

# Attachment A

## East Lake Electrical Infrastructure

### draft Environmental Impact Statement

#### Extract from draft EIS – Executive Summary

#### (Dec 2009)

7 December 2009



This draft Environmental Impact Statement relating to the proposed electrical substation/switching station and associated 132kV connections at East Lake, Canberra, has been prepared by Purdon Associates Pty Ltd and AECOM on behalf of ActewAGL and the ACT Planning and Land Authority (ACTPLA) (the Proponents) in association with ACT Procurement Solutions, and in accordance with requirements of the *Planning and Development Act 2007*, the *Planning and Development Regulation 2008* and the requirements of the scoping document prepared by ACTPLA (dated 25 February 2009).

The draft EIS was completed on 7 December 2009 for submission to ACTPLA for public notification.



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# Non-Technical Summary

## Purpose

The ACT Government and ActewAGL propose to relocate and construct new electrical infrastructure in the East Lake area of Inner-south Canberra to address the need for improved electrical network performance and capacity, as well as improved residential amenity in the area.

The study area is generally contained within the suburbs of Fyshwick and Kingston in the Australian Capital Territory, and is bounded by Canberra Avenue, Kingston Foreshore, Lake Burley Griffin, Molonglo Reach and the Monaro Highway. Figure 0-1 refers.

The *Proposed Development* will require a site of approximately 0.5ha for a new electrical substation/switching station facility. In addition, this new facility will require construction of new electrical connections above and below ground to link the site facility into the existing electrical grid.

This draft EIS report has been prepared by Purdon Associates/AECOM for the ACT Government and ActewAGL as an independent environmental assessment of the proposed site and associated 132kV subtransmission line / cable routes needed for the proposed facility.

This report has been prepared in accordance with the *Planning and Development Act 2007* and an *EIS Scoping Document* issued by ACTPLA in February 2009 for the *Proposed Development*. **Error! Reference source not found.** refers. Minor changes to the structure and content of this report compared to the structure required under the Scoping Document are summarised in **Error! Reference source not found.**

The draft EIS covers the following material:

- a description of the EIS process
- a description of the individual components of the *Proposed Development*
- assessment of impacts on infrastructure, land, water resources, climate and air, biodiversity and nature conservation, heritage, social values, health, economic values. Each section of this assessment describes the existing situation, potential impacts and mitigation measures.
- a risk assessment and a summary of how unavoidable impacts will be managed and recommended mitigation measures
- conclusions regarding the nature and extent of environmental impact caused by the *Proposed Development*
- Recommendations for implementation of the electrical infrastructure plan for East Lake.

Under provisions of the *Planning and Development Act 2007* and the Territory Plan, the *Proposed Development* requires the preparation of an Environmental Impact Statement (EIS) prior to lodgement and assessment of a Development Application (DA) as an Impact Track development.

The *Proposed Development* will also require assessment under the Commonwealth *Environmental Protection Biodiversity Conservation Act 1999* (EPBC) because some of the connection lines traverse the Jerrabomberra Wetland Nature Reserve. In addition, works approval for parts of the *Proposed Development* may be required under the National Capital Plan because it traverses Central National Area Land.

Other development options for the electrical infrastructure and their associated connections into the electricity network have also been assessed against the EIS Scoping Document as part of the environmental assessment process leading to the draft EIS. Assessments of these sites and routes have been included at **Error! Reference source not found.** to a level of detail sufficient to address S211 of the Legislation. Under this provision, and in the event that the Territory decided to adopt one of the development proposals other than E4:

*“...The Minister may exempt a development application for development approval for a development proposal from a requirement to include an EIS if satisfied that the expected environmental impact of the development proposal has already been sufficiently addressed by another study, whether or not the study relates to the particular development proposal.” S211 Planning and Development Act 2007.*

### **Project Background and Rationale**

The need for a new co-located electrical infrastructure facility and associated subtransmission line/cable connections arises from two separate considerations:

- The need by ActewAGL for a new zone substation in the study area to meet existing and expected growth in demand from Fyshwick, Canberra Airport and South Canberra, as well as the need to connect the new substation to the ActewAGL Canberra 132kV transmission network; and
- An objective by the ACT Planning and Land Authority (ACTPLA) and the Land Development Agency (LDA) to improve the urban amenity and land value associated with new urban development in East Lake and Kingston Foreshore by relocation of the existing switching station at Causeway and associated overhead subtransmission lines through East Lake and the Jerrabomberra Wetlands Nature Reserve.

ActewAGL and ACTPLA have recognised the economies of scale and management arising from a co-located facility. ActewAGL will retain ownership of all infrastructure.

### **Site/Route Selection and Evaluation**

Prior to the draft EIS, a strategic site and route selection study was completed by Purdon/AECOM for ActewAGL and ACTPLA to determine the preferred site for the co-located facility and associated routes for subtransmission line connections. A copy of this report is provided at **Error! Reference source not found.** to the draft EIS.

**Error! Reference source not found.** shows the range of sites considered as part of this strategic review of sites and routes.

The site/route selection study undertook a two-staged evaluation of approximately 30 sites for the combined facility and associated subtransmission line options. The initial evaluation resulted in identification of a short list of sites based on the need to minimise impact on the Jerrabomberra Wetlands and other land uses, avoid flood liable land and minimise distance from the existing Causeway switching station to a new site because of the cost of underground cabling.

The evaluation of short listed sites included a detailed site assessment and project team workshops to consider the impact of 15 variables covering economic, technical and environmental factors on each of the 10 short-listed sites.

