recent *Eucalyptus elata* trees planted in 1986 and still present today.

The predominant tree species within the median of Northbourne Avenue is currently *Eucalyptus elata*. Along the Northbourne Avenue section of the alignment, there are approximately 480 trees. The *Eucalyptus elata* is native to the south eastern regions of NSW and is found on the escarpment forests above Moruya, and grows naturally in the ‘cloud forests’ of that region. The *Eucalyptus elata* trees within Northbourne Avenue were planted between 1983-87.

Outside of the median of Northbourne Avenue, Haig Park, passes east-west through the centre of the suburbs of Braddon and Turner (refer below with respect to ACT registered trees).

The Federal Highway section of the Project alignment is typically a suburban landscape, and is the point of change for the northern approach into the city as the character changes from the open woodland environment from the ACT border south. The existing verges within this precinct are typically wide, especially on the eastern side, which is planted in dense, formalised and mixed exotic plantings of tall, evergreen pine trees enclosing the corridor.
Heritage listed trees are also located along this section of the alignment at the intersection of Northbourne Avenue and Swinden Street.

Outside of the Federal Highway and Northbourne Avenue corridor, only a relatively small number of trees are located within the median and roadside verges along Flemington Road and Hibberson Street. These trees are typically juvenile native tree plantings along the verges that are intended to mature with time to define the edges of these roads.

**ACT Registered trees**

Trees of exceptional value within the ACT are protected and identified under the ACT *Tree Protection Act 2005* (TP Act). The trees protected by the TP Act are provided for in the ACT Tree Register. The following protected trees have been identified within the vicinity of the Project:

- A protected tree (*Eucalyptus melliodora*, reference number PTR501) located on Flemington Road, Gungahlin approximately 60 metres south of Flemington Road and 160 metres east Kate Crace Street.
- Another protected tree lies approximately 180 metre to the west of Flemington Road in Mitchell (*Eucalyptus melliodora*, reference number PTR025).
- A protected tree (*Eucalyptus melliodora*, reference number PTR025) located on Vicars Street, Mitchell.
- Haig Park contains a corridor of protected trees in Braddon and Turner which border the east and west sides of the alignment on Northbourne Avenue. The protected group (reference number PTR035) are included within the treed Haig Park and Haig Park West.
- Stands of protected trees are located within the centre laneways of the Sydney and Melbourne Buildings (reference numbers RT0256A and B).
- The group of trees planted within the Vernon Circle road reserve are also protected (reference number PTR032).

In addition to the identified ACT registered trees, a series of trees have also been identified as being provisionally registered along the alignment. Of relevance to the Project, trees provisionally listed on the ACT Tree Register include:

- A stand of trees (*Eucalyptus melliodora, blakelyi and bridgesiana*, reference number PTR155 Group) and a single tree (*Eucalyptus melliodora*, reference number PTR154) located on the proposed construction compound site in Gungahlin.
- A series of trees (consisting of a mix of *Quercus robur, Quercus macrocarpa, Cedrus atlantica*, reference numbers PTR128A to PTR128N) located along the western side of Northbourne Avenue, Lyneham, opposite the current Visitor Information site.
- A tree (*Catalpa speciose*, reference number PTR152) located on the eastern side of Northbourne Avenue, to the south of Ipima Street.

Figure 8.1 provides an indication of the location of the ACT registered trees, and provisionally registered trees, within the vicinity of the Project.
8.2 Investigations

An arborist assessment of the existing trees on Northbourne Avenue and Federal Highway was undertaken in 2010 by ACT Urban Treescapes, and an additional assessment conducted in association with the Project was undertaken in 2014 by dsb Landscape Architects. This recent assessment included an update of the 2010 Treescapes Audit, and included an additional assessment of the existing trees along Flemington Road to Hibberson Street in Gungahlin. Overall, arborist investigations have identified that a high percentage of trees in the median along the Project alignment are classified as being of fair or poor health (in particular along Northbourne Avenue).

A number of the trees identified in the 2010 audit were removed between 2010 and 2014, many of which were trees that had already died, or that presented structural / health issues. Many of the trees that were classified as good health in 2010 were also reduced in classification down to poor/fair-poor health in 2014, indicating a general decline in the health of the *Eucalyptus elata* trees.

The 2010 and 2014 tree assessments have noted the following with respect to planted trees:

- the 2010 assessment noted 802 trees in the corridor and of these, 513 were not in good health
- the 2014 assessment found that through failing health, storm damage and removal of dead or dangerous trees, the total number of trees has dropped to 484, with only 202 healthy trees
- the number of trees in ‘good’ condition is expected to decline in coming years.

A search of the ACT Tree Register was also undertaken as part of the investigations for the Project to identify potential protected trees under the TP Act that may be impacted by the Project.

8.3 Potential impacts

8.3.1 Construction impacts

Direct impact to ACT registered trees

None of the ACT registered trees within the vicinity of the Project would be impacted by the Project.

A number of provisionally registered trees have also been identified along the Project alignment, including within the compound site located along Flemington Road at Gungahlin. These trees are not expected to be impacted by the Project and the trees would be protected during construction.

Direct impact to other trees

The following assumptions were made regarding which trees would require removal to facilitate the construction and operation of the Project:

- *Encroachment into the tree protection zone* — any incursion of the Project construction footprint (including any kerb realignments and service relocations) greater than 10 to 20 percent of the edge of a tree’s canopy would most likely require tree removal, subject to arborist advice.

- *Encroachment into the structural root zone* — Any incursion of the Project impact footprint (including any kerb realignments) into the structural root zone of a tree would likely compromise the tree’s structural stability and would require the removal of the tree.
Tree canopy height — Trees with canopies that would considerably encroach within 1 metre, or overhang, any light rail infrastructure, including overhead wiring and support systems, traffic signals and sight lines, or the LRVs themselves, were assumed to require removal, subject to arborist advice. While some trees could be adequately trimmed to provide the required clearances for the operation of the Project (and thus avoid the need to completely remove the tree), the impact that such trimming would have on the viability of the tree is currently unknown and would need to be determined by an arborist during detailed design.

A conservative approach was applied when estimating the total number of trees that would be removed as part of the Project.

Approximately 860 existing trees would be removed during construction and for the operation of the Project. This would include a majority of mature trees within the median along Northbourne Avenue between Antill Street and the Civic terminus stop, plus trees along Gungahlin Place, Flemington Road, and the Federal Highway (refer to Figure 8.1). Additional areas of planted trees would also be impacted by the stabling depot and maintenance facility at Mitchell.

A summary of the potential tree impacts along the Project alignment is summarised below:

- along Flemington Road between Gungahlin and the intersection with the Federal Highway – 135 trees impacted
- between the intersection of Flemington Road and the Federal Highway and Dickson – 245 trees impacted
- along Northbourne Avenue south of Dickson – 440 trees impacted
- stabling depot and maintenance facility – 40 trees impacted.

The final number of trees impacted by the Project would be determined during the detailed design of the Project.

