Figure 2.15c: Construction footprint and construction compounds
Figure 2.15d: Construction footprint and construction compounds

Legend
- Project impact footprint boundary
- Construction compound sites
Figure 2.15e: Construction footprint and construction compounds

<table>
<thead>
<tr>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project impact footprint boundary</td>
</tr>
<tr>
<td>Construction compound sites</td>
</tr>
</tbody>
</table>
**Major compound areas**

Major compounds would be in place for a period of 3 to 4 years during construction of the Project. These construction compounds would accommodate demountable offices, meal rooms, toilets/showers and parking facilities (where possible). Construction support facilities, including lay down facilities, vehicle and equipment storage, maintenance sheds, chemical/fuel stores and stockpile areas.

The following major construction compounds are proposed along the length of the Project. These sites are shown in Figure 2.15a to Figure 2.15e.

### Table 2.6 Proposed construction compound sites

<table>
<thead>
<tr>
<th>General location description</th>
<th>Block/Section</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gungahlin Town Centre East between Kate Crace Street and Manning Clarke Crescent/Hamer Street</td>
<td>Block 1, Section 230 – Gungahlin</td>
<td>This site would be the logistics hub for the Project (approximately 50,000 m²). Surplus spoil would be stored here before reuse or disposal and rail would be stored here for distribution. There are significant trees on this block which would be protected and which would not be removed for construction compound set-up.</td>
</tr>
<tr>
<td>Light Rail stabling depot and maintenance facility site</td>
<td>Block 1, Section 43, Blocks 2 and 3, Section 15 and Block 1, Section 16 – Mitchell</td>
<td>A major culvert will be constructed to provide access from Flemington Road prior to full establishment of this site (approximately 40,000 m²).</td>
</tr>
<tr>
<td>Carpark opposite EPIC</td>
<td>Blocks 21, Section 71 – Lyneham</td>
<td>This site will be used as a construction laydown area (approximately 18,000 m²).</td>
</tr>
<tr>
<td>Canberra Visitor Information Centre</td>
<td>Block 39, Section 6 – Dickson</td>
<td>The ACT Government has been planning to relocate this facility as part of a separate project. The impacts associated with moving this Visitor Information Centre and the details of where this facility will be relocated will be addressed separately by the ACT Government and not part of the approvals and environmental impact assessment for the Project. The Project would be using the vacated block which would have resulted from the relocated facility (approximately 5,500 m²).</td>
</tr>
<tr>
<td>Car park south of the Melbourne Building on London Circuit</td>
<td>Block 13, Section 63 – Civic</td>
<td>A construction compound would be established over this existing public parking facility. This would result in the use of the whole of the western car park and the temporary removal of all the parking spaces (approximately 250 car parking spaces) during the construction phase (approximately 8,000 m²).</td>
</tr>
<tr>
<td>Minor compounds and road median within Project alignment</td>
<td>Not applicable</td>
<td>Any location within the existing median that is within the Project impact footprint.</td>
</tr>
</tbody>
</table>

All compounds are to be fenced and secured, and maintained in a clean and tidy condition. Controls would be put in place to avoid damage to root zones of mature trees in and adjacent to the proposed compound sites. Rainwater would be harvested for use in the compound and for dust suppression. Gas cylinders, lubricating oils, alumina-thermic weld portions and fuel would be securely stored in well ventilated containers in accordance with current legislation.

Shuttle buses would operate from the major compound areas to work sites.
Minor compound areas

Along the alignment there are sections where the median would be wide enough to accommodate some minor site facilities and storage. These areas would store small quantities of materials for day-to-day use and meals and toilet facilities for the construction workforce. These would be established for shorter periods between 3 and 6 months.

Upon completion of the works these minor compound sites would be cleared of the temporary infrastructure and equipment. The land would be reinstated and handed back to the owner or where applicable landscaping will be completed in accordance with the urban design and landscaping plans.

Stockpiling

Stockpiling of construction materials and spoil would generally occur within proposed construction compounds as well as throughout the construction footprint (as shown in Figure 2.15a to Figure 2.15e).

Stockpiles would store excavated materials such as spoil, stripped topsoil, excavated materials and construction materials such as track segments. They would be located on relatively level ground and away from areas of ecological or heritage value or from drainage lines. Stockpiles and equipment storage facilities could occur anywhere within the construction footprint.

Stockpiling of material and spoil may occur for both short and extended periods of time throughout the construction period, depending on the materials being stored. Overall, the period of stockpiling materials would be minimised as far as practicable to limit potential impacts. Where spoil material is required to be stored for extended periods of time, this material would be stabilised or covered with a suitable cap. These measures would be detailed in the Project construction environmental management plan (CEMP). Stockpiling of materials within the median along Northbourne Avenue would be limited (both in terms of extent of material and the length of time material is stored) where possible to minimise visual impacts.

Erosion and sedimentation management

Erosion and sedimentation controls would be installed, maintained and managed prior to and during construction in accordance with relevant EPA and other relevant guidelines detailed in the Project CEMP. Erosion and sedimentation controls which would be employed throughout construction would include:

- best practice erosion and sedimentation control measures, including the use of siltation fences and other filtering devices to restrict sediment movements to within the work sites and to prevent movement of sediment off-site
- minimising the area and duration of soil disturbance
- locating stockpiles away from drainage lines
- minimising flow velocity of runoff water across work sites and dispersing, rather than concentrating, flows
- revegetation of construction areas as soon as practically possible after construction activities have been completed
- retaining natural vegetation, where possible, to act as buffer zones to minimise erosion
- diverting surface runoff away from disturbed areas at site compounds wherever practicable
- stabilisation of material stockpiles through seeding or weed matting to minimise sedimentation and potential run-off
planning construction works to minimise the length of time soils are disturbed

- restricting construction traffic in unsealed areas and, where required, operation of wheel cleaning areas at locations where vehicles leave the construction site.

The application of specific erosion and sedimentation control measures for each compound location and construction element or activity would be determined on site taking into account local constraints including topography, available space and access requirements.

Construction traffic and parking

Construction traffic arrangements

Construction traffic arrangements would be considered in more detail following finalisation of the design. General principles would be implemented during the construction of the Project would include the following:

- maintenance of traffic flow in both directions
- use of median lane closures in contra-peak direction during traffic peaks and in both directions during off-peak times
- maintenance of at least one lane in each direction, with the exception of bridge structure locations
- staged construction of intersection works, with detail to be determined during future phases of design
- temporarily close right-turns during construction, where necessary.

Vehicle movements

Construction vehicle movements would comprise vehicles transporting equipment, materials and spoil, as well as worker’s vehicles. Minor volumes of materials are expected to be excavated for utility relocations/protection works, or for the construction of the track. Larger volumes of heavy vehicles would occur during the main civil construction works when heavy vehicles are required to transport spoil, concrete, equipment, tracks, overhead wiring etc.

Average and peak daily heavy vehicle movements are outlined in Table 2.7. These truck movements have been estimated based on the average number of truck movements per day and the individual peak number of heavy vehicle movements for any activity throughout the works. The truck movements stated in Table 2.7 are indicative only and may change as a result of detailed construction planning.

<table>
<thead>
<tr>
<th>Table 2.7 Estimate vehicle trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>2016</td>
</tr>
<tr>
<td>2017</td>
</tr>
<tr>
<td>2018</td>
</tr>
<tr>
<td>2019</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

*Indicative daily movements based on approx. 300 working days per year (i.e. No work on Sundays and exclusion of public holidays). This is an average and there would be days of increased peak activities which may impact these average/indicative numbers.
Construction vehicle traffic would be greatest during the main earthworks and civil construction, and would comprise vehicles transporting equipment, materials and spoil, and construction workers accessing the work sites.

Most of the light vehicle movements associated with the construction works would generally be limited to construction staff travelling to and from site for work. Standard traffic management measures would be employed to minimise short-term traffic impacts expected during construction. These measures would be identified in the CTMP.

Construction parking

The main construction car parks would be at the main construction compounds (refer to table below). Reserved car parking for emergency vehicles would be provided within the proposed construction compounds, where appropriate. Construction parking outside of the identified construction compounds would be managed through measures identified in the CTMP. Any proposed on-street parking would be identified within the CTMP and in consultation with TAMS. Table 2.8 identifies the number of car parking spaces that could be accommodated at each of the major construction compound sites.

Table 2.8 Proposed construction parking

<table>
<thead>
<tr>
<th>Construction worker parking location</th>
<th>Approximate number of vehicle parking spaces for construction personnel within construction compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction compound – Gungahlin Town Centre</td>
<td>150 car parking spaces</td>
</tr>
<tr>
<td>Construction compound – Light Rail Depot site</td>
<td>50 car parking spaces</td>
</tr>
<tr>
<td>Construction compound – Car park opposite EPIC</td>
<td>150 car parking spaces</td>
</tr>
<tr>
<td>Construction compound – Current Visitor Information Centre</td>
<td>50 car parking spaces</td>
</tr>
<tr>
<td>Construction compound – Car park south of the Melbourne Building on London Circuit</td>
<td>150 car parking spaces</td>
</tr>
</tbody>
</table>

Construction access and traffic routes

Designated access routes for construction and spoil vehicles would be via the shortest viable route to the arterial road network (refer to proposed routes identified in Figure 2.16). Construction traffic movements between compounds and work sites would be confined, where possible, to travel within the identified Project impact footprint. Where travel within the Project impact footprint is not possible, construction traffic would use identified routes planned to minimise disruption to the public and maintain standards as they relate to noise, vibration, air and water quality.

Routes have been selected to avoid local residential areas but also minimise travel distance. Heavy vehicles would also follow the alignment of the light rail route. Details of all routes used for access and haulage during construction would be refined in consultation with relevant stakeholders and detailed in the appropriate section of an overall construction traffic management plan (CTMP) for the Project.