The methodology resulted in selection of four potential sites within the Fyshwick Sewage Treatment Works (Block 10 Section 59 Fyshwick) as the preferred precinct for the new facility. Within this Precinct, Sites E2 (eastern site) and E4 (northern site) were considered to represent the best sites in terms of minimising disruption to adjacent sewerage works, visual impact from Monaro Highway and cable distance to the Causeway. None of these sites is within the Jerrabomberra Wetlands Reserve although Site E4 is partially within the 1:100 Annual Recurrence Interval (ARI) flood zone, and may require some additional earthworks to create a flood-protected site.

Consultations with stakeholders during preparation of the draft EIS resulted in inclusion in the detailed assessment process of another site (B2) located immediately to the west of the Monaro Highway bridge crossing over the railway line, and an additional route option (R8) around the western side of Blocks 11 and 12 of Section 38 Fyshwick (Wetlands Foreshore Business Park).

Details of all sites and routes considered in environmental studies undertaken for the draft EIS are provided in **Error! Reference source not found.** and Attachment D to satisfy S211 of the *Planning and Development Act*. These additional items for consideration have been done in accordance with Clause 50 (2) (c) (ix) of the *Planning and Development Regulation 2008* and has widened the choice of sites and routes available to ACTPLA and ActewAGL.

All project options and elements assessed in studies associated with the draft EIS are shown in Figure 1-2 and **Error! Reference source not found.**

The *Proposed Development* is shown in Figure 0-3 and should be read in conjunction with Table 0-1.

The main features of the *Proposed Development* assessed in this draft EIS are as follows:

<b>Substation/switching station</b>	A site (E4) on Dairy Road Block 10 Section 59 Fyshwick for a combined substation/switching station with an approximate area of 0.5ha to include 132kV GIS switchgear.
<b>Associated 132kV connections</b>	An underground cable route from Causeway switching station to E4 through Jerrabomberra Wetlands via Route 3.
	A northern underground cable from E4 through the Wetlands to connect the new facility with the existing electrical network near Molonglo Reach via Route 11 (R11).
	A southern overhead subtransmission line connection from the existing 132kV line from Gilmore at Canberra Avenue to the new site facility at E4 via Routes 6, 8 and 10.
<b>Removal of existing (redundant) infrastructure and remediation of land</b>	Causeway switching station
	Northern and southern overhead connections to the Causeway switching station (R13, R15 & #14).