8.3.2 Operation

Following construction of the Project, limited vegetation or tree removal, other than routine maintenance to maintain branch clearances to the light rail infrastructure is anticipated (refer below). No impacts to ACT Registered trees are expected to occur during operation of the Project.

Overhead wires and impacts during operation

During construction, there would be some impact to existing and new trees associated with the installation and operation of the overhead power lines. In a typical wired light rail system overhead wires are located over the centre line of each track, at a height of approximately 5.5 metres above the track surface level, and run continuously along the track.

Typically in Australia, operators have adopted a control measure that maintains tree branches away from the wires at a certain radius around each overhead wire, called a ‘vegetation exclusion zone’. A 2.5 metre radius is currently used for the Sydney Light Rail network, and a 1 metre plus 3 years’ growth is currently utilised in Melbourne. The impact would include pruning of branches so that existing and proposed trees are maintained outside of the exclusion zone.

Whilst the operation of the Project would result in limited impacts to trees, the Project would present the opportunity to review the overall suitability of the existing trees currently planted along the alignment. This opportunity is further discussed in the expected conditions section of this EIS in section 8.5.
Figure 8.1a: Impacts to planted trees

Legend
- Project impact footprint boundary
- Registered trees
- Provisional registered trees
- Planted trees requiring removal

Tree locations are indicative and for illustration purposes only.
Figure 8.1c: Impacts to planted trees

Legend
- Project impact footprint boundary
- Registered trees
- Provisional registered trees
- Planted trees requiring removal

Tree locations are indicative and for illustration purposes only.
Figure 8.1d: Impacts to planted trees

Legend
- Project impact footprint boundary
- Registered trees
- Provisional registered trees
- Planted trees requiring removal

Tree locations are indicative and for illustration purposes only.
Figure 8.1e: Impacts to planted trees

Legend
- Project impact footprint boundary
- Registered trees
- Provisional registered trees
- Planted trees requiring removal

Tree locations are indicative and for illustration purposes only.
8.4 Proposed mitigation measures and offsets

Direct impacts to a number of planted trees would be unavoidable due to the need to construct the Project, balanced with minimum road design requirements (e.g. operational lane configurations and widths) while minimising the requirement for private property (Territory land or lease boundary realignments), allowing for service relocations, and minimising safety risks associated with the operation of the Project (e.g. providing adequate clearances for the LRVs, overhead wires and other infrastructure).

The following management and mitigation measures would be implemented to minimise direct impacts on planted trees during the construction of the Project:

- ACT Registered trees and provisionally registered trees would be identified prior to construction of the Project. No trees listed on the ACT Registered Trees list (as registered or as provisionally registered) would be removed as part of the Project. Where these trees exist within the Project impact footprint, the tree(s) would be marked with a tree potential root zone using exclusion fencing during construction.

- If protected trees are identified to be impacted by the Project (as a result of ongoing refinement or design changes proposed following approval of the EIS or DA), a replacement strategy for the affected trees would be devised and agreed between Project Co and TAMS. The process for removing or impacting protected trees would also be undertaken to meet the requirements of the Tree Protection Act.

- Trees not directly impacted by the proposed permanent works (e.g. overhead wires, substations, light rail stops, kerb realignments, service relocations, etc.) would be retained. Trees that do not significantly impinge on required clearances to such infrastructure would be retained. Some trees would require one-off or ongoing maintenance, for example pruning of low branches that would interfere with the overhead wiring. Where pruning is required, a qualified arborist would be engaged to assess the health and condition of the tree prior to any pruning works.

- Exclusion fencing would be established around the drip lines of each tree to minimise the risk of impact to the viability of the trees (where they are proposed to be protected). Where impact to the drip line area cannot be avoided (due to space constraints), opportunities to raise construction facilities (e.g. demountable) above the ground level would be investigated so as to minimise the footprint impacting on the underlying tree roots, in accordance with Australian Standard AS 4970 Protection of Trees on Development Sites.

- The use of low impact construction techniques (on existing tree roots) for installation of new services would be considered, where appropriate and feasible.

- Where the loss of trees is unable to be mitigated through the above measures, the Project would replace trees removed, in accordance with a tree replacement strategy to be developed during detailed design. An overview of the potential components of the tree procurement strategy is provided in section 8.5 below.

8.5 Expected conditions

The Project presents the opportunity to review the overall suitability of the existing *Eucalyptus elata* trees, and the viability of their retention as the preferred tree species, in particular along Northbourne Avenue, or consider the potential benefits for a revised planting of trees, with the selection of a more suitable species that would thrive within the specific environmental and urban conditions of Northbourne Avenue.

Looking beyond Northbourne Avenue and the Federal Highway, the opportunity also exists to further improve the landscape of Flemington Road, which is largely a tree-less landscape within the median. With the introduction of light rail, there is the potential to plant trees on both sides of the light rail tracks within the median (reducing to a single side in narrow sections). This would greatly improve the landscape character of this wide roadway.
A more complete and holistic approach would be to include the whole road reservation of Flemington Road, to include new street trees on the verges — creating a tree-lined boulevard, one which is representative of the many other avenues across the city of Canberra.

Tree replacement strategy

Over 1,800 new trees are proposed to be replanted within the Project impact footprint, with approximately 700 trees in the Federal Highway and Northbourne Avenue corridor. It is important to the Project, and for the physical outcome for the trees to be planted as semi-mature and at an appropriate scale for their location.

To achieve this semi-mature size, the implementation of an early tree procurement strategy is being investigated as part of the ongoing design of the Project to ensure size, growth and habit are suited to the long term project visions, and are compatible with the technical requirements of a light rail system.

The short term adverse visual impacts along key parts of the corridor such as the Federal Highway and Northbourne Avenue will exist, where a large number of trees require removed. This would change the scale, character and experience of this corridor for years to come as the new trees begin to establish. However, as time progresses, these trees would eventually mature, resulting in a landscaped condition, consistent with the original plans of Walter Burley Griffin (refer to Figure 8.2).

Figure 8.2  Tree procurement and development strategy along Northbourne Avenue
The planting strategy for the Federal Highway precinct would aims to create a memorable precinct and threshold by planting two linear rows of columnar shaped exotic trees on both verges to frame the avenue. These trees represent an extension of the Remembrance Driveway and the recognisable rows of tall poplar trees that mark the entrance to the Hume Highway.

With respect to the Flemington Road, the general intent of a majority of this precinct which is to respect and enhance the native temperate grassland and lowland woodland character of this semi-rural corridor. The planting would become an identifiable marker at each stop along the Project alignment, improving stop legibility. The planting strategy would strengthen the existing landscape character. An enlarged median would allow for a boulevard of *Eucalyptus dalrympleana* (recommended species). There would also be opportunities for woodland trees to be planted in informal copses in road verges (by others).

### 8.6 Residual risks

Based on the mitigation measures identified in section 8.4, an assessment of the residual planted tree risks associated with the Project have been considered (for risks previously identified as being medium or above). These residual risks are identified in Table 8.2.