Oversize vehicles

A number of oversize vehicle deliveries will also be required for some elements of the Project. Oversize equipment to be delivered would include LRVs, substations, heavy plant and bridge beams. Approximately 150 oversize deliveries are expected during the design and delivery phase of Project. These journeys would typically originate interstate and arrive via the routes shown on Figure 2.16. Out of hours deliveries, including those from oversize vehicles, would be minimised as much as practicable.
Construction waste removal

The majority of the excess material would be disposed of at the West Belconnen Resource Management Centre (refer to Figure 2.16). Initial consultation with ACT NoWaste has been undertaken by CMA to confirm the suitability of this facility for the disposal of waste associated with the Project. This facility has the capacity to process, recycle or dispose of all waste generated by the Project.

Local access to properties and businesses would be maintained in a trafficable condition at all times. Where local access is between carriageways, traffic management would be prepared and implemented to minimise disruption to the public through the CTMP for the Project.
### Table 2.9 Proposed construction parking

<table>
<thead>
<tr>
<th>Event class</th>
<th>Event</th>
</tr>
</thead>
</table>
| Class 1 events | ■ New Year’s Eve – City Centre  
 ■ Summer Nats – EPIC  
 ■ Multicultural Festival – City Centre  
 ■ Royal Canberra Show – EPIC  
 ■ National Folk Festival – EPIC  
 ■ Spring Home and Leisure show – EPIC |
| Class 2 events | ■ Canberra Cup Race Day – Thoroughbred Park  
 ■ Other events at EPIC |
| Class 3 events | ■ Australia Celebrates – Federation Mall  
 ■ Australia Day Fireworks – Lake Burley Griffin  
 ■ Skyfire – Lake Burley Griffin  
 ■ Floriade – Commonwealth Park  
 ■ Events – Manuka Oval  
 ■ Events – Canberra Stadium  
 ■ Anzac Day – Australian War Memorial  
 ■ Canberra Balloon Spectacular  
 ■ Groovin the Moo – University of Canberra |

Project Co would be required to consider and minimise impacts to all Class 1 events during the construction phase, which may affect haulage routes, delivery operations and require traffic conditions to be adjusted. Project Co would be required to manage all traffic and transport coordination in consultation with TAMS and ACTION and consistent with the Construction Traffic and Transport Management Constraints and guideline.

During Class 2 and 3 Events, Project Co would be required to arrange delivery activities and construction works so as to not adversely impact on the event(s) and would be required to communicate through suitable channels with the stakeholders and the public to highlight any changed traffic conditions and public transport arrangements.

#### 2.2.4 Territory land and lease boundary realignment requirements

A Project impact footprint has been prepared based on the current Project design. The Project impact footprint outlines the area which is likely to be impacted by the development and operation of the Project. This footprint includes the road reserves, substation locations and connections to the high voltage electricity network, the light rail depot, additional road intersection and access works and the required temporary construction compounds.

The majority of the Project would be contained within the existing road reserves and unleased Territory land of Hibberson Street, Flemington Road, Federal Highway and Northbourne Avenue. There are however small areas of existing leased and unleased Territory land that would likely be affected by the Project.

Table 2.10 specifies each individual parcel of land that would be affected by the Project, the applicable land custodianship and the rationale for land impacts outside the existing road reserve.
### Table 2.10 Land impacts outside existing road reserve in order from north to south

<table>
<thead>
<tr>
<th>Block details</th>
<th>Location</th>
<th>Land custodianship</th>
<th>Rationale for land impacts outside the existing road reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td>Flemington Road immediately east of Kate Crace Street</td>
<td>Land Development Agency – Unleased</td>
<td>Provision of a new two lane outbound carriageway to the south of the light rail will not be possible within the existing road reserve so some block encroachment would be required.</td>
</tr>
<tr>
<td>Block 1</td>
<td>Flemington Road</td>
<td>Land Development Agency – Unleased</td>
<td>Site identified for temporary construction compound. A substation would also be located on this block.</td>
</tr>
<tr>
<td>Block 3</td>
<td>Off Flemington Road, south of Collaroy Street</td>
<td>Land Development Agency – Unleased</td>
<td>A substation would be located on this block.</td>
</tr>
<tr>
<td>Block 29</td>
<td>Off Flemington Road, south of Well Station Drive</td>
<td>TAMS – Vacant (Other) – Municipal – Unleased</td>
<td>A substation would be located on this block.</td>
</tr>
<tr>
<td>Block 2</td>
<td>Sandford Street</td>
<td>TAMS – Other Unleased Assets – Environment – Unleased</td>
<td>The stabling depot and maintenance facility and associated infrastructure (including a substation) would be developed on this parcel of land adjacent to the light rail and road corridor.</td>
</tr>
<tr>
<td>Block 3</td>
<td>Sandford Street</td>
<td>TAMS – Vacant (Other) – Municipal – Unleased</td>
<td>The stabling depot and maintenance facility and associated infrastructure (including a substation) would be developed on this parcel of land adjacent to the light rail and road corridor.</td>
</tr>
<tr>
<td>Block 1</td>
<td>Sandford Street</td>
<td>TAMS – Public Land – Environment – Unleased Note: Nature Conservation Overlay</td>
<td>The stabling depot and maintenance facility and associated infrastructure (including a substation) would be developed on this parcel of land adjacent to the light rail and road corridor.</td>
</tr>
<tr>
<td>Block 1</td>
<td>Sandford Street</td>
<td>Other ACT Government Agency – Not Public Land – Unleased Leased Territory Land – Private Lease – Not Public Land</td>
<td>The stabling depot and maintenance facility and associated infrastructure (including a substation) would be developed on this parcel of land adjacent to the light rail and road corridor. Note: there is currently a lease over the site which would require amendment.</td>
</tr>
<tr>
<td>Block 1</td>
<td>EPIC/Randwick Road stop/intersection layout (north-west corner)</td>
<td>TAMS – Public Land – Environment – Unleased Note: Nature Conservation Overlay</td>
<td>Road widening of Flemington Road is necessary to accommodate the light rail stop as well as additional turning and through lanes at the intersection. Road works including curb works may impact on this block.</td>
</tr>
<tr>
<td>Block 5</td>
<td>EPIC/Randwick Road stop/intersection layout (south-west corner)</td>
<td>TAMS – Public places – Municipal – Unleased</td>
<td>Road widening of Flemington Road is necessary to accommodate the light rail stop as well as additional turning and through lanes at the intersection. Additional road works would impact this block. Note: there is currently a licence over the site which would require amendment. Site identified for temporary construction compound.</td>
</tr>
<tr>
<td>Block details</td>
<td>Location</td>
<td>Land custodianship</td>
<td>Rationale for land impacts outside the existing road reserve</td>
</tr>
<tr>
<td>----------------</td>
<td>----------</td>
<td>-------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Block 21 Section 71, Lyneham</td>
<td>EPIC temporary car park site</td>
<td>TAMS – Vacant (Other) – Municipal – Unleased</td>
<td>Widening of Flemington Road on the west side opposite EPIC, to provide an outbound lane on the west side of the light rail, is likely to require land take from the parcel of land containing the existing car park. Note: there is currently a licence over the site which would require amendment. Site identified for temporary construction compound.</td>
</tr>
<tr>
<td>Block 1 Section 61, Lyneham</td>
<td>Off Flemington Road</td>
<td>TAMS – Vacant (Other) – Municipal – Unleased</td>
<td>Widening of Flemington Road to provide lanes required.</td>
</tr>
<tr>
<td>Block 2 Section 61, Lyneham</td>
<td>Off Flemington Road</td>
<td>TAMS – Public places – Municipal – Unleased</td>
<td>Widening of Flemington Road to provide lanes required for access into new EPIC intersection.</td>
</tr>
<tr>
<td>Block 5 Section 72, Lyneham</td>
<td>EPIC site</td>
<td>Other Government agency – Not Public Land - Unleased</td>
<td>Allowance has been made at the intersection of Randwick Road to extend to four-way, providing a consolidated main access point into the EPIC site. Additional access point land take requirements also possible. Land take may be required to the east within EPIC to accommodate the relocated city bound traffic lanes including widening of the Flemington Road approach to the Federal Highway intersection to two lanes.</td>
</tr>
<tr>
<td>Block 1 Section 75, Lyneham</td>
<td>Corner of Flemington Road and Federal Highway</td>
<td>TAMS – Public places – Municipal – Unleased</td>
<td>Land take is required to the east within EPIC to accommodate the relocated city bound traffic lanes including widening of the Flemington Road approach to the Federal Highway intersection to two lanes.</td>
</tr>
<tr>
<td>Block 20 Section 71, Lyneham</td>
<td>Land adjacent to Kamberra Winery access</td>
<td>TAMS – Public places – Municipal – Unleased</td>
<td>Road widening of the Federal Highway on the west side is necessary to accommodate the light rail stop as well as additional turning and through lanes at the intersection. While the road works would remain within the existing road reserve, the residual verge widths on the west side would be narrow.</td>
</tr>
<tr>
<td>Block 19 Section 71, Lyneham</td>
<td>Land adjacent to Kamberra Winery access</td>
<td>TAMS – Public places – Municipal – Unleased</td>
<td>Road widening of the Federal Highway on the west side is necessary to accommodate the light rail stop as well as additional turning and through lanes at the intersection. While the road works would remain within the existing road reserve, the residual verge widths on the west side would be narrow.</td>
</tr>
<tr>
<td>Block 41 Section 51, Downer</td>
<td>Off Federal Highway</td>
<td>TAMS – Public places – Municipal – Unleased</td>
<td>A substation would be located on this block.</td>
</tr>
<tr>
<td>Block 4 Section 67, Lyneham – Volume 1686 Folio 95</td>
<td>Yowani Country Club</td>
<td>Leased Territory Land – Private lease – Not Public Land</td>
<td>Swinden Street stop/intersection layout conversion to a four way intersection to provide a new access into the Yowani Country Club and associated road widening of the Federal Highway to accommodate the light rail stop, slip lanes and additional through lane on the Federal Highway both north and southbound.</td>
</tr>
<tr>
<td>Block 49 Section 59, Lyneham</td>
<td>Lyneham Sports Precinct</td>
<td>TAMS – Public places – Municipal – Unleased</td>
<td>Land required to accommodate additional northbound lane along Northbourne Avenue from Antill Street to Barton Highway.</td>
</tr>
<tr>
<td>Block 39 Section 6, Dickson</td>
<td>Dickson Visitor Information Centre</td>
<td>Leased Territory Land – Government Lease – Not Public Land</td>
<td>Site identified for temporary construction compound.</td>
</tr>
</tbody>
</table>
### Block details

<table>
<thead>
<tr>
<th>Block</th>
<th>Location</th>
<th>Land custodianship</th>
<th>Rationale for land impacts outside the existing road reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 12</td>
<td>Macarthur House. Corner of Northbourne Avenue and</td>
<td>Leased Territory Land – Government</td>
<td>A substation would be located on this block. Note: there is currently a lease over the site which</td>
</tr>
<tr>
<td>Section 50</td>
<td>Macarthur Avenue</td>
<td>Lease – Not Public Land</td>
<td>would require amendment.</td>
</tr>
<tr>
<td>Lyneham –</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume 1139</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folio 50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 13</td>
<td>City Car Park – Corner London Circuit and Northborne</td>
<td>TAMS – Public land – Municipal – Car</td>
<td>Site identified for temporary construction compound.</td>
</tr>
<tr>
<td>Section 63</td>
<td>Avenue</td>
<td>Park</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Project land impacts would generally fall into one of the following categories:

- Territory land boundary realignments
- land required for substations
- land subject to lease surrender and re-grant
- removal of land licences
- land required for the temporary construction compounds.
- land required for Territory land or lease boundary realignment.