Figure 0-1: Urban Context and Study Area

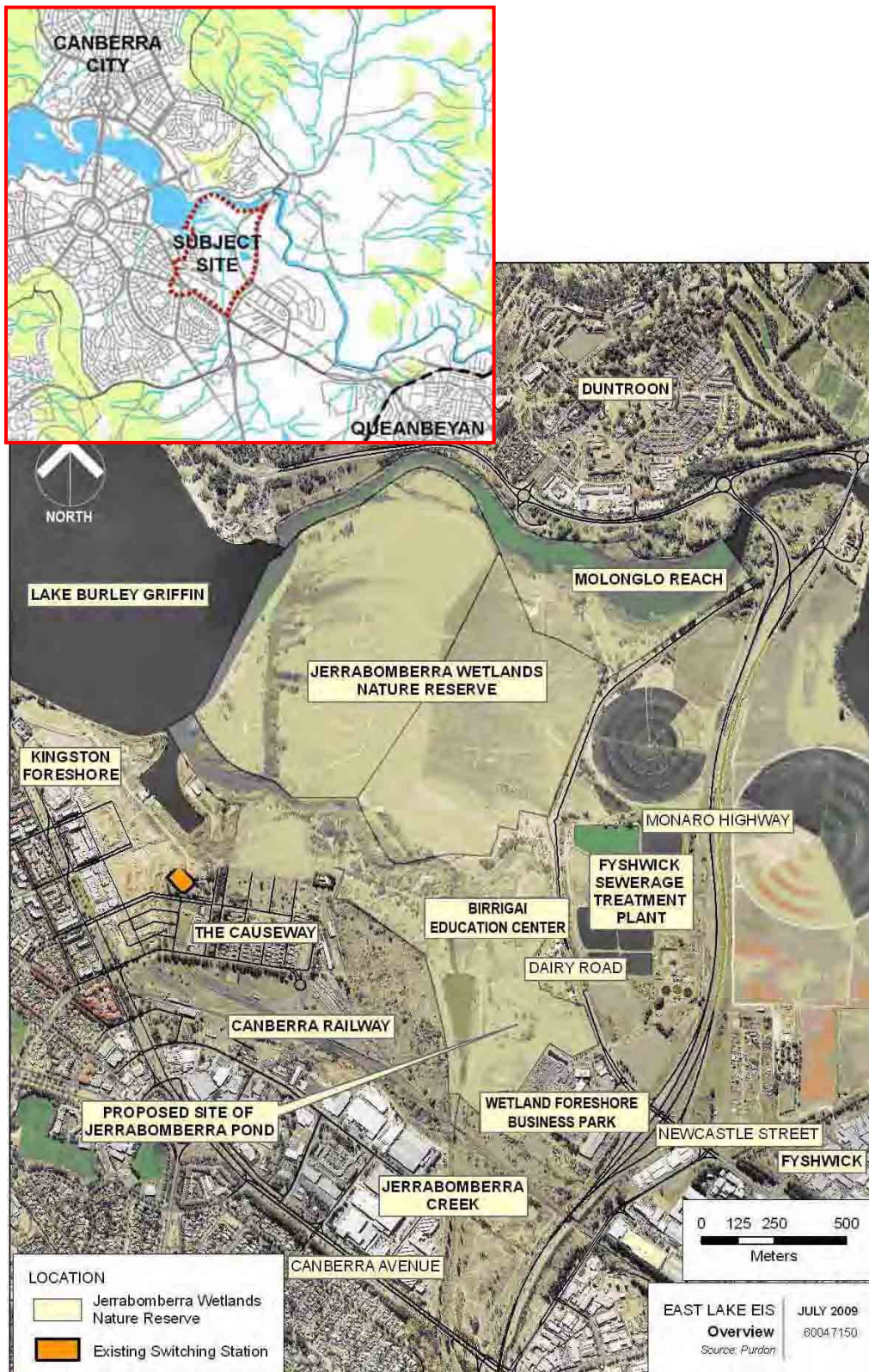


Figure 0-2: All Infrastructure Elements included in Background Studies for EIS



**Table 0-1: Proposed Development E4 – Electrical Infrastructure Elements**

Location (refer Figure 0-3)	Approx Length (m) Area (ha)	Description
<b>Substation &amp; Switching Station</b>		
Site E4 - Dairy Road (Block 10 Section 59 Fyshwick)	0.5ha (Site area only)	Combined facility with external electrical equipment, buildings and security fence.
<b>Associated 132kV Connections</b>		
<b>Causeway cable connection</b>		
R1 – Common Causeway cable link to sites E2,E4 & B2	700m	2x2 Cable trenches on each side of road to enhance network security
R3 – Causeway cable connection to Site E4	960m	132 kV Cable trench approx 1.5m depth and 4m wide with 5m 'work' zone adjacent to trench (15m easement).
<b>Southern line connection</b>		
R6 – Canberra Ave to B2 (adjacent Monaro Hwy)	500m	Overhead single pole 132kV line (20m high, 40m easement)
R8 – Site B2 to Site E2 (west of Wetlands Foreshore Business Park)	1,090m	Overhead single pole 132kV line (20m high, 40m easement)
R10 – Dairy Road	380m	Overhead single pole 132kV line (20m high, 40m easement)
<b>Northern line connection</b>		
R11 – Site E4 to Molonglo Reach cable (northern wetlands)	1,400m	Double 132kV cable trench approx 1.25m depth and 4m wide with crossover pits. Maximum disturbance zone of 15m.
<b>Decommissioned Assets</b>		
R13 – Causeway to Molonglo Reach via wetlands	1,470m	Removal and rehabilitation of existing 132kV overhead subtransmission poles and lines
#14 – Causeway Switching Station	1ha	Removal and rehabilitation of existing switching station
R15 – Causeway to Canberra Ave	2,280m	Removal and rehabilitation of existing 132kV overhead subtransmission poles and lines

Figure 0-3: Proposed Development (E4) – Site and Routes



The combined substation/switching station will occupy a site area of approximately 0.5ha (60x82m). This facility site will require flat land cleared of all vegetation that can be flood-protected (up to a 1:100 ARI). It will require a perimeter security fence and will contain external screen planting.

The 132kV subtransmission circuits from the existing switching station to the new facility will be provided as three underground cable circuits because of the need to maintain connection to the Telopea Park zone substation in Kingston. Whilst most of this cable will be installed using open trench methods, small sections of the cable route will be installed by directional boring where it crosses waterways in Jerrabomberra Wetlands to avoid disturbance to wildlife, water quality and vegetation.

New overhead subtransmission line connections to the facility will be required from the south (Canberra Avenue) to site E4. This will involve an extension of the existing 132kV line from Gilmore substation. Where this line crosses Canberra Avenue, it will be diverted to connect with the proposed East Lake zone substation at E4 as part of the joint substation/switching station facility. *(An alternative solution of using underground cables was dismissed because of the high construction cost and the need for an additional fenced facility for overhead to underground transition near Canberra Avenue.)*

The subtransmission lines will be located within a 40m protected corridor and require an easement over private leased land where appropriate. Subtransmission poles will stand approximately 20m above natural ground level and be placed up to 150m apart in a single pole configuration (not a lattice tower) except at points of inflexion in the route where a 3-pole configuration will be required for safety support.

A northern connection from site E4 will be required to the existing overhead network near Molonglo Reach. The *Proposed Development* involves a cable route (R11) through the Wetlands as the least environmentally disruptive solution.

On the basis that all new infrastructure is implemented, the existing Causeway switching station and associated twin pole 132kV subtransmission lines running north along the edge of Lake Burley Griffin through the Jerrabomberra Wetlands and the single pole 132kV subtransmission line running south to Canberra Avenue will be decommissioned and removed. These actions will remove overhead electrical infrastructure from the refuge area of Jerrabomberra Wetlands reducing the risk of bird strike and improving the visual amenity of Lake Burley Griffin foreshore. The actions will also improve views from Morshead Drive, and create more urban land for release as a result of removal of existing assets and improve residential amenity adjacent to these assets.

It should be noted that removal of the Fyshwick zone substation and overhead sub-transmission lines from Fyshwick to Oaks Estate may occur in 10 to 15 years after the new East Lake zone substation is constructed as part of the above project, but these items are not part of the current draft EIS.

Subject to the outcome of the draft EIS and subsequent DA process, construction of the *Proposed Development* would occur in stages, commencing with the zone substation and associated subtransmission line connections.

Capital cost of the entire *Proposed Development* is estimated to be approximately \$37 million in 2008 dollar terms (+/- 25%). These cost estimates include earthworks, equipment purchase, construction and installation, but do not include land acquisition for the new facility. Whilst the cost of rehabilitation of The Causeway site is included, any substantial remediation cost (if necessary) has not been included and will be part of the site development cost.