**Table 8.2 Residual planted tree risks**

<table>
<thead>
<tr>
<th>ID</th>
<th>Potential impact</th>
<th>Original residual risk rating</th>
<th>Residual likelihood</th>
<th>Residual consequence</th>
<th>Residual risk rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.1</td>
<td>Removal of existing trees along the alignment of the project that make a significant contribution to the visual character/amenity of the receiving environment. For example, the removal of the trees from the centre median and introduction of the rail infrastructure would provide a significant visual change for the approach route into Canberra.</td>
<td>Significant</td>
<td>Almost Certain</td>
<td>Major (short/medium term)</td>
<td>Significant (short/medium)</td>
</tr>
<tr>
<td>D.2</td>
<td>Direct impacts to significant trees listed under the Tree Protection Act.</td>
<td>Medium</td>
<td>Remote</td>
<td>Positive (long term)</td>
<td>Beneficial (long)</td>
</tr>
</tbody>
</table>
9. Landscape and visual

This Chapter outlines the potential visual and landscape impacts which are anticipated to occur as a result of the Project. This Chapter provides a summary of the Landscape character and visual impact assessment by Hassell and contained as Technical Paper 4 in Volume 3 of this EIS.

The Project PEA (Parsons Brinckerhoff, 2014a) initial risk assessment for the Project identified the potential landscape and visual risks presented in Table 9.1 below.

### Table 9.1 Initial noise and vibration impact risks associated with the Project

<table>
<thead>
<tr>
<th>ID</th>
<th>Potential impact</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Risk rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.1</td>
<td>Visual impacts would include vegetation clearing and construction activities including the placement and movement of plant and other equipment during construction.</td>
<td>Almost Certain</td>
<td>Minor</td>
<td>High</td>
</tr>
<tr>
<td>E.2</td>
<td>The placement of such elements as the rail line, new stops, overhead wiring, lighting, substations and the light rail vehicles in the corridor.</td>
<td>Almost Certain</td>
<td>Moderate</td>
<td>Very high</td>
</tr>
</tbody>
</table>
| E.3 | The depot at Mitchell will provide for landscape changes and visual impacts albeit being introduced into a largely commercial/industrial area:  
  - Additionally ancillary project elements such as substations would result in some visual impacts.                                       | Almost Certain | Minor       | High        |

9.1 Environmental conditions and values

9.1.1 Landscape character precincts

The Project would cross a variety of distinct precincts along the corridor; extending from the new urban development area of Gungahlin through the industrial precinct of Mitchell, to the Federal Highway approach and the open spaces around EPIC, the racecourse, Yowani and the sports fields, along the wide boulevard of Northbourne Avenue, and finally the built up commercial hub of Civic.

Six landscape character precincts have been identified along the Project. The light rail route as it passes through each precinct is illustrated in Figure 9.1. A description of the existing landscape and visual character of each precinct along the Project alignment is provided in Table 9.2.

### Table 9.2 Existing landscape and visual character of each precinct

<table>
<thead>
<tr>
<th>Precinct 01: Hibberson Street</th>
<th>Project works within precinct</th>
<th>Existing landscape and visual character</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The route begins at Gungahlin Place, in Hibberson Street, which would become a light rail only street serving the town centre of Gungahlin and the adjacent bus interchange</td>
<td>Hibberson Street is an active street in Gungahlin Town Centre. It has a scale and character that is representative of a typical regional main street. The street has active frontages with shopping, service, and food &amp; beverage outlets, as well as outdoor dining on the footpaths. Gungahlin Town Centre has a cluster of four medium-sized retail developments centred on Gungahlin Place and fronting Hibberson Street with parking accessed from the rear, and primary pedestrian access from Hibberson Street.</td>
</tr>
<tr>
<td>Precinct</td>
<td>Project works within precinct</td>
<td>Existing landscape and visual character</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Precinct 02:</td>
<td>Stops at Manning Clark Crescent, Mapleton Avenue, and Nullarbor Avenue would be located within the wide boulevard precinct of Flemington Road north and serve the adjacent residential suburbs of Harrison and Franklin.</td>
<td>The existing built character of Flemington Road north consists primarily of residential developments, varying from single storey low density to six storey medium density, with retail on the ground floor. All currently undeveloped lots adjacent to the light rail alignment have been purchased with development plans underway for similar levels of development. The existing landscape cross section of the road way is sparse with dry grass planting in the median, and juvenile native tree planting in the verge which are of a poor condition. The landscape character is however enhanced by the regionally significant grassland reserves including the ‘North Mitchell Grassland Reserve’ at the corner of Well Station Drive, and the Gungaderra Creek open space corridor both of which contain pockets of remnant native open woodland planting and native temperate grasslands, which are characteristic of the area.</td>
</tr>
<tr>
<td>Flemington Road north</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precinct 03:</td>
<td>Well Station Drive would mark the transition to Flemington Road south with the narrower section of the roadway. The stop of Well Station Drive serves the suburb of Mitchell and the light industrial area. Just south of Mitchell would be the light rail stabling depot and maintenance facility, and the EPIC light rail stop.</td>
<td>The landscape in this precinct is characterised by the semi-rural environment of the surrounding grasslands and patches of native lowland woodland. There are also glimpses of open views across the grasslands to the distant hills and ranges, including Black Mountain to the south west, and Mount Ainslie to the south east. These views are framed by stretches of lowland woodland and informal verge tree planting. Several ecologically sensitive sites are located adjacent to the corridor and strongly inform the character of the precinct, including the Crace Grassland Nature Reserve, and the West-Kenny Open Space corridor.</td>
</tr>
<tr>
<td>Flemington Road south</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precinct 04:</td>
<td>The alignment would then join the Federal Highway, travelling along the median, with stops proposed at Phillip Avenue and Swinden Street.</td>
<td>The existing landscape character of the Federal Highway precinct is defined in Appendix X of the NCP (2013), as a sequence of ‘landscape patterns which identify a change in landscape character from an informal planting, open rural landscape to a regular planted, dense canopy pattern of a semi-urban landscape’. The planting patterns are visible today and include formal and linear arrangements of plantings.</td>
</tr>
<tr>
<td>Federal Highway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precinct 05:</td>
<td>The route would then continue onto Northbourne Avenue, with a proposed stop adjacent to the Dickson town centre creating a bus interchange via the future bus terminus at Challis Street (not included as part of the current Project). South of Dickson the alignment would continue south with stops proposed at Macarthur Avenue, Condamine Street and Elouera Street.</td>
<td>The experience along Northbourne Avenue is dominated by the landscape with buildings generally set back from the street, and the avenue dominated by dense planting of trees, and exotic grass lawn. The quality of architecture is aged along the avenue, with minimal street activation at ground level. The built form begins to intensify south of Haig Park with larger commercial buildings leading towards the city centre. The median is planted with distinctive staggered rows of native trees with low canopies and stringy bark. The quality of these tree plantings in the median and verge is diminished by the general poor health of most the existing trees, and inconsistency in the tree arrangement due to the loss of trees over time.</td>
</tr>
<tr>
<td>Northbourne Avenue</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Precinct 06: Civic

The route would extend two more blocks south of Barry Drive which would mark the transition from a suburban to a more commercial urban environment. The light rail terminus at Alinga Street would create an interchange with the existing bus terminus on Mort Street.