### Territory land realignments

As described, the majority of the Project would be contained within the existing road reserves of Hibberson Street, Flemington Road, Federal Highway and Northbourne Avenue. However, in order to accommodate Project elements such as the light rail stops, stabling depot and maintenance facility, substations and additional road carriageway and intersection improvements, the existing road reserve would need to be widened in a number of locations along the route. The Project design has been undertaken to ensure minimal impacts on leased land and the majority of impacts, as identified in Table 2.10, would be on unleased Territory Land.

The below sections detail the required Territory Land boundary realignments required to accommodate the Project.

### Required boundary realignments

Boundary realignments would be required for the following blocks described in Table 2.10.

- Block 1 Section 231, Gungahlin
- Block 2 Section 15, Mitchell
- Block 3 Section 15, Mitchell
- Block 1 Section 16, Mitchell
- Block 49 Section 59, Lyneham
- Block 1 Section 60, Lyneham
- Block 1 Section 61, Lyneham
- Block 2 Section 61, Lyneham
- Block 5 Section 71, Lyneham
The areas of land requiring boundary realignments are shown on Figure 2.17a to Figure 2.17e.

**Land required for substations**

As described in section 2.2.1, the Project would include a total of seven substations located along the Project alignment and connections to the existing high voltage network. For the high voltage connections, these would be accommodated within existing road reserves and would not require boundary realignments for these connections. Five of the substations would also be located within the existing corridor road reserves. The land needed to accommodate these five substations would not be removed from the road reserve and a specific substation block would not be created.

The two other substations would however be located on land that is currently leased (one within the stabling depot and maintenance facility site and one at Macarthur House). The leases over these two sites would be surrendered and the land removed from the lease before the re-grant takes place (refer to following section for further details). The substation at the depot would be located in the newly created block which would house the entire stabling depot and maintenance facility. The substation at Macarthur House would be surveyed with the intention that a standalone block would be created for this substation. This block would be approximately 150 square metres.

The applicable block and section references for each of the substation sites is provided in Table 2.10.

**Land subject to lease surrender and re-grant**

Two locations along the Project alignment would impact on land currently covered by Executive Leases (ACT Government to ACT Government). The leases at both of these sites would need to be surrendered and then re-granted with the land impacted excluded from the new lease. The details of both these blocks and the land requirements are detailed below:

- Block 1 Section 16, Mitchell – A portion of the south east corner of the existing block would need to be removed from the lease as this portion of the block would be used to form a new block to accommodate the stabling depot and maintenance facility (refer to Figure 2.17b). The new stabling depot and maintenance facility site would be created by amalgamating three existing blocks into one. The current lease of the facility is for the Supply Services unit of ACT Health (formerly Totalcare).

- Block 12 Section 50, Lyneham – There is a current lease over this site which houses the ACT Government (TAMS) Directorate. An electrical substation located on this block to supply the light rail system. A standalone block would be created for the proposed substation.

ACT Property Group is responsible for administering both of these leases. Once onsite surveys have been completed, CMA would meet with the ACT Property Group to formalise the required process.
Figure 2.17b: Proposed Territory land and lease boundary realignment requirements

Legend:
- Project impact footprint boundary
- Construction compound sites
- Land subject to boundary realignment
- Substation sites
Figure 2.17d: Proposed Territory land and lease boundary realignment requirements

Legend
- Project impact footprint boundary
- Construction compound sites
- Land subject to boundary realignment
- Substation sites
Figure 2.17c: Proposed Territory land and lease boundary realignment requirements

Legend:
- Project impact footprint boundary
- Construction compound sites
- Land subject to boundary realignment
- Substation sites
Removal of land licences

There are a number of blocks that have existing licences over them that would need to be removed. These sites are:

- Block 2 Section 15, Mitchell
- Block 1 Section 42, Mitchell
- Block 5 Section 71, Lyneham
- Block 21 Section 71, Lyneham.

Negotiations would occur with relevant licence holders to ensure licences are removed prior to construction commencing.

Territory Land Boundary realignment

As described in Table 2.10, the Project would involve some land impacts at Downer to accommodate the proposed the Swinden Street stop, new access to Yowani Country Club and a new four way intersection at Swinden Street providing access to the Lyneham Sport Precinct. To accommodate the stop and intersection, realignment of the existing land lease boundary would be required at the Yowani Country Club. CMA has commenced discussion with the Yowani Country Club regarding the land lease boundary realignment required to accommodate the intersection changes. Ongoing discussion with the Yowani Country Club would continue as part of the ongoing refinement to the design of the Project.

An additional portion of land adjacent to the road reserve has been recently identified as being required to accommodate the road widening of the Federal Highway to allow for the light rail stop, slip lanes and additional through lanes on the Federal Highway both north and southbound. The applicable land that the required Territory land boundary realignment relates to is Block 4, Section 67 Lyneham and is shown in Figure 2.17c.

2.2.5 Operation of the Project

Light rail services

The Project is proposed to operate as a ‘turn up and go’ service. The Project would operate between 6.00 am and midnight Monday to Thursday, 6.00am and 1.30 am on Fridays and Saturdays and between 8.00 am and midnight on Sundays. The Project would commence operations at a frequency of:

- six minutes between 7.00 am and 9.00 am and between 4.00 pm and 6.00 pm on weekdays
- 10 minutes between 9.00 am and 4.00 pm on weekdays
- 15 minutes at other times on weekdays, Saturdays and Sundays.

The journey time for the Project is anticipated to be approximately 25 minutes from Gungahlin to Civic, with no significant difference between peak and off-peak.
Light rail vehicles

The LRVs would have a capacity of at least 200 passengers, would be approximately 2.65 metres wide and up to 33 metres long. LRVs would have level boarding at all doors, priority seats for mobility-impaired passengers and designated areas for wheelchairs, pushers and bicycles. LRVs would also have visual and audible announcements for each stop as it approaches, including interchange information. The LRVs would also provide dedicated space for four bicycles. Power supply for the LRVs would be at 750 V DC using overhead wires, however the LRVs would be capable of conversion to operate wirelessly on potential future extensions.

The Project would commence with an initial fleet of approximately 14 LRVs.

Track sanding

The LRVs to be used for the Project would utilise sand to gain traction in slippery conditions, when required. The LRV would automatically spray a small amount of sand in front of the wheels to help it gain better traction. The on-board sand boxes would be filled at the stabling depot and maintenance facility as required at the end of each shift.

LRV and road network integration

A key feature of the Project is that, for the majority of the proposed route, LRVs would operate within an exclusive right-of-way within generally existing medians. This provides an operating environment that is both safe and free from the adverse effects of road congestion. However, at intersections and at a limited number of other locations, LRVs would share the right-of-way with other road users and/or pedestrians.

LRVs would progress through intersections under signal control, but with some priority over vehicular traffic. Traffic signals would be designed to detect the approach of an LRV in sufficient time allow for an LRV to pass through an intersection as it approaches. The design intent is for LRVs to be able to proceed through all intersections with minimal delay.

In practice however, LRVs would experience some small delays at some intersections depending on the direction of travel and the time of day. This is due to the need to maintain effective signal coordination for the road network. Estimates of these delays to LRVs have been factored into the proposed light rail journey time forecasts. The amount of delay would depend on the final design of the intersections and traffic light control system which would be completed during the detailed design phase of the proposal.

Posted road speeds and design speeds

The LRVs would operate with a maximum vehicle speed of 70 kilometres per hour. However, there would be situations where lower operating speeds will be appropriate:

- Light rail vehicles speed limits would match the road speed limits of the adjacent roadways. Where this is higher than 70 kilometres per hour, such as along the Federal Highway where the posted speed limit is 80 kilometres per hour, the maximum LRV speed would not be exceeded.
- A lower speed limit would be applied to the light rail only area along Hibberson Street where a maximum proposed speed limit of 20 kilometres per hour is proposed.
Cycle paths

The Project would maintain ongoing provisions for pedestrians and cyclists with the objective of:

- providing safe pedestrian access to platforms with minimal deviation from pedestrian desire lines, including providing signalised pedestrian crossings
- maintaining safe pedestrian access along and across the light rail corridor
- providing for continued safe cyclist access along and across the light rail corridor.

Cycle paths have been considered as part of the Project works, with the approach being to reinstate or repair any existing cycle paths that are impacted by the Project. Existing bicycle lanes and priority controls would be maintained along the corridor, typically without modification. There is no current proposal to construct additional cycle paths as part of current Project.

One section of existing cycle path along the alignment has been identified as being impacted by the Project and would require reinstatement. This section generally relates to the existing on-road shoulder cycle lanes along Flemington Road between Well Station Drive and the Federal Highway.

Integration with other transport modes

Light rail stops would be connected from the median to the nearest footpath using signalised pedestrian crossings, generally at one end of the platform. Along some sections of the Project alignment (such as along Flemington Road), bus lanes would be removed and the bus network restructured to avoid the duplication of services (refer to Chapter 10 for details).