## **Potential Impact & Mitigation Measures**

The *Proposed Development* for new electrical infrastructure at East Lake has been assessed against all environmental matters identified in the EIS Scoping Document, and has been the

subject of a risk assessment consistent with the accepted methodology outlined in Australian Standard AS/NZS 4360:2004:2430.

The *Proposed Development* is considered to have minimal adverse impact on the local environment but will have a number of substantial benefits.

The infrastructure project has been sited to minimise any adverse impacts on the non-human biological, physical, social and economic environments in the general study area.

**Error! Reference source not found.** summarises the 'before' and 'after' situation for the *Proposed Development* in the study area in relation to:

- number of 132kV subtransmission poles
- length of 132kV subtransmission lines
- approximate 'easement' and 'footprint' requirements for cables, subtransmission lines and site facilities.

In summary, the Proposed Development will result in a substantial reduction in the number of 132kV subtransmission poles and overhead wires in the study area, as well as within the Wetlands Nature Reserve. It will also substantially reduce the area required for easements and footprints of electrical infrastructure in the Wetlands and total study area.

The siting of the facility at location E4 (part Block 10 Section 59 Fyshwick) in Dairy Road opposite the Wetlands car park will be designed to minimise visual impact and will comply with agreed EPA noise standards. The facility is not considered to have adverse impact on bird life in the vicinity of the site.

Cable connections to and from the site through the Wetlands will have no visual impact once constructed, and have minimal risk of adverse impact on water quality, bird life, human health or recreational amenity either during or post construction.

Overhead subtransmission lines from Canberra Avenue via Monaro Highway and west of the Wetlands Foreshore Business Park will have marginal impact on visual amenity as seen from both of these locations. This route traverses a short section of the south east corner of the Wetlands Nature Reserve.

Removal of existing dual-pole lines from the more sensitive western 'Refuge Area' of the Wetlands as part of the *Proposed Development* will result in a net positive impact on the Reserve in terms of potential for bird strike and improved visual amenity.

Whilst some environmental impact associated with the *Proposed Development* is unavoidable given the nature of the project, a range of mitigating measures has been identified in the draft EIS for implementation by ActewAGL during and post construction.

The full list of mitigation measures is provided at Chapter 16 of the draft EIS (refer **Error! Reference source not found.**) and covers impacts associated with construction and on-going operation phases of the *Proposed Development*. These mitigation measures are based on a concept design for the electrical infrastructure presented in this draft EIS.

The mitigation measures recommended for the *Proposed Development* cover all aspects of potential development impact associated with construction and on-going operation phases of the *Proposed Development* including:

- |                      |                       |
|----------------------|-----------------------|
| ▪ Waste              | ▪ Noise and vibration |
| ▪ Topography         | ▪ Lighting            |
| ▪ Adjacent land uses | ▪ Biodiversity        |

- Visual amenity
- Erosion and sedimentation
- Climate change and air quality
- Oil spill
- Climate and air
- Heritage
- Social
- Health
- Economics
- Hazard and risk.

More detailed network design studies may result in changes to elements of the *Proposed Development*, and these will be addressed in the Development Application (DA) stage of the project.

The draft EIS identifies the following key environmental management tools for the *Proposed Development*:

- Preparation of a **Construction Environment Management Plan (CEMP)** for the *Proposed Development* provided by the contractor and approved by the Territory in accordance with common industry practices prior to commencement of construction. This CEMP will include a range of matters relating to temporary traffic management, noise, air and water quality, as well as erosion/sediment control.
- The use of **monitoring programs** by ActewAGL, or its contractors, to occur regularly throughout the construction process to ensure compliance with parameters in the CEMP. The monitoring will include:
  - noise
  - erosion and sediment control
  - water quality
  - air quality.
- **Auditing** by ActewAGL of works undertaken by the contractor as part of their Environmental Management System (EMS) auditing program. Those undertaking the inspection roles for the programs outlined above will complete reports that will be forwarded to ActewAGL for review and approval of works and compliance.

On balance, the proposed electrical infrastructure works in East Lake will result in the upgrade of electrical services to a significant part of Central Canberra, and would be implemented without significant adverse environmental impacts on adjacent land uses including the Jerrabomberra Wetlands, provided the recommended mitigation measures were adopted as part of the *Proposed Development*.

The *Proposed Development* would also result in a number of other net benefits including enhancement of the Wetlands, improved residential amenity, more urban land for development, and better design outcomes in Kingston Foreshore and East Lake.



# Attachment B

## East Lake Electrical Infrastructure

### draft Environmental Impact Statement

#### Extract from draft EIS - List of Mitigation Measures

7 December 2009



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## Summary of Mitigation Measures

Table **Error! No text of specified style in document.-1** summarises the key environmental management commitments identified for the *Proposed Development* for electrical infrastructure at East Lake and should be read in conjunction with **Error! Reference source not found.**

Mitigation measures associated with all aspects of the *Proposed Development* have also been identified for all elements of the EIS Scoping Document (refer Chapters 6-15 above).

These mitigation measures are based on a concept design for the electrical infrastructure presented in this draft EIS.

More detailed network design studies may result in changes to elements of the *Proposed Development*, particularly the substation/switching station facility which may result in environmental impacts that differ from those identified to date. Where potential changes in final design have not been anticipated in this draft EIS, ActewAGL will commit to the adoption of new mitigation measures to ensure an equal or better environmental outcome than envisaged by use of the current mitigation measures.