Existing landscape and visual character

The precinct has a distinctive and diverse urban character. The street has a strong building line with commercial frontages built to the boundary line. The footpaths are paved and include street furniture and pedestrian lighting. The median is of the same 28 metre width as within Precinct 05 with a row of staggered trees, but includes pedestrian access via a central pathway.

The precinct is anchored by the historically significant Sydney and Melbourne buildings located south of the proposed terminus location. There are also open vistas out to City Hill beyond.

9.1.2 Viewpoints

Viewer locations are public places where full or screened views of the Project would be viewed and there is human activity. This activity may include residential, industrial, business/commercial, educational or recreational land uses. The following viewpoints (refer to Figure 9.2) were selected as representative of the range of views to the Project and the proposed light rail:

- 01 Gungahlin Terminus – view east along Hibberson Street
- 02 Nullarbor Avenue Stop – view north west along Flemington Road
- 03 Condamine Street Stop – view north west along Northbourne Avenue
- 04 Alinga Street Stop (Civic) – view north along Northbourne Avenue.

The identified landscape character precincts and viewpoints have formed the basis of the landscape and visual impact assessment outlined in the following sections.
Source: HASSELL Architects

**Figure 9.1** Key plan of character precincts identified along the Project alignment
Figure 9.2  Key viewpoint locations along the Project alignment

Source: HASSELL Architects
9.2 Investigations

The methodology used for the landscape and visual impact assessment for the Project conforms generally with the directions offered by the following documents:


Site visits were undertaken between August 2014 and February 2015. Following this, public domain features and representative viewpoints of the site were identified and assessed.

Landscape character assessment and visual impact assessment are evaluated separately in this Chapter. Landscape character refers to the overall impact of the Project on an area’s character and sense of place. The assessment of visual impacts is based on day to day visual effects of a project based on people’s views.

Landscape and visual impacts were assessed under construction and operational impacts. Operational assessment was then separated and assessed in two stages due to the strong influence of the landscape and planted trees. These stages represent the approximate time for the planted trees to establish and reach their near optimal benefit to the landscape and visual character of the project area. These stages are:

- short-medium term impacts, identified as the operation of the Project from 0–15 years
- long term impacts, identified as the operation of the Project from 15 years and onwards.

9.2.1 Landscape character assessment

The landscape and character impacts have been assessed by identifying the likely change and impacts to public domain features along the project alignment which are directly and indirectly impacted as a result of the Project. These public domain elements include:

- buildings and built elements
- parks, gardens, reserves and plazas
- roads and road reserves
- footpaths, shared paths and cycleways
- streetscapes.

9.2.2 Visual impacts assessment

The visual impacts have been assessed, using a viewpoint based approach. A series of views were selected to represent the range of views to the project, this selection process aims to identify a range of locations and viewing situations and included views that captured:

- important view corridors, character areas and streetscapes as identified in the planning guidance
- different visual components of the proposal (stops, termini, interchanges, intersection treatments, structures etc.).

A detailed methodology can be found in Technical Paper 4.
9.3 Potential impacts

9.3.1 Construction

Construction of the Project would require a range of works including utility relocations, intersection modifications, track slab construction and other systems works (installation of wiring). As part of the works, some sections of streets and footpaths would be closed or restricted to pedestrians and general traffic. Civil and systems works would include construction of the track slab steps, and rail installation. Track construction would occur in linear sections between intersecting streets, with the intersections constructed separately, during weekends and week nights.

Each section would be established as a site with traffic lanes diverted, temporary hoardings and barriers. During this time, construction equipment such as slip track machinery, cherry pickers, mobile cranes and trucks would be seen within the precinct. A series of construction laydown areas would also be located within the Project impact footprint as described in section 2.2.3.

Assessment of landscape character impacts

During construction there would be a range of temporary adverse landscape impacts within the Project footprint. Impacts during construction would be primarily derived from tree loss and the scale of the works being undertaken within each precinct.

A summary of the potential landscape character impacts of the Project during construction is provided in Table 9.3.

Table 9.3 Assessment of landscape character impacts (construction)

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Potential impact</th>
<th>Assessment of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precinct 01 – Hibberson Street</td>
<td>High adverse landscape and impact</td>
<td>Construction works would require the closure of Hibberson Road as well as the periodic closure of footpaths. Closure and detour signs would create minor visual impacts within the precinct. Track construction would occur in linear sections between intersecting street. Each section would be established as a construction site, and temporary hoardings and barriers would be erected, creating visual impacts within the precinct.</td>
</tr>
<tr>
<td>Precinct 02 – Flemington Road North</td>
<td>Moderate adverse landscape impact</td>
<td>Construction would be limited to within the median, with existing traffic lanes and verges largely unaffected, due to the majority of works being contained within the median. Temporary hoarding and barriers would be erected around the construction zones. A major site compound would be located in the existing vacant lots on both sides of Flemington Road between Kate Crace Street and Manning Clarke Crescent. 100 car parking spaces are proposed for site personnel.</td>
</tr>
<tr>
<td>Precinct 03 – Flemington Road south</td>
<td>High adverse landscape impact</td>
<td>Works would occur within the median, with some work also proposed on existing verges for road realignment. Flemington Road would remain open to traffic with lane closures or deviations required. Temporary hoardings and barriers would be erected around the construction zones. The existing carpark adjacent to the race course would be used as a construction laydown area.</td>
</tr>
<tr>
<td>Precinct</td>
<td>Potential impact</td>
<td>Assessment of impact</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Precinct 04 – Federal Highway</td>
<td>Very high adverse landscape impact</td>
<td>Federal Highway would remain open to traffic with a construction site mostly contained to the median, with some lane closures and/or temporary diversions required. Some works outside of the existing median would also be required for the relocation of the existing gas main pipeline to the verge on the eastern side of the Federal Highway and for new access works at the Yowani Country Club. Temporary hoardings and barriers would be constructed adjacent to the works area. Road widening works would result in the removal of a number of trees (refer to Chapter 8) within the verges, and impacts to some adjacent footpaths and shared paths.</td>
</tr>
<tr>
<td>Precinct 05 – Northbourne Avenue</td>
<td>Very high adverse landscape impact</td>
<td>Northbourne Avenue would remain open to traffic with a construction site mostly contained to the median. The construction of the light rail tracks in the median would require all existing median trees and turf planting to be removed. Track construction would occur in linear sections between intersecting streets. Each section would be established as a site with temporary diversions of traffic lanes, temporary hoardings and barriers. A construction laydown area would be located at the current visitor information centre on Northbourne Avenue. This would be fenced and the existing building may be used. Existing traffic lanes and verges would be largely unaffected as the majority of works would be contained to the median and some minor intersection works.</td>
</tr>
<tr>
<td>Precinct 06 – Civic</td>
<td>Very high adverse landscape impact</td>
<td>Northbourne Avenue would remain open to traffic with a construction site mostly contained to the median. The construction of the light rail tracks in the median would require all existing median trees and turf planting to be removed. Track construction would occur in linear sections between intersecting streets. Each section would be established as a site with traffic lanes diverted, temporary hoardings and barriers. A construction compound would be located in the existing car park on the western corner of Northbourne Avenue and London Circuit. This area would be securely fenced with additional offices, storage containers, meals and toilet facilities. One hundred car parking spaces would be included in the compound for site personnel.</td>
</tr>
<tr>
<td>Mitchell stabling depot and maintenance facility</td>
<td>Minor adverse landscape impact</td>
<td>Major earthworks and some tree clearing predominantly along the south boundary of the site would be required to allow for the construction of the light rail stabling tracks and depot facility resulting in a considerable reduction in landscape character.</td>
</tr>
</tbody>
</table>

### Assessment of representative viewpoints

During construction, the Project would result in temporary adverse impacts to existing viewpoints along the Project alignment, arising from removal of existing trees, the creation of worksites surrounded by hoardings, and the movement of plant and equipment (which would intermittently impact existing views).