The following major interchange locations would be developed to integrate with the Project:

- Gungahlin Town Centre — the existing bus network would be adjusted to integrate with the new terminus stop located in Gungahlin Place.
- Mitchell — the Project would integrate with existing bus stops in Sandford Street and Well Station Drive.
- Dickson — a new bus interchange is currently being considered adjacent to the proposed Dickson Stop. This interchange is outside the scope of the current Project and would be designed and constructed independently of the Project, with linkages proposed between the new interchange and the Dickson Stop.
- Civic — the Project would provide interchange opportunities with the existing bus interchange in Alinga Street, Northbourne Avenue and East Row.

Bus operation changes

As part of the regular bus service, ACTION Buses currently operate several routes travelling along and in the vicinity of the study area. The proposed introduction of the Project would be accompanied with a modification to the existing bus network (occurring separately to this Project) to avoid the duplication of services along the corridor and to allow passengers to conveniently interchange between services to take advantage of the quicker and more direct light rail service. Overall, the proposed changes to bus operation at the Gungahlin Town Centre, Dickson and Civic would include the following:

- A revised local bus network would be introduced, serving bus/light rail interchanges at Gungahlin, Dickson and the Civic at which passengers would interchange between light rail and bus. The proposed revised local bus network would be based upon removing buses travelling as trunk or express services along Flemington Road and Northbourne Avenue between Gungahlin, Dickson and the Civic. The reallocation of these services to alternative routes would be determined by ACTION Buses and is outside the scope of the current Project.
Current bus routes running along Northbourne Avenue, Federal Highway and Flemington Road towards Gungahlin and vice versa would be removed as trunk or express services along these routes and replaced with the proposed light rail).

Further details regarding the proposed changes to existing bus networks as a result of the Project is provided in Chapter 10.

Changes to parking

Locating the light rail within the median would minimise the impact on existing parking spaces. The pedestrianisation of sections of Hibberson Street would affect some (up to 24 spaces) existing parking spaces between Gungahlin Place and Hinder Street, and some existing parking spaces between Hinder Street and Kate Crace Street (up to 30 spaces). The creation of car passenger drop-off and pick-up spaces near light rail stops may result in the loss of some parking spaces at these locations.

Ticketing system and passenger displays

The Project would be fully integrated with the MyWay ticketing system. Each stop would include the provision of card validators with some stops including ticket vending and MyWay top-up machines (to be determined as part of the detailed design of the Project). The placement and number of these devices would be investigated as operational requirements are developed.

Stabling depot and maintenance facility operations

The stabling depot and maintenance facility would allow the stabling and deployment of LRVs to meet the operational requirements of Project. The stabling depot would provide safe and secure storage of LRVs, for efficient and economic inspections and regular repair and cleaning as part of the LRVs’ maintenance regime. The stabling and maintenance facilities would provide for the ongoing maintenance of the entire rolling stock fleet, including preventative and corrective maintenance, heavy lift and overhead work, general presentation area and associated office and storage facilities for infrastructure and LRVs whilst not in use.

The stabling depot and maintenance facility would also be the main management and control base for the Project and would include the Operational Control Centre (OCC). The OCC would control and manage the technical rail systems of the Project. The OCC would be staffed on a 24-hour basis by operators who would monitor performance of the network, manage staff, manage LRV services, respond to incidents, provide passenger information and monitor power supply.

There would be regular activity at the stabling depot and maintenance facility on a 24-hour basis. The maintenance component of the facility would allow for the following operational requirements and activities. These would generally be undertaken within a dedicated enclosure:

- LRV maintenance
- workshop(s)
- underfloor wheel lathe and inspection pits
- bogie lifting and storage areas
- component repair and other infrastructure storage areas
- paint booth (including graffiti removal).

On average, 1 to 2 LRVs would be in the maintenance facility at any one time. Overnight activity may include interior LRV cleaning (mopping, sweeping, vacuuming of the LRVs).
Upon entering the stabling facility, each LRV would pass through the sanding plant and/or wash plant or directly travel to a stabling location within the site. Rainwater harvesting would be used at the stabling depot and maintenance facility in addition to water efficient vehicle wash facilities. Some hazardous materials would be used and stored at the stabling/maintenance facility and these would be managed and stored by Project Co in accordance with relevant Territory regulations.

**Infrastructure maintenance during operation**

Maintenance would be required at times along the light rail track. Maintenance activities would include:

- regular activities such as track and overhead wiring inspections, and inspection and cleaning of the track drainage system
- preventative maintenance and repair and minor repairs to failed infrastructure components as required
- maintenance of landscaping and appropriate clearances to overhead trees (branch trimming etc.)
- cleaning of passenger facilities
- track grinding and periodic replacement of track and other light rail infrastructure.

During operation of the Project, Project Co would be responsible for the maintenance of infrastructure within the operational boundary of the Project. This would include maintenance of Project elements such as:

- all operational Project infrastructure such as tracks, track slabs and overhead wiring
- all infrastructure and cleaning services at stops, including stop shelters, stop platform surfaces and removal of rubbish from bins located on stop platforms
- substation maintenance, including landscaping within the identified substation sites.

Existing infrastructure and landscape maintenance that is currently undertaken by TAMS that is outside the operational boundary of the Project would continue to be managed and undertaken by TAMS. Access to any existing infrastructure that currently exists and is accessible would be maintained as part of the Project.

The final requirements for infrastructure and landscape maintenance responsibilities associated with the Project would be negotiated through ongoing consultation and agreement between CMA, Project Co and TAMS during the design and construction phase with a view to the establishment of a maintenance interface agreement between Project Co. and TAMS for the operations phase of the Project.

**Light rail stop and communications systems**

Each light rail stop would be installed with an equipment module/cabinet to house all local communications and passenger information system equipment relevant to the stop. Systems at stops such as closed circuit television, ticketing, public address systems (emergency only), audio call/help points, and passenger information displays would be provided at each stop location.

On-board the LRVs, there would be passenger PA systems to announce items such as next stops, or other relevant information. These systems would be connected to the communications backbone network, with all base equipment located at the operational control centre.
Road and LRV safety

Signalling

The Project would operate as a line-of-sight light rail system. As with a road vehicle, it would be the driver’s responsibility to observe the route ahead and stop before any obstruction. No signalling system would be required to maintain separation between LRVs on plain track. As with road traffic, signalling would be required to manage potential conflicts between LRVs and road vehicles at intersections.

At simple light rail junctions (such as crossovers or at terminus locations) where speeds are low and sight lines are good, a rule would be used to define which LRV has priority if more than one LRV approaches at once (analogous to Give Way or Stop signs at road intersections). At more complex road intersections, where speeds are higher, or where sight lines are poor, signalling would be provided to manage conflicts between LRVs even if no road traffic is present.

Disruptions to light rail services and incident management

During operation of the Project, unforeseen incidents may disrupt Project services, preventing parts of the network from being operated. Such incidents could include:

- road traffic accidents (including a collision between an LRV and motor vehicle or pedestrian)
- major fault or failure of an LRV, requiring police attendance to divert traffic until the disabled LRV has been recovered
- fire on board an LRV
- infrastructure faults (e.g. track, overhead wires and signals)
- derailment of an LRV vehicle
- overhead power supply failure
- unruly or ill passenger(s)
- flooding, bushfires or other environmental disruptions.

Preliminary operational contingency measures would be developed and implemented in the event of such incidents occurring. Recovery of a damaged/disabled LRV from the road network is anticipated to be a relatively simple operation due to the central median alignment of the Project that would allow ready access by a tow vehicle (truck).

Where an unforeseen incident prevents part of the Project from being operated, shortened services would be provided where possible (dependent upon the location and nature of the incident).

Event management

Most special events would typically be held outside of peak hours and therefore some spare LRVs would be available to supplement normal services. On the day of a special event, Project Co would make announcements (such as through the use of PIDS and on-board PA) at relevant stops advising customers of special event arrangements.
2.3 Project objectives and justification

2.3.1 Project vision and objectives

The Project has identified two key rationales:

- to increase overall levels of transportation service for the people of Canberra, facilitating a shift to public transport consistent with ACT Government policy
- to provide sustainable urban development and revitalisation along the proposed rail corridor, with employment, economic and social benefits for the people of Canberra.

The Project’s vision has been identified as being:

‘to boost Canberra’s sustainable growth by changing and improving transport options, settlement patterns and employment opportunities’.

In meeting this vision, eight project objectives have been identified to guide the development of the Project. These objectives are listed in Table 2.11 below.

Table 2.11 Capital Metro Light Rail Stage 1 — Gungahlin to Civic Project objectives

<table>
<thead>
<tr>
<th>Project objective</th>
<th>Category</th>
<th>Objective description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase the mode share of public transport (direct)</td>
<td>Transport</td>
<td>Capital Metro would increase the use of public transport. The main focus is to get people out of their cars and on to Capital Metro. A new, legible and easy to use service would generate trips, particularly into the central retail and commercial precinct of the City. The service needs to be safe, convenient, attractive, frequent, reliable, affordable and integrated with a modified bus and pedestrian network.</td>
</tr>
<tr>
<td>Optimise frequency and service reliability (direct)</td>
<td>Transport</td>
<td>Light rail on dedicated tracks is one of the most reliable forms of public transport service. Capital Metro would provide commuters and other users with high levels of on-time running.</td>
</tr>
<tr>
<td>Affordable capital and operational costs (direct)</td>
<td>Economic</td>
<td>The service would be developed with financial prudence and value for money outcomes for the ACT.</td>
</tr>
<tr>
<td>Grow a more diversified Canberra economy (indirect)</td>
<td>Economic</td>
<td>Capital Metro would be a direct and indirect stimulus to a Canberra economy that needs to diversify its base to reduce the reliance on government administration and defence. A world-class transport service will support economic activity in many ways. It will improve vital connections between people, stimulate business innovation, and assist in attracting and retaining skilled workers, enterprising businesses and students to Canberra.</td>
</tr>
<tr>
<td>Stimulate sustainable, urban re-development along the corridor (direct)</td>
<td>Economic</td>
<td>The Northbourne Avenue Corridor is identified in the City Plan as an area for significant smart growth via re-development. Capital Metro is a complementary project that supports higher density land use, which in turn increases patronage on the service.</td>
</tr>
<tr>
<td>Increase social and economic participation (indirect)</td>
<td>Community</td>
<td>The service would provide greater opportunities for non-motor vehicle owning people to access jobs, education, health services and other social activities.</td>
</tr>
<tr>
<td>Revitalise the Northbourne Avenue corridor (indirect)</td>
<td>Community</td>
<td>The Northbourne Avenue Corridor is a gateway to Canberra for residents entering the City or visitors entering from the north. Revitalisation would make it a more active and socially connected precinct for all types of Canberra residents and a fitting gateway to the nation’s capital. The Capital Metro will increase activity at ground level and boost the image of the city.</td>
</tr>
</tbody>
</table>
### Project objectives

<table>
<thead>
<tr>
<th>Project objective</th>
<th>Category</th>
<th>Objective description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce carbon and other emissions (direct)</td>
<td>Environmental</td>
<td>The additional passenger capacity and demand would replace trips by motor vehicle and consequently reduce greenhouse emissions. In addition, other motor vehicle emissions such as particulate matter, nitric oxides and carbon monoxide would also be reduced.</td>
</tr>
</tbody>
</table>

By fulfilling the project objectives, the project would generate a range of sustainability benefits derived from improved connectivity, from realising urban renewal opportunities and environmental quality improvements.