**Table Error! No text of specified style in document.-1: Proposed Development E4 - Environmental Management Commitments**

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
<b>Option E4 - Dairy Road North (Block 10 Section 59 Fyshwick)</b>		
Infrastructure	Could affect future expansion of sewage treatment plant. Impacts on sewer pipeline that crosses site	Liaison / agreement with ACTEW Corp. Sewer line to be relocated.
	Minimal impact on traffic congestion or road safety issues	No mitigation.
Waste	Demolition – small amounts of green waste and earth spoil	Re-use of soil and mulching of green waste
	Construction – Generally concrete, bitumen, metal 'off-cuts' from construction activity	Re-cycling in accordance with an approved Waste Management Plan
	Operation – minimal office & staff wastes	Disposal & recycling by commercial contractor
Land	Potential impact on adjacent land uses, including amenity: wetlands car park area; Sewage plant; Birrigai	Landscape screening along Dairy Road; plus setback of facilities
	Potential for spillage of transformer oils.	Bund to be constructed around each transformer.
	Erosion and sediment loss from stockpiles.	Spoil management to be in accordance with

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
		approved Erosion & Sediment Control plan (ESCP), including: separate stockpiling of topsoil; minimising exposure time of trenches; filtering of any discharge water.
	<p>Minor (distant) visual impact for northbound traffic along Monaro Highway</p> <p>Visual impact for users of Dairy Road (for a short section)</p> <p>Visual impact for users of the WFBP.</p>	<p>Reinforce planting on ACTEW Corp land adjacent to Monaro Highway</p> <p>Retain and reinforce planting along Dairy Road</p> <p>Site design to incorporate visual screening with building walls, screens and/or planting around the perimeter fencing</p> <p>The positioning of building structures within the compound will be designed to provide screening to Dairy Road.</p> <p>Busbars, corona rings and conductors treated with low reflective finish</p>
Water Resources	Potential for impacts to groundwater through spillage	<p>Transformers to be bunded to contain 130% of oil volume</p> <p>Construction works to be in accordance with Erosion and Sediment Control Plan (ESCP)</p> <p>Waste materials managed in accordance with Waste Management Plan</p>
	Potential for sediment laden runoff from exposed areas	Application of WSUD principles to control runoff.
Climate, Air & Noise	Dust (PM10) and fumes from increased traffic during construction.	Dust management control in accordance with CEMP
	Light pollution at night	Lighting for security will be designed to minimise light spill.
	Construction noise on nearby business receivers.	Construction noise to be monitored and controlled in accordance with CEMP.
	Construction noise on birdlife, particularly migratory bird species	Works that affect core wetlands areas to be completed during periods of low migratory bird use of the wetlands (winter)
	Minor operational noise on nearby business receivers.	Noise barriers will be effective in controlling noise emissions close to the source i.e. around the transformers or the substation site
Biodiversity	Disturbance to existing vegetation	<p>CEMP to include Vegetation and Fauna Management sub-plan addressing: staff induction; description of habitats and species of conservation significance; clearing limits; 'no-go' areas; marked and fenced trees</p> <p>All areas of temporary disturbance will be restored to preconstruction condition</p> <p>Installation of barrier fencing around the</p>

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
		<p>construction areas</p> <p>Re-vegetation of disturbed areas using local provenance plant species indigenous to the vegetation communities of the study area</p> <p>Cleared native vegetation to be mulched and stockpiled on site for later use in soil stabilisation and vegetation rehabilitation</p>
	Bird strike & electrocution	Design of switching yard to seek to remove any potential habitat or food sources which may attract birds.
Heritage	Isolated find (ELIF1) located in, or near to, the substation site	Salvage collection of artefact and lodgement with ACT Heritage Unit
<b>R1 - Common Causeway cable connection</b>		
Infrastructure	No impact on infrastructure	No mitigation.
Waste	Potential small amounts of spoil, concrete, metal 'off-cuts' from cable installation activity	Disposal and recycling in accordance with an approved Waste Management Plan
Land	Cabling works may encounter fill material with the potential disturbance and release of contaminants.	<p>Concept design has been developed to avoid these areas. If during detailed design or construction waste materials are discovered, work would stop and further investigation into altering the alignment be conducted.</p> <p>If it is not possible to avoid impacting the landfill areas, testing should be conducted prior to excavation to ensure appropriate OHS measures are implemented and suitable disposal or remediation measures are implemented.</p>
	Erosion and sediment loss from stockpiles and trenches, with potential for sediment run off into Jerrabomberra Creek.	Spoil management to be in accordance with approved ESCP, including: separate stockpiling of topsoil; minimising exposure time of trenches; filtering of any discharge water.
	Fill material used as backfill around the cable conduits may affect drainage characteristics of the Wetlands.	Excavated material will be used for backfilling and shortfalls will be made up from soils with similar characteristics
	No visual impact after construction except for maintenance of a tree-free corridor along the alignment of the cable	Reinstate ground vegetation to provide habitat cover and prevent soil erosion
Water Resources	Potential for sediment-laden runoff from exposed areas	Application of WSUD principles to control runoff.
	Potential for contaminated water to seep into	Concept design has been developed to avoid these areas. If during detailed design or