A summary of the potential visual impacts of the Project on representative viewpoints during construction is provided in Table 9.4.
### Assessment of visual impacts (construction)

<table>
<thead>
<tr>
<th>Viewpoint (refer to Figure 9.2)</th>
<th>Potential impact</th>
<th>Assessment of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gungahlin Terminus – view east along Hibberson Street (View 01)</td>
<td>Moderate adverse visual impact</td>
<td>This view would change substantially during construction. The central road would become the primary work site and closed to pedestrians and traffic, with temporary hoarding erected around the works area. The tall existing street lighting would be removed and views and access across the street would be limited. Footpath widths may also be reduced.</td>
</tr>
<tr>
<td>Nullarbor Avenue Stop – view north west along Flemington Road (View 02)</td>
<td>Minor adverse visual impact</td>
<td>This view would change substantially as the view becomes focused on a construction work site and temporary hoarding erected around the site. There would be limited impact to traffic lanes and vehicular movement, except at intersections, which would require closure for periods of time where civil works and track slab construction would prohibit any cross movement. Impact to the verges would be limited to the location of the side overhead wiring poles and new bicycle parking locations. Pedestrian movement would also become limited at intersections due to the median construction works. Contextual views would be disrupted by machinery and hoardings.</td>
</tr>
<tr>
<td>Condamine Street Stop – view north west along Northbourne Avenue (View 03)</td>
<td>Very high adverse visual impact</td>
<td>This view would change significantly as all the existing median trees would be removed and the median would become the construction works area, with temporary hoarding erected around the perimeter. Pedestrian access across the avenue would be restricted, and the mid-block crossings would be temporarily removed. These changes, particularly the removal of all median trees, would significantly reduce the existing landscape character of this view, and the changes would not be visually consistent with the existing character of the avenue.</td>
</tr>
<tr>
<td>Alinga Street Stop (Civic) – view north along Northbourne Avenue (View 04)</td>
<td>Very high adverse visual impact</td>
<td>All trees in the median would be removed and would significantly change the character of the view. This view would change significantly as early works utility relocations begin and the existing median becomes the construction works area, with temporary hoarding around the perimeter. Views across the median would be obstructed to the lower levels of buildings on Northbourne Avenue. Pedestrian access in the median would be prohibited during construction.</td>
</tr>
</tbody>
</table>

### 9.3.2 Operation

The key landscape character and visual impacts during operation of the Project would generally include the proposed stops and light rail infrastructure design as well as the removal and replanting of trees along the Project alignment, including:

- introduction of light rail tracks within the road surface along the length of the Project
- the creation of a pedestrianised/light rail only zone in Gungahlin
- overhead wiring along the Project alignment
- removal of existing street trees along the Project alignment and subsequent replacement with semi-mature/juvenile trees
- removal of vehicular traffic (except for the LRVs and cross-streets) along Hibberson Street between Gungahlin Place and Kate Crace Street
- stabling depot and maintenance facility site.
Assessment of short-medium term landscape impacts

Very high adverse landscape impacts would be experienced during the short-medium term at precinct four, five and six. Majority of these impacts are due to the removal of trees along the project alignment. Semi-mature trees would be planted to minimise these impacts, however their size would limit their ability to reflect the existing landscape character.

A summary of the potential short-medium term landscape impacts of the Project during operation is provided in Table 9.5.

Table 9.5  Assessment of landscape character impacts (short-medium term operation)

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Potential impact</th>
<th>Assessment of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precinct 01 –</td>
<td>Moderate benefit landscape</td>
<td>There would be an increase in pedestrian areas including the provision for additional outdoor seating zones, and reduction of visual clutter through the integration of street lighting into overhead wiring poles. The amenity of the street would be further enhanced by the inclusion of semi-mature trees. LRVs would be seen approaching, departing and stationary at the Gungahlin Place terminus stop and would be somewhat similar to the character of the existing transport network which characterises this area. An overall reduction of visual impacts would be achieved through the integration of street lighting into architecturally designed electrical poles. However, the single 'end of line' pole would detract from the character of the street due to its size and prominence. Catenary wires would also remain a visible component but would be screened out of view by the street trees. The replacement of the asphalt road reserve with a high quality concrete finish on the tracks would significantly improve the aesthetic quality of the street. The stop and shelters would be visually unobtrusive and maintain open views across the street.</td>
</tr>
<tr>
<td>Hibberson Street</td>
<td>impact</td>
<td></td>
</tr>
<tr>
<td>Precinct 02 –</td>
<td>Negligible landscape impact</td>
<td>Stops and track infrastructure would be visible within the existing median along Flemington Road and would result in some change in landscape character through the removal of the existing grassed median and replacement with a concrete track alignment. Whilst the stops would typically be of a light weight design, these would still be visible within the existing landscape and would result in some minor change. The proposed new formal row of trees in the medium would be planted in semi-mature size, and would provide limited visual benefit to the wide street corridor in the short-medium term. The effect of these trees and the temperate grassland planting in the median would marginally enhance the overall landscape character of the avenue, and would partially offset the adverse impact of the light rail infrastructure within the otherwise green existing median. The concrete tracks would be of a standard finish and provide minimal benefit to the overall landscape character of the precinct. However, at stops, a higher quality concrete finish would enhance the local character aligning with the high quality finishes of the platform and shelter design. The light rail stops would create an identifiable element and enhance the overall character of the street.</td>
</tr>
<tr>
<td>Flemington Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North</td>
<td>impact</td>
<td>STOPS AND TRACK INFRASTRUCTURE WOULD BE VISIBLE WITHIN THE EXISTING MEDIAN ALONG FLEMINGTON ROAD AND WOULD RESULT IN SOME CHANGE IN LANDSCAPE CHARACTER THROUGH THE REMOVAL OF THE EXISTING GRASSED MEDIAN AND REPLACEMENT WITH A CONCRETE TRACK ALIGNMENT. Whilst the stops would typically be of a light weight design, these would still be visible within the existing landscape and would result in some minor change. The proposed new formal row of trees in the medium would be planted in semi-mature size, and would provide limited visual benefit to the wide street corridor in the short-medium term. The effect of these trees and the temperate grassland planting in the median would marginally enhance the overall landscape character of the avenue, and would partially offset the adverse impact of the light rail infrastructure within the otherwise green existing median. The concrete tracks would be of a standard finish and provide minimal benefit to the overall landscape character of the precinct. However, at stops, a higher quality concrete finish would enhance the local character aligning with the high quality finishes of the platform and shelter design. The light rail stops would create an identifiable element and enhance the overall character of the street.</td>
</tr>
<tr>
<td>Precinct 03 –</td>
<td>Moderate adverse landscape</td>
<td>The overall landscape character of Flemington Road south would be extensively modified by the removal of the existing verge and small amount of existing median trees towards the southern end of Flemington Road, considerable road widening works, and the introduction of the light rail infrastructure in the central reserve. The new trees on the verges would be planted at a semi-mature size, which would have limited landscape and visual benefits during the short-medium term. Stops and track infrastructure would be visible within the existing median along Flemington Road and would result in some change in landscape character through the removal of the existing grassed median and replacement with a concrete track alignment. The island platforms and shelters would be clearly identifiable in the streetscape due to their prominence in the road corridor which would have unobstructed views due to the lack of trees in the median.</td>
</tr>
<tr>
<td>Flemington Road</td>
<td>impact</td>
<td></td>
</tr>
<tr>
<td>south</td>
<td>impact</td>
<td></td>
</tr>
</tbody>
</table>
Precinct 04 – Federal Highway