## Key benefits

The introduction of light rail would change the way transport services are delivered and used in Canberra. Construction of a new high-capacity, frequent and reliable mode of transport would unlock additional capacity and provide a better experience to customers. Key benefits of the Project have been identified as follows:

- **Create jobs** — construction of the Project would support up to 3,500 jobs (approximately 1,400 direct and approximately 2,100 indirect jobs). Additionally, the corridor development could result in up to 26,000 additional jobs along the corridor. Taking into account the flow-on jobs from industry and consumption effects results, this could result in up to 50,000 additional jobs along the corridor. Approximately 125 jobs are anticipated to be directly created as a result of the Project (Ernst and Young, 2014).

- **Encourage investment** — The Project has already attracted significant investor interest in Australia and overseas.

- **Revitalise the city** — Light rail is proven to attract people and economic activity to the areas surrounding stops. In Canberra, light rail is being used to help stimulate urban renewal along the Northbourne Corridor and in the City, supporting the City Plan and City to Lake initiatives. Light rail will also help manage population growth by supporting urban intensification along transport routes as set out in the ACT Government’s planning strategy.

- **Increase accessibility and connectivity** — The Project would link the City to the rapidly developing suburbs of the north and Dickson Town Centre. Improved public transport infrastructure and urban intensification along transport routes will also support social inclusion by allowing greater numbers of people to live close to services with reduced dependence on private vehicle use.

- **Encourage a more active lifestyle** — Current research shows people will walk up to 1.6 kilometres for light rail, a much higher distance than for buses where people will walk on average 400 metres.

- **Provide a reliable, frequent and well integrated transport system** — The Project would provide a reliable service every 6 minutes during peak periods. Based on other light rail networks, the Project would operate with up to 97 percent of light rail services running on time.

- **Encourage smarter land use** — The ACT population is projected to reach over 600,000 by the 2050s, urban intensification along transport routes such as the Northbourne Corridor will allow Canberra to develop as a more compact and efficient city.

- **Reduce congestion** — Canberra congestion costs are predicted to reach $200 million per annum by 2020, an 82 per cent increase from $110 million in 2005. The provision of a new high-capacity, frequent and reliable mode of transport presents an opportunity to reduce congestion on the existing road network.

- **Reduce pollution** — Increasing public transport use reduces direct emissions from private cars, improving local air quality. Electrically-powered light rail also has a greater opportunity to reduce the overall greenhouse gas emissions from transport by using renewable energy sources, in line with the ACT Government’s target of 90 per cent renewable energy use by 2020.
2.3.2 Project need and justification

The challenges

A number of trends and issues impacting the existing transport corridor between Gungahlin and Civic have been identified. These trends, described in greater detail below, have determined that the corridor should be the first investigated for alternative transport options. The following section provides a brief outline of the current transport issues associated within the Gungahlin and Civic corridor.

Growing population

The low residential densities and the dispersed nature of activity centres and employment in Canberra currently do little to improve productivity of the Canberra economy, reduce car dependency, sustain public transport operations or reduce greenhouse gas emissions. These problems are expected to be magnified by future anticipated population growth within the Gungahlin and Civic corridor. The Gungahlin to City Corridor connects Canberra’s fastest growing district, Gungahlin, with the City and the Parliamentary Triangle, Canberra’s focal points for civic and employment activities.

Over the past decade, population levels within the Gungahlin district have grown at an average rate of 6.8 per cent per annum. Population levels in Gungahlin under a ‘business as usual’ case are projected to almost double by 2031, compounding current congestion, social exclusion and housing affordability concerns under a business as usual scenario.

Growing congestion

The key roads forming the Gungahlin and Civic corridor (Flemington Road, the Federal Highway and Northbourne Avenue) are approaching available capacity during peak periods. Although capacity on alternative routes including Gungahlin Drive and Majura Parkway could be expanded, these routes do not directly serve the City and there are few options to increase road capacity outside of current road corridors. Without intervention, future growth within the Gungahlin and Civic corridor is anticipated to lead to a further decline in traffic speeds, increasing travel time impeding access to employment, community facilities, social and recreational activities.

Impacts on the broader bus network

As a key bus corridor, the degradation of travel speeds along the Gungahlin and Civic corridor also impacts on the speed, efficiency and reliability of cross-regional bus services operating beyond the Gungahlin and Civic corridor. This further impacts travel times for passengers within the north of Canberra as well as those travelling to and from the Central National Area and Parliamentary Triangle.

Unsustainable development patterns

From an international standpoint, Australian city population densities are lower than global counterparts – even more so for Canberra. Low densities result in increased car dependency, placing upward pressure on per capita costs for providing public transport and community services over larger areas and raising social exclusion and service access issues.

The Project’s potential

Investment in a rapid transit system along the Gungahlin and Civic corridor has the potential to unlock a number of economic development opportunities to assist in meeting the challenges identified above. These opportunities are summarised below.
Increasing the transport capacity of existing corridors

There are few options to increase capacity outside of existing road corridors. During peak periods, existing bus services operating along Northbourne Avenue carry more passengers than all cars combined. An investment in a rapid transit project along the existing corridor would significantly increase its carrying capacity, provide vital capacity to cater for future growth and optimise the use of existing assets.

Promoting economic productivity

A number of opportunities have already been identified by the ACT Government to increase residential and commercial densities on significantly underdeveloped sites along the Gungahlin to Civic corridor. These include public housing redevelopments, a redevelopment of the Dickson Group Centre and the potential redevelopment of land currently occupied by the exhibition centre and Canberra Racecourse. As a key landowner and land manager under the Territory’s leasehold system, a unique opportunity exists for the ACT Government to encourage urban renewal within the Gungahlin and Civic corridor, both directly and indirectly.

The development of additional transport capacity would provide a significant enabler for further development of, and investment in, these sites, maximising existing land capacity within the Gungahlin and Civic corridor.

Promoting greater sustainability

The ACT Government would actively support increasing density and a strong mix of activities along the Gungahlin to Civic corridor to encourage localised travel and trips, which could be serviced by a rapid transport system. Where inter-town travel is required to connect with employment hubs, faster and more reliable public transport services would encourage a greater use of public transport.

Part of a broader network

The Gungahlin to Civic corridor is the backbone of the Government’s 2031 Strategic Public Transport Plan Network that establishes the future public transport network for Canberra. This network aims to deploy rapid and frequent bus and other transport services that would significantly enhance service frequencies and legibility of public transport services. The network and cross-regional services meeting with the Gungahlin to Civic corridor would originate from Tuggeranong, Fyshwick, Queanbeyan and Molonglo Valley. When realised in full, corridors that combine urban renewal, redevelopments and transport investment could be extended to other corridors such as Constitution Avenue and Commonwealth Avenue.

Economically efficient

Preliminary cost-benefit analyses undertaken suggest that, despite the higher cost of delivery, rapid transit has the potential to be more economically viable than other ‘road based’ approaches to meeting the identified transport needs (A discussion of alternative modes is provided in section 2.4 below).

Implications of not proceeding

The implications of not proceeding with the Project would leave the transport network in its current state and would not provide additional sustainable and reliable transport alternatives to Canberra’s city and northern regions. This would increase the pressure on the existing transport network, especially as its population grows in key areas such as Gungahlin.

Additionally, as land uses continue to evolve and intensify, particularly along the Federal Highway and Northbourne Avenue corridors, and travel demand increases and continues to expand from its focus on Civic alone and provide opportunities at centres such as Dickson and Gungahlin, the existing structure and service offering of the public transport system would become increasingly out of step with customer expectations.
The result would be worsening levels of customer satisfaction and the subsequent inability to effectively meet the transport demand with available public transport options.

Finally, the economic benefits from the Project would fail to be realised with flow-on impacts to productivity and Canberra’s regional economy.

2.4 Alternatives considered

2.4.1 Consideration of strategic transport options

Following the identification of the need for a new public transport option for Canberra (refer to section 2.3), a strategic approach was adopted to define and filter the range of potential options available for meeting this transport need. The following section provides a summary of the option identification and evaluation process used to develop the range of transport options considered for the Project.

Options identification

A range of options were considered to reduce the dependence on private vehicles, increase the use of public and active transport and better manage increasing travel demand along the Gungahlin to Civic corridor. Table 2.12 outlines the range of options that were considered, whether they were shortlisted and the rationale for their inclusion or exclusion from further consideration.