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
	groundwater during boring should landfill be encountered.	<p>construction waste materials are discovered, work would stop and further investigation into altering the alignment be conducted.</p> <p>If it is not possible to avoid impacting the landfill areas, testing should be conducted prior to excavation to ensure appropriate OHS measures are implemented and suitable disposal or remediation measures are implemented.</p>
Climate, Air & Noise	Dust (PM10) and fumes from increased traffic during construction.	Dust management control in accordance with CEMP.
	Construction noise impacts	<p>Development of a construction noise management plan that identifies specific activities and associated machinery, locations relative to receivers, and noise minimisation measures.</p> <p>Works that affect core wetland areas to be completed during periods of low migratory bird use of the wetlands (winter)</p>
Biodiversity	Disturbance to existing vegetation, including native trees	<p>CEMP to include Vegetation and Fauna Management sub-plan addressing: staff induction; description of habitats and species of conservation significance; clearing limits; 'no-go' areas; marked and fenced trees</p> <p>All areas of temporary disturbance will be restored to preconstruction condition</p> <p>Installation of barrier fencing around the construction areas</p> <p>Re-vegetation of disturbed areas using local provenance plant species indigenous to the vegetation communities of the study area</p> <p>Engagement of an ecologist during the removal of native vegetation.</p> <p>Clearly mark access sites for construction vehicles to prevent accidental impacts to adjacent vegetation</p>
	Disturbance to riparian vegetation	Cable alignment to be on previously cleared and disturbed areas, to avoid mature casuarinas.
Heritage	No potential adverse impact	No mitigation
<b>R3 - Causeway cable connection to Site E4 (via silt pond)</b>		
Infrastructure	No impact	No mitigation.
Waste	Potential small amounts of	Disposal and recycling in accordance with an

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
	spoil, concrete, metal 'off-cuts' from cable installation activity	approved Waste Management Plan
Land	Cabling works may encounter fill material with the potential disturbance and release of contaminants.	<p>Concept design has been developed to avoid these areas. If during detailed design or construction waste materials are discovered, work would stop and further investigation into altering the alignment be conducted.</p> <p>If it is not possible to avoid impacting the landfill areas, testing should be conducted prior to excavation to ensure appropriate OHS measures are implemented and suitable disposal or remediation measures are implemented.</p>
	Erosion and sediment loss from stockpiles and trenches, with potential for sediment run off into Jerrabomberra Creek.	Spoil management to be in accordance with approved ESCP, including: separate stockpiling of topsoil; minimising exposure time of trenches; filtering of any discharge water.
	Fill material used as backfill around the cable conduits may affect drainage characteristics of the Wetlands.	<p>Excavated material will be used for backfilling and shortfalls will be made up from soils with similar characteristics</p> <p>Reinstate ground vegetation to provide habitat cover and prevent soil erosion</p>
	No visual impact after construction except for maintenance of a tree-free corridor along the alignment of the cable	No mitigation
	Potential impact on Jerrabomberra Creek	Boring beneath Jerrabomberra Creek will avoid disturbance to the Creek and the need for temporary diversions or realignments
Water Resources	Potential for sediment-laden runoff from exposed areas	Application of WSUD principles to control runoff.
	Potential for contaminated water to seep into groundwater during boring should landfill be encountered.	<p>Concept design has been developed to avoid these areas. If during detailed design or construction waste materials are discovered, work would stop and further investigation into altering the alignment be conducted.</p> <p>If it is not possible to avoid impacting the landfill areas, testing should be conducted prior to excavation to ensure appropriate OHS measures are implemented and suitable disposal or remediation measures are implemented.</p>

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
Climate, Air. & Noise	Dust (PM10) and fumes from increased traffic during construction.	Dust management control in accordance with CEMP.
	Construction noise impacts	Development of a construction noise management plan that identifies specific activities and associated machinery, locations relative to receivers, and noise minimisation measures.  Works that affect core wetland areas to be completed during periods of low migratory bird use of the wetlands (winter)
Biodiversity	Disturbance to existing vegetation, including native trees	CEMP to include Vegetation and Fauna Management sub-plan addressing: staff induction; description of habitats and species of conservation significance; clearing limits; 'no-go' areas; marked and fenced trees  All areas of temporary disturbance will be restored to preconstruction condition  Installation of barrier fencing around the construction areas  Re-vegetation of disturbed areas using local provenance plant species indigenous to the vegetation communities of the study area  Engagement of an ecologist during the removal of native vegetation.  Clearly mark access sites for construction vehicles to prevent accidental impacts to adjacent vegetation
	Disturbance to riparian vegetation	Cable alignment to be on previously cleared and disturbed areas, to avoid mature casuarinas.
Heritage	No potential adverse impact	No mitigation
<b>R6 - Canberra Ave to B2 (adjacent Monaro Hwy)</b>		
Infrastructure	No impact	No mitigation.
Waste	Potential small amounts of spoil, concrete, metal 'off-cuts' from line construction activity	Disposal and recycling in accordance with an approved Waste Management Plan
Land	Erosion and sediment loss from stockpiles.	Spoil management to be in accordance with CEMP.
	New access road	Construction in accordance with detail design plans

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
	Minor loss of roadside plantings	Additional roadside landscaping
	Minor visual impact from new single poles for Monaro Highway users, north-bound (but will replace existing poles to west)	Poles and conductors (wires) will have a low reflective finish
Water Resources	Potential for sediment laden runoff from exposed areas	Application of WSUD principles to control runoff. Construction works to be in accordance with Erosion and Sediment Control Plan (ESCP)
Climate, Air. & Noise	Dust (PM10) and fumes from increased traffic during construction.	General dust management control in accordance with CEMP
	Construction noise impacts	Development of a construction noise management plan that identifies specific activities and associated machinery, locations relative to receivers, and noise minimisation measures.
Biodiversity	Disturbance to existing vegetation	CEMP to include Vegetation and Fauna Management sub-plan addressing: staff induction; description of habitats and species of conservation significance; clearing limits; 'no-go' areas; marked and fenced trees  All areas of temporary disturbance will be restored to preconstruction condition  Installation of barrier fencing around the construction areas  Re-vegetation of disturbed areas using local provenance plant species indigenous to the vegetation communities of the study area  Cleared native vegetation to be mulched and stockpiled on site for later use in soil stabilisation and vegetation rehabilitation
	Bird strike & electrocution	Design to prevent cross-over of subtransmission lines.  Conductor (wire) separation to ensure width is greater than bird wingspans
Heritage	No potential adverse impact	No mitigation
<b>R8 - Site B2 to Dairy Road (west Wetlands Foreshore Business Park)</b>		
Infrastructure	Potential impacts on	Liaise with ACTEW Corp during detailed design