**Potential impact**: Very high adverse landscape impact

The project would result in an adverse impact to the landscape character of the precinct as a result of the removal of existing verge and central median trees (which would occur during construction). The implementation of formal rows of semi-mature landmark trees would assist in offsetting the impacts in the short to medium term.

Stops and track infrastructure would be visible within the existing median along the Federal Highway and would result in some change in landscape character through the removal of the existing grassed median and replacement with a concrete track alignment. The overhead wiring poles, catenary wires and stops would become noticeable elements, however given the scale, width and density of existing verge plantings, they would not adversely impact the overall character of the avenue.

**Assessment of impact**

The removal of the existing median trees would have a significant impact to the landscape character of the precinct. Replacement with semi-mature size trees would have limited benefit in offsetting these adverse impacts during the short-medium term.

Stops and track infrastructure would be visible within the existing median along Northbourne Avenue and would result in some change in landscape character through the removal of the existing tree line and grassed median and replacement with a concrete track alignment. Whilst the stops would typically be of a light weight design, these would still be visible within the existing landscape and would result in changes to the existing landscape character of this roadway. These changes would be somewhat offset by the existing transport nature of the existing corridor.

The designed overhead wiring poles would be a visible element that would have an adverse impact on the landscape character of the avenue; however they would not be visually inconsistent with the existing road infrastructure. In the short term, the overhead wiring poles would remain visible above the height of the juvenile trees until they reach maturity. The catenary wires would largely be obscured from the view of pedestrians or road users due to the tree canopies.

The landscape character of the wide, landscaped median would be reduced at each stop location as the double row of trees would become a single row and planting areas would be replaced with the stop platforms, shelters and increased hard paved areas for pedestrian circulation.

Precinct 06 – Civic

**Potential impact**: Negligible landscape impact

The removal of the existing median trees would have a significant impact to the landscape character of the precinct. Replacement, semi-mature size trees would have limited benefit in offsetting this adverse impacts during the short-medium term.

Stops and track infrastructure would be visible within the existing median along Northbourne Avenue and would result in some change in landscape character through the removal of the existing tree line and grassed median and replacement with a concrete track alignment. Whilst the stops would typically be of a light weight design, these would still be visible within the existing landscape and would result in changes to the existing landscape character of this roadway. These changes would be somewhat offset by the existing transport nature of the existing corridor.

LRVs would be seen approaching, departing and stationary at the Civic terminus stop and would be somewhat similar to the character of the existing transport network which characterises this area.

Overall amenity of the median would be enhanced due to the provision of high quality paving within the pedestrian areas, high quality stone sett paving across the track surface, and dense low planting throughout the precinct.

Mitchell stabling depot and maintenance facility

**Potential impact**: Negligible landscape impact

There would be considerable changes in landscape and visual character to the area; due to the large depot facility buildings and extensive hard paved areas and concrete light rail tracks. Landscaping and revegetation implemented across the site would offset the impacts of the stabling depot and maintenance facility infrastructure.
Substations

Substations provide traction power to the LRVs across the network. As described in Chapter 2, the Project would include 7 substations spread along the alignment. The potential visual impacts of these substations are described in Table 9.6.

Table 9.6 Assessment of landscape character impacts (short-medium term operation)

<table>
<thead>
<tr>
<th>Substation</th>
<th>Assessment of potential impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substation 1</td>
<td>Substation 1 would be located in the vacant lot on the northern side of Flemington Road between Kate Grace Street and Hamer Street. It would be highly visible from Flemington Road, and its appearance would be visually inconsistent with the existing landscape character of the open grasslands and distant woodlands.</td>
</tr>
<tr>
<td>Substation 2</td>
<td>Substation 2 would be located in the vacant lot on the eastern side of Flemington Road in front of a landscaped public open space area and pond. Substation 2 would be highly visible from Flemington Road and adjacent buildings, which area primarily residential. It would also partially obstruct views to the pond behind. The visual appearance of the substation would also be visually inconsistent with the landscape character of the area it is located within.</td>
</tr>
<tr>
<td>Substation 3</td>
<td>Substation 3 would be located in the suburb of Mitchell approximately 250 metres south of Well Station Drive. It would be situated adjacent to an existing woodland area and warehouse building, approximately 70 metres setback from Flemington Road. Substation 3 would be only partially visible from Flemington Road due its position set back from the roadway, but would be highly visible from the adjacent warehouse building. The appearance of the substation would be generally consistent with the surroundings due to its close proximity to the adjacent warehouse building.</td>
</tr>
<tr>
<td>Substation 4</td>
<td>The proposed location of substation 4 would be within the stabling depot and maintenance facility site, situated adjacent to the proposed sand silo and wash plant facilities. The substation would only be partially visible from Flemington Road, and due to its situation amongst other stabling depot buildings it would be generally visually consistent with its surroundings.</td>
</tr>
<tr>
<td>Substation 5</td>
<td>The proposed location of substation 5 would be within a wide planted verge area on the eastern side of Federal Highway north of Panton Street and west of existing residential properties. The substation would be situated adjacent to an existing pedestrian pathway, while its location would have little or no direct impact to pedestrian movement. Substation 5 would only be partly visible from Federal Highway and Panton Street due to the partial screening from the surrounding existing trees. The substation may be partially visible from the adjacent residential properties depending on the height of the viewpoint; as it would be partially screened by the back fences of the adjacent residential properties.</td>
</tr>
<tr>
<td>Substation 6</td>
<td>The proposed location of substation 6 would be on the western verge area of Northbourne Avenue north of the Macarthur House building. The substation would be positioned in front of the Macarthur House car park and adjacent to the existing footpath within the verge. The substation would be highly visible from street level view and from the adjacent buildings.</td>
</tr>
<tr>
<td>Substation 7</td>
<td>The proposed substation 7 would be located on the western side of Mort Street, on the corner of Elouera Street. The substation would be integrated within an existing public car park and would be highly visible from Mort Street and some of the adjacent buildings. It would be partially visible from Elouera Street.</td>
</tr>
</tbody>
</table>