<table>
<thead>
<tr>
<th>Option</th>
<th>Short listed?</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing transport arrangement</td>
<td>Yes</td>
<td>This option would provide a base case for which the other options could be assessed against for benefits and disadvantages.</td>
</tr>
<tr>
<td>Conversion of existing lanes to transit lanes</td>
<td>No</td>
<td>The conversion of existing general traffic lanes to transit lanes may provide some short term relief for buses. However, this treatment may cause congestion as single-occupant vehicles are constrained to fewer lanes. This would increase through traffic on north Canberra suburban roads, negatively impacting on residential amenity and liveability.</td>
</tr>
<tr>
<td>Conversion of existing lanes to bus lanes</td>
<td>No</td>
<td>The conversion of existing lanes to bus lanes may provide some short term relief for buses and may present a cost-effective bus priority measure. However, previous studies have demonstrated this treatment would cause congestion along Northbourne Avenue and result in ‘rat-running’ on current day demand levels.</td>
</tr>
<tr>
<td>New bus lanes</td>
<td>No</td>
<td>Recent assessments have shown that new conventional bus lanes are not economically and financially viable.</td>
</tr>
<tr>
<td>Bus rapid transit</td>
<td>Yes</td>
<td>Previous studies have not explored in detail the viability of bus rapid transit (BRT). Consideration of a dedicated BRT option was therefore short listed for further consideration.</td>
</tr>
<tr>
<td>Light rail</td>
<td>Yes</td>
<td>Previous studies have not explored in detail the viability of light rail confined to the Project corridor. Given the high community support for light rail and that light rail is viewed as a long term transport solution within the Project Corridor, light rail was therefore short listed for further consideration.</td>
</tr>
<tr>
<td>Other Modes</td>
<td>No</td>
<td>Other transport modes such as monorail, metro rail and heavy rail were not considered viable for the identified corridor.</td>
</tr>
<tr>
<td>Road pricing</td>
<td>No</td>
<td>Road pricing is currently not a part of ACT Government policy. Any future consideration of road pricing should consider options for different types of road pricing and an associated assessment of equity, community and political acceptability would need to be undertaken before it is considered a viable option.</td>
</tr>
</tbody>
</table>
Options assessment

Based on the shortlisting process, three transport scenarios were considered to be the most feasible for further consideration as the preferred transport option. These scenarios were:

- existing transport arrangement
- bus rapid transit
- light rail.

The detail of each transport scenario was workshopped with a range of stakeholders. Each of the transport scenarios differ in the degree of priority and segregation that would be afforded to public transport services. Consideration of each of the short-listed transport-based scenario is provided below.

Existing transport arrangement

The ‘business as usual’ transport scenario assumed that, apart from committed road and public transport initiatives, no further changes to the network would be undertaken. Improvements in public transport would still be made across Canberra under the business as usual case although no significant changes are proposed along the Project alignment. The business as usual scenario was based on the 2031 Strategic Public Transport Plan. Under this scenario, the current limited stop Red Rapid service that travels between Gungahlin and Fyshwick via the City would continue to be the primary public transport link between Gungahlin and Civic.

While the Strategic Public Transport Plan would bring about a better level of legibility to the public transport network, bus services would continue to share road space with general traffic along the Project Corridor, which is expected to become increasingly congested over time.

Bus rapid transit option

Unlike conventional bus services, BRT systems typically operate on dedicated lanes and corridors, separated from other forms of road traffic. The separation of services from general traffic allows for higher travels speeds, improved service reliability and increased frequencies relative to conventional bus services.

Under the BRT scenario, new bus lanes would be constructed in the median along Northbourne Avenue and Flemington Road (refer to Figure 2.18). In addition, bus bays would be constructed along the Project alignment to allow limited or express services to bypass other stopping bus services. The BRT scenario would make allowance for approximately 15 stops between Gungahlin and Civic with stops nearest to Gungahlin and Civic spaced closer together and intermediate stops spaced further apart. The new BRT service would operate between Gungahlin and Civic and integrate with the existing Red Rapid route between Civic and Fyshwick.

Source: City to Gungahlin Transit Corridor Infrastructure Australia Project Submission (ACT Government, 2012)

Figure 2.18  Indicative Project corridor under a bus rapid transit scenario (Northbourne Avenue)
Light rail option

Light rail typically has a lower capacity and speed than that of conventional heavy rail and metro rail services but higher capacity and speed of traditional street-running tram services as well as conventional bus services. The main benefit of a light rail system would be that it provides higher levels of amenity, travel speed, reliability and capacity compared to existing bus services.

The light rail scenario would be based on a similar treatment identified for the BRT in that the light rail corridor would be built in the median along Northbourne Avenue and Flemington Road (refer to Figure 2.19). No change in the number of general traffic lanes on Northbourne Avenue or Flemington Road would be proposed. The dedicated light rapid transit corridor would make allowance for a similar number of stops between Gungahlin and Civic as the BRT scenario. The light rail service would operate between Gungahlin and Civic and integrate with the existing Red Rapid route between Civic and Fyshwick.

Source: City to Gungahlin Transit Corridor Infrastructure Australia Project Submission (ACT Government, 2012)

Figure 2.19 Indicative Project corridor under a light rail scenario (Northbourne Avenue)

The preferred option

Following consideration of each of the short-listed options, the following key findings were identified:

- the ‘business as usual’ scenario, assuming no change to existing transport infrastructure and/or service patterns within the study area, was concluded as unrealistic as there would need to be some kind of intervention to improve the flow of traffic between Gungahlin and Civic

- modelling indicates that both the BRT and light rail scenarios would both result in a significant mode shift to public transport along the study corridor when compared to the ‘business as usual’ scenario where no infrastructure improvements are made to the transport services in future years

- whilst the light rail scenario have an higher estimated capital investment cost than the BRT scenario (between approximately $300 and $360 million for BRT and between approximately $700 and $860 million for light rail), light rail would provide greater overall benefits due to its ability to achieve broader development and community/social benefit outcomes such as being a driver for increased urban development densities along the Gungahlin to Civic corridor

- it was considered that light rail would provide increased benefits over BRT as increasing the number of buses along Northbourne Avenue would lead to increased noise and air pollution along the identified transport corridor

- introduction of light rail to the corridor, in comparison to BRT, could improve journey times and reliability for customers while increasing the capacity of the transport system. As shown in Figure 2.20 below, one light rail vehicle has the capacity to move approximately three times the number of passengers than a rapid bus service.
Following determination of the preferred mode of transport, a series of light rail design options were considered as part of the ongoing development of the Project. An overview of the key design options considered is presented in section 2.4.3.

### 2.4.2 Light rail design options

**Overview**

Following determination that light rail was the preferred transport mode for the Project, a number of options were considered with respect to various Project design elements. These Project elements included the following:

- track alignment options – including the consideration of median running and side running
- stop locations – which included the consideration of terminus and intermediate stop location options
- stabling depot and maintenance facility location options
- light rail power supply options – including the potential for side versus centre pole arrangements, substation locations and alternative power supply options
- landscaping and tree planting options along the Federal Highway and Northbourne Avenue.

Details on each of these design options and the reasons for selecting each of the preferred option that form part of the preferred Project (as described in section 2.2 of this EIS) is provided in the following sections.
Track alignment options

General

The alignment of the tracks within the median strip of the Gungahlin and Civic corridor was investigated during the design process to be the best option. This built on previous studies undertaken in 2012 and 2013 (URS, 2013) that considered both kerbside and median alignments along the identified corridor. As part of the investigation, the advantages and disadvantages of locating the tracks in the median (centre of the road), on either side of the road or within the road lanes along the entire corridor were considered.

The median alignment was identified as the preferred alignment as it presented the following benefits:

- it aligned with the Griffin plans for Canberra which allowed wide medians for rail transport
- it retained the current traffic capacity on the existing roads adjacent to the median (Flemington Road, Federal Highway and Northbourne Avenue) and it created the least disruption to traffic
- less direct impact on access for businesses, facilities and residents on either side of the road
- if the light rail were to operate in traffic lanes, it would have the potential to complicate the turning movements at each intersection
- there is already a wide median for the majority of the corridor, which provides significant construction and operational benefits
- remove the need to widen intersections that are already taking up a significant area (such as the intersection of Antill Street and Northbourne Avenue in Dickson)
- supports the ability to provide prioritisation for light rail services without significant changes to current traffic light operation
- every change of position from the median to an alternative running option (such as side or separated running) would result in the requirement for either a new signalled intersection or make an existing intersection more complex, presenting a source of potential delays both to LRVs and road traffic.

Northbourne Avenue

Identification of potential track alignment locations

As discussed above, the preferred option for the Project alignment would be to utilise the existing median. Although the existing median is sufficient for a majority of the Project alignment, for the section of the alignment along Northbourne Avenue between the Federal Highway and the Antill Street/Mouat Street intersection three track alignment options were considered further. This included:

- median running alignment
- west side running alignment
- east side running alignment.

To the south of the Antill Street/Mouat Street intersection, the alignment was identified to remain as a median running alignment.
Selection of the preferred option

The preferred option was identified as being a median alignment as it achieved the identified assessment criteria and presented the following benefits:

- better alignment with the Griffin plans for Canberra which allowed wide medians as a transport corridor, in comparison to the western and eastern side alignments
- retain the current traffic capacity and it creates the least disruption to traffic
- provide the simplest and fastest solution for light rail operations
- provide the simplest solution for road traffic, providing simpler intersection designs at either Swinden Street and Phillip Avenue (compared to the east side option), or Barton Highway (compared to the west side option)
- avoid additional intersections incorporating light rail crossings of the through traffic on Northbourne Avenue and the Federal Highway. Only turning movements would be affected, which make light rail priority easier to provide along this section of the alignment
- in the alignment between Antill Street and Barton Highway, no trees in the median would be impacted, as opposed to the eastern (substantial additional tree impacts) and western (some additional tree impacts) alignment options
- be located further from houses than an east side alignment, which would make light rail noise less obtrusive
- no additional land would be required, in comparison to the western alignment option which would require additional land take in this area.