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
	nearby sewerage network	and construction stage.
	Minor disruption to rail services during construction.	CEMP to include details on timing of work to avoid rail disruption.
Waste	Potential small amounts of spoil, concrete, 'metal off-cuts' from line construction activity	Disposal and recycling in accordance with an approved Waste Management Plan
Land	Minor reduction of future 'business amenity' for WFBP through additional electrical infrastructure along site boundary	No mitigation
	Intrusion into southern part of Wetlands Nature Reserve	No mitigation
	Minor visual impact for train passengers Visual impact for users of WFBP (Future development of the WFBP could face electrical infrastructure) Minor visual impact for northbound traffic along Monaro Highway (for a short section).	Poles and conductors (wires) will have a low reflective finish
Water Resources	Potential for sediment laden runoff from exposed areas	Application of WSUD principles to control runoff. Construction works to be in accordance with Erosion and Sediment Control Plan (ESCP)
Climate, Air & Noise	Dust (PM10) and fumes from increased traffic during construction.	General dust management control in accordance with CEMP
	Construction noise impacts	Development of a construction noise management plan that identifies specific activities and associated machinery, locations relative to receivers, and noise minimisation measures.
Biodiversity	Disturbance to existing vegetation	CEMP to include Vegetation and Fauna Management sub-plan addressing: staff induction; description of habitats and species of conservation significance; clearing limits; 'no-go' areas; marked and fenced trees

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
		<p>All areas of temporary disturbance will be restored to preconstruction condition</p> <p>Installation of barrier fencing around the construction areas</p> <p>Re-vegetation of disturbed areas using local provenance plant species indigenous to the vegetation communities of the study area</p> <p>Cleared native vegetation to be mulched and stockpiled on site for later use in soil stabilisation and vegetation rehabilitation</p>
	Bird strike & electrocution	<p>Design to prevent cross-over of subtransmission lines.</p> <p>Conductor (wire) separation to ensure width is greater than bird wingspans</p>
Heritage	Archaeologically sensitive area (ELSA1) impacted by pole placement	Avoid impact where possible, if not, conduct a program of archaeological test pitting prior to disturbance to determine if archaeological material present and draft appropriate management strategies
<b>R10 – Dairy Road to Site E4</b>		
Infrastructure	Negligible impact on infrastructure along Dairy Road.	No mitigation.
Waste	Potential small amounts of spoil, concrete, 'metal off-cuts' from line construction activity	Disposal and recycling in accordance with an approved Waste Management Plan
Land	Minor loss of roadside plantings	Additional roadside landscaping
	Intrusion into unleased Territory land	No mitigation
	<p>Visual impact for users of WFBP (Future development of the WFBP could face electrical infrastructure)</p> <p>Minor visual impact for northbound traffic along Monaro Highway (for a short section).</p>	Poles and conductors (wires) will have a low reflective finish
Water Resources	Potential for sediment laden runoff from exposed areas	<p>Application of WSUD principles to control runoff.</p> <p>Construction works to be in accordance with Erosion and Sediment Control Plan (ESCP)</p>

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
Climate, Air. & Noise	Dust (PM10) and fumes from increased traffic during construction.	General dust management control in accordance with CEMP
	Construction noise impacts	Development of a construction noise management plan that identifies specific activities and associated machinery, locations relative to receivers, and noise minimisation measures.
Biodiversity	Disturbance to existing vegetation	CEMP to include Vegetation and Fauna Management sub-plan addressing: staff induction; description of habitats and species of conservation significance; clearing limits; 'no-go' areas; marked and fenced trees  All areas of temporary disturbance will be restored to preconstruction condition  Installation of barrier fencing around the construction areas  Re-vegetation of disturbed areas using local provenance plant species indigenous to the vegetation communities of the study area  Cleared native vegetation to be mulched and stockpiled on site for later use in soil stabilisation and vegetation rehabilitation
	Bird strike & electrocution	Design to prevent cross-over of subtransmission lines.  Conductor (wire) separation to ensure width is greater than bird wingspans
Heritage	No potential adverse impact	No mitigation
<b>R11 - Site E4 to Molonglo Reach underground cable (wetland)</b>		
Infrastructure	Negligible impact on infrastructure along Dairy Road.	No mitigation.
Waste	Potential small amounts of spoil, concrete, 'metal off-cuts' from line construction activity	Disposal and recycling in accordance with an approved Waste Management Plan
Land	Minor impact on recreational uses and amenity along Dairy Road	No mitigation
	Intrusion into northern part of Wetlands Nature Reserve	No mitigation