Assessment of long term landscape impacts

The Project would provide beneficial long term landscape impacts, especially along the Federal Highway and Northbourne Avenue due to planted trees reaching maturity and reflecting the existing and overall desired character of the area. A summary of the potential long term landscape impacts of the Project during operation is provided in Table 9.7.
Table 9.7 Assessment of landscape character impacts (long term operation)

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Potential impact</th>
<th>Assessment of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precinct 01 – Hibberson Street</td>
<td>Moderate beneficial landscape impact</td>
<td>Planted trees would reach their maturity during this time, enhancing the amenity of the street; however their limited number would not result in a significant improvement. The Gungahlin Place terminus stop would be highly integrated with the town centre in the long term and would have formed part of the existing, urban/built landscape character of the town centre.</td>
</tr>
<tr>
<td>Precinct 02 – Flemington Road north</td>
<td>Moderate beneficial landscape impacts</td>
<td>Following the establishment of the proposed formal rows of trees within the median (subject to detailed design), a consistent tree canopy would be formed. This would have the combined effect of enhancing the boulevard character of the precinct. Landscaping along the alignment and around stop locations would have matured and would have assisted with the Project blending in with the existing (and desired) landscape character of the precinct.</td>
</tr>
<tr>
<td>Precinct 03 – Flemington Road south</td>
<td>Negligible adverse landscape impact</td>
<td>Planted trees (where these can be planted within the median, subject to detailed design) would be established and reaching maturity, enhancing the overall landscape character and offsetting the adverse impacts of the road works and light rail infrastructure. Landscaping along the alignment and around stop locations would have matured and would have assisted with the Project blending in with the existing (and desired) landscape character of the precinct.</td>
</tr>
<tr>
<td>Precinct 04 – Federal Highway</td>
<td>Very high beneficial landscape impact</td>
<td>Planted trees along the verge would have sufficiently matured over time, the arrival experience of entering the city would be enhanced; and would reinforce the ‘sequence of landscape patterns’ described in Appendix X (NCP 2013). Landscaping along the alignment and around stop locations would have matured and would have assisted with the Project blending in with the existing (and desired) landscape character of the precinct.</td>
</tr>
<tr>
<td>Precinct 05 – Northbourne Avenue</td>
<td>Very high beneficial landscape impact</td>
<td>Planted trees in the median would have established and reached near maturity, greatly enhancing the landscape character. The trees would form a continuous canopy over the light rail tracks and along the length of the avenue, creating a grand boulevard landscape character. Landscaping along the alignment and around stop locations would have matured and would have assisted with the Project blending in with the existing (and desired) landscape character of the precinct.</td>
</tr>
<tr>
<td>Precinct 06 – Civic</td>
<td>Very high beneficial landscape impact</td>
<td>Planted trees in the median would have established and a consistent tree canopy would be created along the precinct. This would enhance the urban quality and create a grand boulevard character. Landscaping along the alignment and around stop locations would have matured and would have assisted with the Project blending in with the existing (and desired) landscape character of the precinct.</td>
</tr>
<tr>
<td>Mitchell stabling depot and maintenance facility</td>
<td>Negligible adverse landscape impact</td>
<td>Planted trees around the stabling depot and maintenance facility would be established and reaching maturity and the overall landscape character of the facility would be mitigated. The trees would also be screened by some of the buildings and infrastructure from the neighbouring area and Flemington Road.</td>
</tr>
</tbody>
</table>

Assessment of representative viewpoints (short-medium term)

The Project would result in adverse short to medium term visual impacts due to the removal of trees along the project alignment and introduction of light rail infrastructure. The replanting of semi-mature trees would assist in minimising these impacts; however their full benefit would not be seen until they have reached maturity.
The Gungahlin Terminus would experience improved visual impacts due to the pedestrianisation of Hibberson Street between Gungahlin Place and Kate Crace Street and the creation of high quality, accessible public spaces in Civic.

A summary of the potential short-medium visual impacts of the Project on representative viewpoints during operation is provided in Table 9.8.

Table 9.8 Assessment of visual impacts (short-medium term operation)

<table>
<thead>
<tr>
<th>Viewpoint (refer to Figure 9.2)</th>
<th>Potential impact</th>
<th>Assessment of impact</th>
</tr>
</thead>
</table>
| Gungahlin Terminus — view east along Hibberson Street (View 01)     | Moderate beneficial visual impact | The view would be changed as the existing road would be replaced with the light rail tracks and the footpath extended across to enclose the street.  
The high quality light rail shelters would be highly visible within the view, as would the central overhead wiring poles, wires, and any LRVs located at the stop.  
New proposed trees would only be slightly visible in this view over the short-medium term.                                                                                 |
| Nullarbor Avenue Stop – view north west along Flemington Road (View 02) | Minor adverse visual impact | The light rail and high quality central island stop would be dominant within the view.  
The overhead wiring poles would be highly visible within the median standing out against the skyline.  
New trees planted in the median would not be visible until they have matured. LRVs would be seen travelling through the view, or stopped at the light rail platforms.  
The verges would remain in their existing condition.                                                                                                                                         |
| Condamine Street Stop – view north west along Northbourne Avenue (View 03) | High adverse visual impact | The general landscape quality of the median in this view would be greatly reduced by the removal of the existing trees within the median.  
The size of semi-mature planted tree would have limited landscape visual benefit during the short-medium term.  
The light rail stops and overhead wiring poles would be the most visually prominent element within the view due to the minimal tree coverage. The light rail tracks, while visible within the centre of the view, would be disguised by the proposed native wildflower planting alongside the tracks.  |
| Alinga Street Stop (Civic) – view north along Northbourne Avenue (View 04) | Moderate beneficial visual impact | The majority of the area would become an accessible, high quality public space, which would be befitting for the urban character of the CBD.  
The inclusion of a stop in this view would enhance the experience of the median, establishing a focal point and destination.  
Overhead wiring poles with integrated lighting would replace the street lighting in the median and reduce visual clutter of the public domain.  
The landscape quality of the median in this view would be reduced through the removal of the existing trees within the median.  
The size of semi-mature planted trees would have limited landscape visual benefit during the short-medium term.                                                                                     |

Assessment of representative viewpoints (long term)

The Project would generally contribute to improving existing long term operational viewpoints along the Project alignment, especially along Northbourne Avenue. Planted trees would have matured, offsetting the visual impacts of the light rail and reflecting the existing visual character of Northbourne Avenue.