The median option would however require the relocation of a high-pressure gas main which is currently located within the median (refer to section 2.2.3 and Chapter 15).
Stop locations

General

Identification of potential stop locations

A long-list of potential stop locations were initially identified, including up to 23 different stop locations along the Project alignment. These included:

- Warwick Street
- Gozzard Street
- Gungahlin Place
- Hinder Street
- Kate Crace Street
- Manning Clark Crescent
- Wizard Street
- Mapleton Avenue
- Nullarbor Avenue
- Well Station Drive
- Lysaght Drive
- Sandford Street
- EPIC
- Phillip Avenue
- Swinden Street
- Dickson
- Owen Flats/The Pavilion
- Macarthur Avenue/Wakefield Avenue
- Condamine Street/Ipima Street
- Masson Street/Girrahween Street
- Elouera Street/Gould Street
- Alinga Street
- Civic.

Assessment criteria for the general stop location options

Each of the identified stop locations was assessed against a set of criteria, which included the following:

- patronage – stops were selected to support areas that include strong current and future projected population and employment localities. Potential walk-up catchment of the stops was also considered
- access and connectivity – the distance between potential stop locations, ease of access to the stop, connectivity with the local population and proximity to high priority destinations
- legibility – clarity of location in the urban environment
- public domain – the ability to enhance the local area
- number of stops – resultant overall number of stops along the alignment was considered, in addition to realising the need to rationalise the number of stops along the route in order for the system to be competitive with road and bus traffic.

After identifying the relevant criteria, a workshop was held on the 26 March 2014 with CMA and the engineering technical advisors to discuss and apply the identified criteria. Following the outcomes of the workshop and additional design and feasibility investigation, a list of the preferred stops was determined.
Selection of the preferred option

The preferred stop locations were considered through the assessment process described above to provide maximum benefit to the community and most closely meet the identified criteria. Each of the identified preferred and potential alternative stop locations are shown on Figure 2.21. Table 2.14 summarises the rationale for not pursuing certain alternative stop locations.

Table 2.13 Alternative stop locations not pursued for the Project

<table>
<thead>
<tr>
<th>Stop name</th>
<th>Stop location</th>
<th>Rationale for not being pursued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warwick Street</td>
<td>Hibberson Street near the intersection of Warwick Street</td>
<td>Refer to the section below regarding the proposed Gungahlin terminus stop for details regarding the rationale for pursuing the preferred option.</td>
</tr>
<tr>
<td>Gozzard Street</td>
<td>Hibberson Street near the intersection of Gozzard Street</td>
<td></td>
</tr>
<tr>
<td>Hinder Street</td>
<td>Hibberson Street near the intersection of Hinder Street</td>
<td>This stop was considered to be too close to the preferred location of the Gungahlin terminus stop (refer to discussion below).</td>
</tr>
<tr>
<td>Kate Crace Street</td>
<td>Flemington Road near the intersection of Kate Crace Street</td>
<td>This stop was considered to be too close to the preferred location of the Gungahlin terminus stop (refer to discussion below).</td>
</tr>
<tr>
<td>Wizard Street</td>
<td>Flemington Road near the intersection of Wizard Street</td>
<td>This stop was considered to be too close to proposed Manning Clark Crescent stop, which was considered to more closely meet the identified stop location criteria.</td>
</tr>
<tr>
<td>Lysaght Drive</td>
<td>Flemington Road near the intersection of Lysaght Drive</td>
<td>This stop was not considered to provide sufficient local catchment support a light rail stop.</td>
</tr>
<tr>
<td>Sandford Street</td>
<td>Flemington Road near the intersection of Sandford Street</td>
<td>This stop was not considered to provide sufficient local catchment to support a light rail stop.</td>
</tr>
<tr>
<td>Owen Flats/The Pavilion</td>
<td>Northbourne Avenue near the existing Information Visitor Centre</td>
<td>This stop was not considered to provide sufficient local catchment to support a light rail stop when considered in relation to the proposed Dickson interchange stop, and location of the MacArthur Avenue stop (which was considered to more closely meet the identified stop location criteria).</td>
</tr>
<tr>
<td>Masson Street/Girrahween Street</td>
<td>Northbourne Avenue at the intersection with Masson Street/Girrahween Street</td>
<td>This stop was considered to have a reduced justification due to surrounding land uses, in particular the Haig Park reserve to the north, which afforded other similar stop locations with improved catchment and access potential.</td>
</tr>
<tr>
<td>Civic</td>
<td>Various locations including along Northbourne Avenue generally between Alinga Street and London Circuit, in addition to Bunda Street</td>
<td>Refer to the section below regarding the proposed Civic terminus stop for details regarding the rationale for pursuing the preferred option.</td>
</tr>
</tbody>
</table>
Figure 2.21 Potential stop location options identified for the Project
Gungahlin terminus stop

Identification of potential Gungahlin terminus stop locations

Five options were proposed by CMA and considered for the location of the Gungahlin terminus including:

- Flemington Road, east of Kate Crace Street (Option 1)
- Hibberson Street, just east of Gungahlin Place (Option 2)
- Gungahlin Place (south of Hibberson Street (Option 3A) or north of Hibberson Street (Option 3B))
- Hibberson Street, west of Gozzard Street only (Option 4)
- Hibberson Street, west of Gozzard Street with an additional stop on Flemington Road east of Kate Crace Street (Option 5).

Each of these options are shown on Figure 2.22 below.

Assessment of feasible design options for the Gungahlin terminus stop

Prior to assessment of the options, a high level strategic consideration of each of the options was undertaken. Where an option did not meet the strategic need of the Project, it was not further considered. The following did not meet the identified criteria and were not progressed further:

- Option 1 – this option would be located at the extreme eastern end of Gungahlin and the alignment would not continue into the town centre
- Option 3A (turning south) – this option would not allow future extension in any feasible future option
- Option 4 – this option would be the only stop within the Gungahlin town centre, located at the extreme west end and would not offer a beneficial service to the east end of Gungahlin town centre.

The high level consideration of the above options left three remaining viable options for consideration. These included Option 2, Option 3B, and Option 5 which are further considered below.
Selection of the preferred option

Following consideration of each of the viable stop locations for the Gungahlin terminus, the stop located in Hibberson Street, just east of Gungahlin Place (Option 2) was considered the preferred option as it was considered to best meet the identified assessment criteria and presented the following benefits:

- offers a light rail service to a terminus at the centre of Gungahlin
- allows good interchange with buses in Gungahlin Place as interchanging customers would not need to cross a road lane
- allows subsequent extension of the track in either of two possible directions (west or north). The other two options would provide additional constraints to the extension in the future (if required)
- provides simpler light rail operation with a minimum amount of complexity for signalling and track layout
- the terminus platforms would be built into the existing pedestrian footways, providing improved pedestrian access
- allows for an incremental approach to the pedestrianisation in Hibberson Street (if required)
- provides the shortest light rail journey time compared to the other options
- represents the lowest cost option compared to the other options.

Civic terminus stop

Identification of potential Civic terminus stop locations

Six locations were identified and considered for the Civic terminus stop for the Project. These included stops at the following locations:

- north of Alinga Street (Option 1)
- along London Circuit East (Option 2)
- along Vernon Circle (Option 3)
- east of Alinga Street (Option 4)
- within Bunda Street (Option 5)
- between the Sydney and Melbourne buildings (Option 6).

Each of these options is shown on Figure 2.23 below.

As with the Gungahlin terminus stop, a high level strategic consideration was undertaken prior to assessment of each of the options which determined all of the identified options were feasible and therefore considered as part of the options assessment.
Selection of the preferred option

Upon comparison of the Civic terminus location options, it was determined that Option 1, located to the north of Alinga Street along Northbourne Avenue was preferred as it scored best across the assessing criteria and presented the following benefits:

- provides the least overall impact due to its location within the Northbourne Avenue median
- provides a good level of bus and light rail interchange as it would be close to the existing bus interchange on Alinga Street and would not affect existing services. Other options would result in increased distances to travel between the light rail and bus interchange or would result in direct impacts to existing bus interchange locations
- provides good light rail operations and would not require any additional traffic signal phasing south of Alinga Street
- provides the most flexibility of all of the options for future extension to the south. A number of the other options, such as options 2, 3 and 5 would have reduced potential directions for future expansion of the network to certain directions and/or designs in the future
- provides good opportunities for urban design improvements within the vicinity of the stop and would also result in less heritage impacts. Alternatives such as Option 3 and Option 6 would result in potential additional heritage impacts due to their proposed locations on Vernon Circle and between the Sydney and Melbourne buildings respectively
- limits additional impact to trees compared to other options.
Dickson interchange

Background

The Project is expected to replace most or all bus services on Northbourne Avenue south of Dickson (refer to section 2.2.5 and Chapter 10). Dickson is also a significant destination in its own right. About half the patronage at the light rail stop is expected to come from the bus interchange, with the remaining half anticipated to arrive and depart as pedestrians accessing Dickson. A revised local bus network is currently proposed to be implemented (outside the scope of this Project), serving a proposed interchange at Dickson, at which passengers to and from the city would interchange between light rail and bus.

As noted in section 2.2.5, the development of this interchange is outside the scope of the current Project and would be designed and constructed independently of the Project, with linkages proposed between the new interchange and the Dickson Stop. In order to identify the preferred design for the Dickson light rail stop, consideration of a preferred location for the interchange was required. A summary of the process undertaken to identify the most feasible strategic arrangement for the Dickson interchange is described below.

Identification of potential interchange locations

Two main concepts were identified for the proposed Dickson interchange arrangement. As part of both concepts, Cape Street would be extended from Challis Street to Northbourne Avenue, creating a new through route. Additionally, as part of both concepts, the light rail stop at Dickson would be located within the Northbourne Avenue median to allow for efficient operation of the light rail. The two locations for the Dickson interchange which were considered included the following:

- Option 1: split option – the new bus stop location would be located in Cape Street with interchange passengers being required to cross the southbound carriageway of Northbourne Avenue to access the Dickson light rail stop.
- Option 2: integrated options – the bus and light rail interchange would both be located within the median of Northbourne Avenue, with some shared running of buses on the light rail tracks being required at this point. The intersection with Cape Street would permit right turns for buses into the median and left turns out of the median into Cape Street.