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
	Fill material used as backfill around the cable conduits may affect drainage characteristics of the Wetlands.	Excavated material will be used for backfilling and shortfalls will be made up from soils with similar characteristics
	No visual impact after construction except for maintenance of a tree-free corridor along the alignment of the cable	Reinstate ground vegetation to provide habitat cover and prevent soil erosion
Water Resources	Potential for sediment laden runoff from exposed areas	Application of WSUD principles to control runoff. Construction works to be in accordance with Erosion and Sediment Control Plan (ESCP)
Climate, Air & Noise	Dust (PM10) and fumes from increased traffic during construction.	General dust management control in accordance with CEMP
	Construction noise impacts	Development of a construction noise management plan that identifies specific activities and associated machinery, locations relative to receivers, and noise minimisation measures.
Biodiversity	Disturbance to existing vegetation, including native trees	CEMP to include Vegetation and Fauna Management sub-plan addressing: staff induction; description of habitats and species of conservation significance; clearing limits; 'no-go' areas; marked and fenced trees  All areas of temporary disturbance will be restored to preconstruction condition  Installation of barrier fencing around the construction areas  Re-vegetation of disturbed areas using local provenance plant species indigenous to the vegetation communities of the study area  Engagement of an ecologist during the removal of native vegetation.  Clearly mark access sites for construction vehicles to prevent accidental impacts to adjacent vegetation
Heritage	No potential adverse impact	No mitigation
	Archaeologically sensitive area (ELSA2) impacted by pole placement	Conduct archaeological monitoring of pole hole excavations and comply with unanticipated discovery protocols, or conduct a program of archaeological test pitting prior to disturbance

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
		to determine if archaeological material present and draft appropriate management strategies
<b>R13 – Decommission Overhead Lines: Causeway to Molonglo Reach via Wetlands</b>		
Infrastructure	Twin subtransmission lines to be decommissioned and removed with net benefit to core wetlands area and visual amenity	Demolition works to be undertaken within framework of an approved CEMP & JWMP
Waste	Concrete and steel materials from decommissioning existing overhead lines	Disposal and recycling in accordance with an approved Waste Management Plan
Land	No significant land impact likely	Demolition as per agreed CEMP
	Positive visual impact through reducing visual clutter from this part of the wetlands, and improving viewshed amenity for walkers and cyclists in the local area	No mitigation
Water Resources	No Impact	No mitigation
Climate, Air. & Noise	Dust (PM10) and fumes from increased traffic during construction.	General dust management control in accordance with CEMP
	Noise impacts	Development of a noise management plan that identifies specific activities and associated machinery, locations relative to receivers, and noise minimisation measures.
Biodiversity	Disturbance to existing vegetation	CEMP to include Vegetation and Fauna Management sub-plan addressing: staff induction; description of habitats and species of conservation significance; clearing limits; 'no-go' areas. marked and fenced trees  All areas of temporary disturbance will be restored to preconstruction condition  Installation of barrier fencing around the construction areas  Re-vegetation of disturbed areas using local provenance plant species indigenous to the vegetation communities of the study area  Cleared native vegetation to be mulched and

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
		stockpiled on site for later use in soil stabilisation and vegetation rehabilitation
	Bird strike & electrocution	Design to prevent cross-over of subtransmission lines. Conductor (wire) separation to ensure width is greater than bird wingspans
	Potential spread of weeds	Prior to the commencement of works, weed-dominated areas to be sprayed with Glyphosate.
Heritage	No potential adverse impact	No mitigation
<b>#14 – Decommission Causeway Switching Station</b>		
Infrastructure	Causeway switching station will be decommissioned and removed, with benefits to local residential amenity and potential for more land sales by the Territory	Demolition works to be undertaken within framework of an approved CEMP. All traffic involved in decommissioning the site will utilise the existing road network which has the capacity to accommodate the expected low level construction traffic volumes.
Waste	Potential for exposure of asbestos materials	Facility will be assessed for contaminated materials before demolition. Qualified and licensed contractors will be employed for removal of asbestos if found
	Steel and concrete materials from decommissioning existing facility	Disposal and recycling in accordance with an approved Waste Management Plan
Land	Potential for spillage of transformer oils during demolition of switching station.	Use of appropriately licensed and experienced contractors.
	Positive visual impact for existing and future residents & visitors. Improvements to future residential amenity and increased land for new urban development	No mitigation
Water Resources	No Impact	No mitigation
Climate, Air & Noise	Dust (PM10) and fumes from increased traffic during construction.	General dust management control in accordance with CEMP
	Noise impacts	Development of a noise management plan that identifies specific activities and associated

Location (Fig 1-3)	Potential Impact	Proposed Mitigation Measures
		machinery, locations relative to receivers, and noise minimisation measures.
Biodiversity	No impact	No mitigation
Heritage	No potential adverse impact	No mitigation
<b>R15 – Decommission Overhead Lines: Causeway to Canberra Ave</b>		
Infrastructure	Single pole subtransmission lines to be decommissioned and removed with potential for more land sales and improved future residential amenity	Demolition works to be undertaken within framework of an approved CEMP & JWMP.
Waste	Concrete and steel materials from decommissioning existing overhead lines	Disposal and recycling in accordance with an approved Waste Management Plan
Land	No significant impact likely	No mitigation
	Positive visual impact for residents & visitors plus improvements to future residential amenity and increased land for new urban development	No mitigation
Water Resources	No Impact	No mitigation
Climate, Air. & Noise	Dust (PM10) and fumes from increased traffic during construction.	General dust management control in accordance with CEMP
	Noise impacts	Development of a noise management plan that identifies specific activities and associated machinery, locations relative to receivers, and noise minimisation measures.
Biodiversity	No impact	No mitigation
Heritage	No potential adverse impact	No specific mitigation other than adherence to Heritage protocols for the construction process