A summary of the potential long term visual impacts of the Project on representative viewpoints during operation is provided in Table 9.9.
Table 9.9 Assessment of visual impacts (long term operation)

<table>
<thead>
<tr>
<th>Viewpoint (refer to Figure 9.2)</th>
<th>Potential impact</th>
<th>Assessment of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gungahlin Terminus – view east along Hibberson Street (View 01)</td>
<td>Moderate beneficial visual impact</td>
<td>Once the new tree plantings have reached maturity, the trees would be visible behind the platforms. However these trees would have a limited effect of enhancing the visual amenity of the street. Refer to Figure 9.3 for a representation of the long term visual impacts.</td>
</tr>
<tr>
<td>Nullarbor Avenue Stop – view north west along Flemington Road (View 02)</td>
<td>Minor beneficial visual impact</td>
<td>The quality of this view would be greatly enhanced as the proposed median trees (where these can be planted within the median, subject to detailed design) reach a high level of maturity, becoming visible above and behind the light rail stop. The mature trees would minimise the visual impact of the moving LRVs and overhead wiring poles, and would increase the amenity of this view. Refer to Figure 9.4 for a representation of the long term visual impacts.</td>
</tr>
<tr>
<td>Condamine Street Stop – view north west along Northbourne Avenue (View 03)</td>
<td>Very high beneficial visual impact</td>
<td>The visual prominence of the proposed stop would eventually be reduced as the new trees mature and form a continuous tree canopy above it over time. These new trees, once at maturity, would be commensurate to the boulevard character of Northbourne Avenue, and would enhance the overall landscape character of the avenue over time. Refer to Figure 9.5 for a representation of the long term visual impacts.</td>
</tr>
<tr>
<td>Alinga Street Stop (Civic) – view north along Northbourne Avenue (View 04)</td>
<td>Very high beneficial visual impact</td>
<td>Once the new trees in the median have established and reached near maturity, the landscape character of the view would be greatly enhanced. The trees would form a continuous canopy over the light rail tracks, which would have the effect of offsetting the high adverse impacts caused by the removal of the existing trees. Refer to Figure 9.6 for a representation of the long term visual impacts.</td>
</tr>
</tbody>
</table>

Source: HASSELL Architects

Note: Indicative only, subject to detailed design

Figure 9.3 Artist’s impression of the proposed terminus on Hibberson Street, Gungahlin
Figure 9.4  Artist’s impression of the proposed stop along Flemington Road at Nullarbor Avenue

Figure 9.5  Artist’s impression of the proposed stop along Northbourne Avenue at Condamine Street

Note: Indicative only, subject to detailed design
9.4 Proposed mitigation measures and offsets

A series of mitigation measures have been developed to mitigate the potential visual and amenity impacts of the Project during construction and operation. Mitigation measures proposed for construction and operation include:

9.4.1 Detailed design

- Detailed design would consider opportunities to incorporate the proposed substations into the existing environment to reduce their visual prominence (such as through the provision of façade treatments, potential landscaping etc.), in consultation with TAMS.

9.4.2 Construction

- High quality hoarding would be implemented with the consideration given to the potential for public art integration/inspiration from the avenue planting to soften the visual impact of the hoarding. Opportunities for the use of interpretative designs on hoardings during construction to visually display the history and significance of heritage items along the Project route would also be investigated. The final finish of hoardings would be determined prior to construction commencing following agreement between CMA, Project Co and TAMS.
- Access to existing retail developments would be maintained or alternative access would be provided.
- Access would be maintained or alternative routes provided for pedestrians crossing at signalised intersections.
- Where possible materials and machinery within the construction site would be located to minimise visual impacts.
Works would be timed to accommodate special events held at EPIC or Canberra Racecourse.

Early procurement of median trees would ensure quality and consistency of size for implementation.

Maintenance of pedestrian access across Hibberson Street at the intersection with Gungahlin Place would reduce impacts to pedestrians

9.4.3 Operation

The visual impact of the light rail tracks would be mitigated by incorporating a stabilised decomposed granite material finish which is of a natural character and appearance.

The understorey planting of seasonal wildflowers would be established in the short-medium term and would enhance the landscape character and screen the light rail tracks from view in accordance with the urban design principles for the Project.

The potential use of material such as natural decomposed granite for the track finish (or a similar material), as used in Federal Highway would also act to mitigate the visual impact of the light rail infrastructure.

Where the loss of trees is unable to be mitigated through the above measures, the Project would replace trees removed, in accordance with a tree replacement strategy to be developed during detailed design. This strategy would identify suitable species and planting configurations for inclusion along the Project alignment.

Consideration to the opportunity to combine several above-ground street elements (lighting, traffic signals, overhead wiring etc.) on common use poles to reduce visual clutter and to reduce potential impacts on existing awnings and footpaths, would be undertaken in consultation with relevant stakeholders.

Where possible, catenary would be located with consistent pole types and even spacing.

At night, the strategy for lighting would be to ensure the Project contributes to a safe and legible streetscape. In particular, the lighting required for the Project would be mitigated as follows:

- all lights would be located at a similar level to the overhead catenary system so to minimise the light spill onto adjacent areas
- all lights would be directed downwards, with the exception of feature lighting that would always be capped by a surface material
- light colour would be designed in response to the surrounding context and be selected to complement the surrounding lighting colour
- Australian Standard levels for public safety and CCTV would be used, so no unnecessary lighting would be required to be provided.

9.5 Expected conditions

The Project visual impacts in the short to medium term are expected to result in a range of impacts from very highly adverse to very highly beneficial. This is primarily due to the influence of the planted trees within the views, which during short-medium term stage, would not be established enough to provide the optimal landscape benefits. Prior to the full development of the proposed landscaping along the Project route, the Project infrastructure (tracks, stops, substations etc.) would be highly visible within the landscape.

In the long term, the Projects visual impacts are expected to be beneficial. This represents the final establishment of the landscape and planted trees along the Project alignment. The full realisation of the proposed landscaping would be expected to soften any impacts of Project infrastructure.
9.6 Residual risks

Based on the mitigation measures identified in section 9.4, an assessment of the residual planted tree risks associated with the Project have been considered (for risks previously identified as being medium or above). These residual risks are identified in Table 9.10.

Table 9.10 Residual landscape and visual risks

<table>
<thead>
<tr>
<th>ID</th>
<th>Potential impact</th>
<th>Original residual risk rating</th>
<th>Residual likelihood</th>
<th>Residual consequence</th>
<th>Residual risk rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.1</td>
<td>Visual impacts would include vegetation clearing and construction activities including the placement and movement of plant and other equipment during construction.</td>
<td>High</td>
<td>Unlikely</td>
<td>Minor</td>
<td>Medium</td>
</tr>
<tr>
<td>E.2</td>
<td>The placement of such elements as the rail line, new stops, overhead wiring, lighting, substations and the light rail vehicles in the corridor.</td>
<td>Very high</td>
<td>Possible</td>
<td>Moderate</td>
<td>Medium</td>
</tr>
</tbody>
</table>
| E.3 | The depot at Mitchell will provide for landscape changes and visual impacts albeit being introduced into a largely commercial/industrial area:  
  ■ Additional ancillary project elements such as substations would also result in some visual impacts. | High | Possible | Minor | Low |