Preferred interchange location

Whilst the provision of an interchange at Dickson does not form part of the scope of the Project, for the identified Project design, the split option (i.e. separated bus and light rail locations) was considered to be the preferred location for development of the light rail design for the following reasons:

- there would be no sharing of the light rail corridor with buses, reducing the risk of delay or conflict between LRVs and buses
- bus movements into and out of median of Northbourne Avenue would be difficult to accommodate at Cape Street and Antill Street and would potentially cause delay due to extra traffic signal stages
- the existing limited space in the median of Northbourne Avenue would result in a constraint to the number of bus bays able to be provided
- construction was considered to be more difficult in the Northbourne Avenue median rather than in Cape Street
- a bus and light rail interchange within the median of Northbourne Avenue would be more visually obtrusive compared with a light rail only stop.
2.4.3 Other project element options

Stabling depot and maintenance facility location options

LRVs require maintenance facilities and storage space for spare parts, and a secure stabling location to ensure they are not vandalised. LRVs would depart from the stabling depot early in the morning and return late at night, and some maintenance activities would be undertaken overnight. Consideration of appropriate locations for the proposed stabling and maintenance depot was undertaken.

Assessment and selection of the preferred design option

A series of requirements were developed to guide the assessment of the proposed stabling depot and maintenance facility. The key requirements for the facilities are summarised below:

- space for the following features:
  - stabling tracks for 18 x 33 metre LRVs (allowing for future fleet growth)
  - wash and sand plants
  - an operational control centre including office space for the operator’s management team
  - a maintenance shed providing 4 berths capable of undertaking full inspection of vehicles
  - an underfloor wheel lathe
  - workshops and stores
  - staff facilities including car park
- located within and adjacent to appropriately zoned land, such as industrial land uses at Mitchell
- located on cleared land or land which does not contain any environmental constraints such as native or endangered vegetation
- accessibility to the site
- suitably located along the alignment to provide reasonable access to both the northern and southern extent of the Project
- preferable to have all these facilities co-located on a single site.

Based on the operational requirements and site criteria identified, the proposed site at Mitchell was considered to be the only feasible location for the stabling and maintenance depot along the Project alignment. Whilst a new bridge crossing between the stabling site and Flemington Road would be required to provide access for LRVs, in view of the night-time activity required during operation and its location in a non-residential area made this location the preferred.

The proposed site also has the advantage of being vacant land currently within Territory ownership. Further discussion of the proposed stabling and maintenance depot is provided in section 2.2.2.

Light rail power supply and design options

Substation locations

Substations are required to provide power supply for the LRVs, at the required voltage, to the light rail system. The substations would provide 750-volt DC electricity supply and would require approximately 60 square metres for the building footprint with some additional land required for the overall substation land to allow for maintenance access, crane access for equipment replacement, parking and security fencing.
The number of substations required for the light rail system was determined by the power demand of the system, which was influenced by the number and frequency of LRVs proposed for the Project. To meet power demand for the Project, seven substations were identified as being required along the Project alignment. The final location of the seven substations was identified based on the substations being:

- in close proximity to the alignment
- appropriately spaced to provide adequate coverage for the system (typically spaced within 2 kilometres of each other)
- available access to electricity feeder connection points
- easily accessible for maintenance purposes
- located in open spaces or on unleased Territory Land.

Environmental and social impacts and mitigation were also considered. Examples of where these influenced substation siting and design included:

- avoidance of areas of high built heritage significance
- avoidance of areas of ecological significance
- avoidance of areas of privately leased land along the alignment, where possible
- avoidance of substations within the vicinity of sensitive receivers to minimise potential noise impacts
- avoidance of urban design or visual amenity impacts.

The proposed substation locations for the Project are discussed in section 2.2.2.

**Side versus centre poles**

The overhead wire system and associated poles would be one of the most visible aspects of the Project to most people, as these would be fixed in the visual landscape. Whilst the wires themselves would be visually ‘light-weight’ and not overly bulky or excessive, where they are attached to poles, the poles themselves would be more noticeable and therefore, required consideration regarding how best to minimise their impact. Other considerations include:

- safety, specifically around potential for collision with poles
- space-proofing to ensure the servicing of light rail infrastructure is limited to within the identified corridor.

Centre poles are proposed along the length of the alignment to provide the greatest opportunity to minimise clutter in the landscape and enhance visual amenity. Overhead wiring is discussed further in section 2.2.2 and the final design of the proposed overhead wiring system would be determined during detailed design.

**Wire free running**

Whilst wire-free running is less visually intrusive than overhead wiring, there are a number of constraints to wire-free running including charging requirements and high speed running. These factors require additional traction power to meet LRV power demand. The distance between stops also provides a constraint to wire-free running, with greater distances providing less than optimal operations.

The Project, whilst not currently proposing any wire-free sections, does not preclude the potential for a wireless power system to be implemented as part of the Project during the procurement process.
Landscaping and tree planting options

Landscape and tree planting options along Flemington Road and Northbourne Avenue were considered as part of the development of the Project with the aim of providing a consistent approach to vegetation and landscaping along the corridor. A summary of the options considered is provided below.

Federal Highway

A series of concept design considerations were undertaken to determine the form, scale and configuration of tree plantings that would achieve the required vision for the Federal Highway as the gateway to Canberra and is summarised below:

- **Option 1** – This option drew upon existing evergreen fringe plantings of Cypress and Radiata Pine trees whose scale and presence would create impact while maintaining a funnelled view corridor to Black Mountain.

- **Option 2** – This option explored the continuation of the native boulevard character of Northbourne Avenue. This was not considered to be preferred due to the vision for creating a distinct threshold and formalised point of arrival from country to city.

- **Option 3** – This option considered the introduction of a new row of large deciduous exotic trees along the verges to create impact and provide seasonal variation; a key Canberra characteristic. This option was not favoured as it was not considered to meet the character of a gateway tree.

Northbourne Avenue

A series of design considerations for the Northbourne Avenue median planting treatment were considered during the concept design process to determine the most appropriate urban design outcome for the avenue. A summary of these design options are summarised below:

- **Option 1** – This option considered provision of a decomposed granite (or mown turf) median with contrasting bicultural tree plantings in a staggered arrangement.

- **Option 2** – This option considered dense lowland woodland through tightly planted native trees evenly spaced in regular rectangular beds and separated with band of decomposed granite.

- **Option 3** – This option considered the provision of a bushland character through an informal, native tree planting arrangement and native grassland understorey.

- **Option 4** – This option considered applying a traditional European style boulevard with two rows of parallel, deciduous exotic tree plantings based on the Griffin ideal that Canberra should be a lush ‘oasis’. The concept proposed exotic trees in the median with tall native eucalypts on the verges which is typical of a Canberra style boulevard with mixed tree species.

An outline of the proposed planting to be undertaken along Flemington Road and Northbourne Avenue is provided in Chapter 8. The final requirements for landscape planting along the corridor would be negotiated through ongoing consultation and agreement between CMA, Project Co and NCA during the design and construction phase.
2.5 Future stages

The Capital Metro Light Rail Stage 1 — Gungahlin to Civic Project would be the first stage of a proposed future broader Canberra light rail network. Whilst the Project considered within this EIS focuses on the construction and delivery of Stage 1 of the network, between Gungahlin and the City Centre, the ACT Government is currently planning and considering options for future extensions of the light rail network. This includes the first proposed extension of the Project to Russell, announced in February 2015.

Both the proposed extension to Russell and the options for a future light rail network are briefly outlined in the sections below.

2.5.1 Extension to Russell

The first potential future stage of the proposed light rail network was announced in early 2015 and is currently being investigated as an extension of the main alignment between Gungahlin and Civic to Russell. The extension, hereafter, referred to as the Russell Extension, would involve extension of the existing Project by approximately 3 kilometres. The Russell Extension would link the proposed terminus at Civic to a new terminus in Russell Drive, Russell.

The aim of Russell Extension is provide an increased public transport catchment to the south east of the main centre of Civic and provide an improved public transport service to the anticipated future land uses within this precinct. Design options are currently being investigated for this extension, however funding for the Project extension has not been allocated at this stage. The Russell Extension would include the following key features:

- the construction of approximately 3 kilometres of light rail track primarily within existing road corridors of:
  - Northbourne Avenue
  - London Circuit
  - Constitution Avenue
  - Russell Drive
- five or six additional stops, including a terminating stop in Russell Drive.

The Russell Extension would operate with a frequency similar to the Project between Gungahlin and Civic.

2.5.2 Future light rail master plan network

The Future Light Rail Master Plan, currently under development, will identify light rail corridors as part of future long-term transport network planning, where light rail and buses together could offer a sustainable transport solution that delivers improvements across the city. The development of the Light Rail Master Plan is underpinned by existing policy documents such as Transport for Canberra (ESDD, 2012b) and the ACT Planning Strategy (ESDD, 2012a), which plan for Canberra’s continued development as a liveable and connected city.

The Light Rail Master Plan will identify potential light rail corridors which, in addition to the current Gungahlin to City Project, are likely to experience high demand and would be appropriately served by light rail, through staged extensions. The Light Rail Master Plan will also identify opportunities where bus rapid transit or bus priority may assist in growing demand for public transport prior to light rail and where it should be employed to complement the light rail network.

An indicative light rail master plan network for the Canberra region is shown in Figure 2.24.
Source: Light Rail Master Plan – Project Update, December 2014 (ACT Government 2014a)
Note: Indicative network only, subject to further design development

**Figure 2.24** Indicative light rail master plan network
Light rail will also make a significant contribution to the ACT Government’s climate change strategy. As with all public transport that encourages walking as part of its use, light rail will contribute to the ACT’s Healthy Weight Initiative. The Light Rail Master Plan will:

- identify major transport corridors and hubs for future expansion of the light rail network
- encourage development along major transport corridors and in key centres consistent with the ACT Planning Strategy and Transport for Canberra
- preserve transport corridors to ensure future delivery of an efficient light rail system
- integrate light rail and buses together to form the future public transport network.

The Light Rail Master Plan is currently being developed by the ACT Government Environment and Planning Directorate (EPD). It is proposed to release the draft Light Rail Master Plan for public comment once the master plan has been drafted. This process will assist in informing the refinement and preparation of the final Light Rail Master Plan.

The development of any additional sections of the Light Rail Master Plan is outside of the scope of the current Project as described in this EIS would be subject to separate assessment and approval processes.